

Complexity, Psychology, Sustainability & Spirituality: Why they matter for your business (really)

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Saturday 26th September 2015



Epektasis

SPIRITUALITY • SUSTAINABILITY • EMPOWERMENT • HOPE

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My background ...

- BSc in science (geology & chemistry) and MA in development studies, BTh(Hons) in theology, PhD in development economics at Monash University.
- Worked with World Vision (WV Australia & WV International) for 16 years – responsible for WVI's relations with WTO, OECD & UNCTAD from 2000-2003 & climate policy from 2007-2009.
- Witnessed constant, often bitter debates in WTO, UN, World Bank etc over trade policy, globalisation, sustainability, climate change & effects on developing countries
- Was a Research Fellow at Monash University & Lecturer in the Masters of International & Community Development program at Deakin University.
- Senior Economist at the Australian Conservation Foundation 2013
- Now Director of *Epektasis*.

Roadmap



Outline

- **Complex systems: Getting better information**
- **Logical fallacies & cognitive biases**
- **A sustainability reality check**
- **Why spirituality matters – even if you're an atheist**

Outline

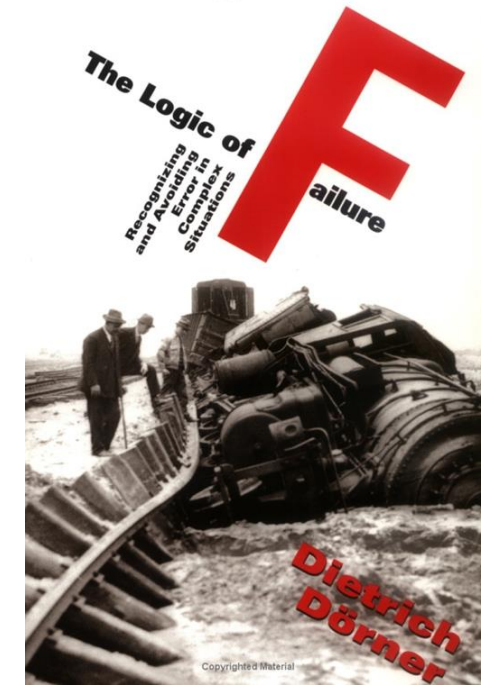
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- Logical fallacies & cognitive biases
- A sustainability reality check
- Why spirituality matters – even if you're an atheist

Why care about complex systems?



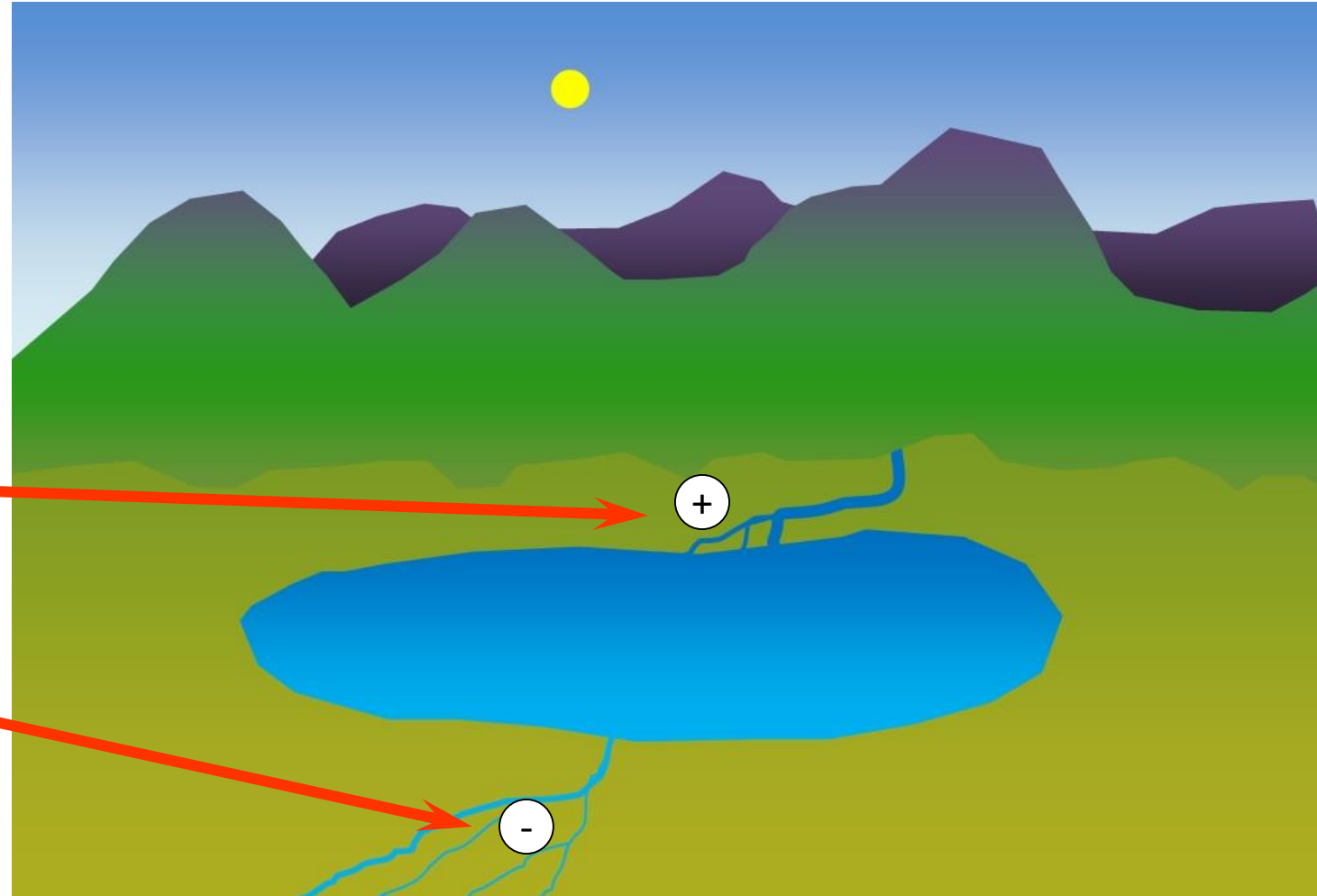
Dörner, D., (1996) *The Logic of Failure: Recognizing and Avoiding Error in Complex Situations*, trans. Kimber, R. and Kimber, R.; Basic Books, New York, 222 pp.

Understanding the nature of the systems we are dealing with will not guarantee success, but failing to do so almost always guarantees failure – unless we're very lucky.



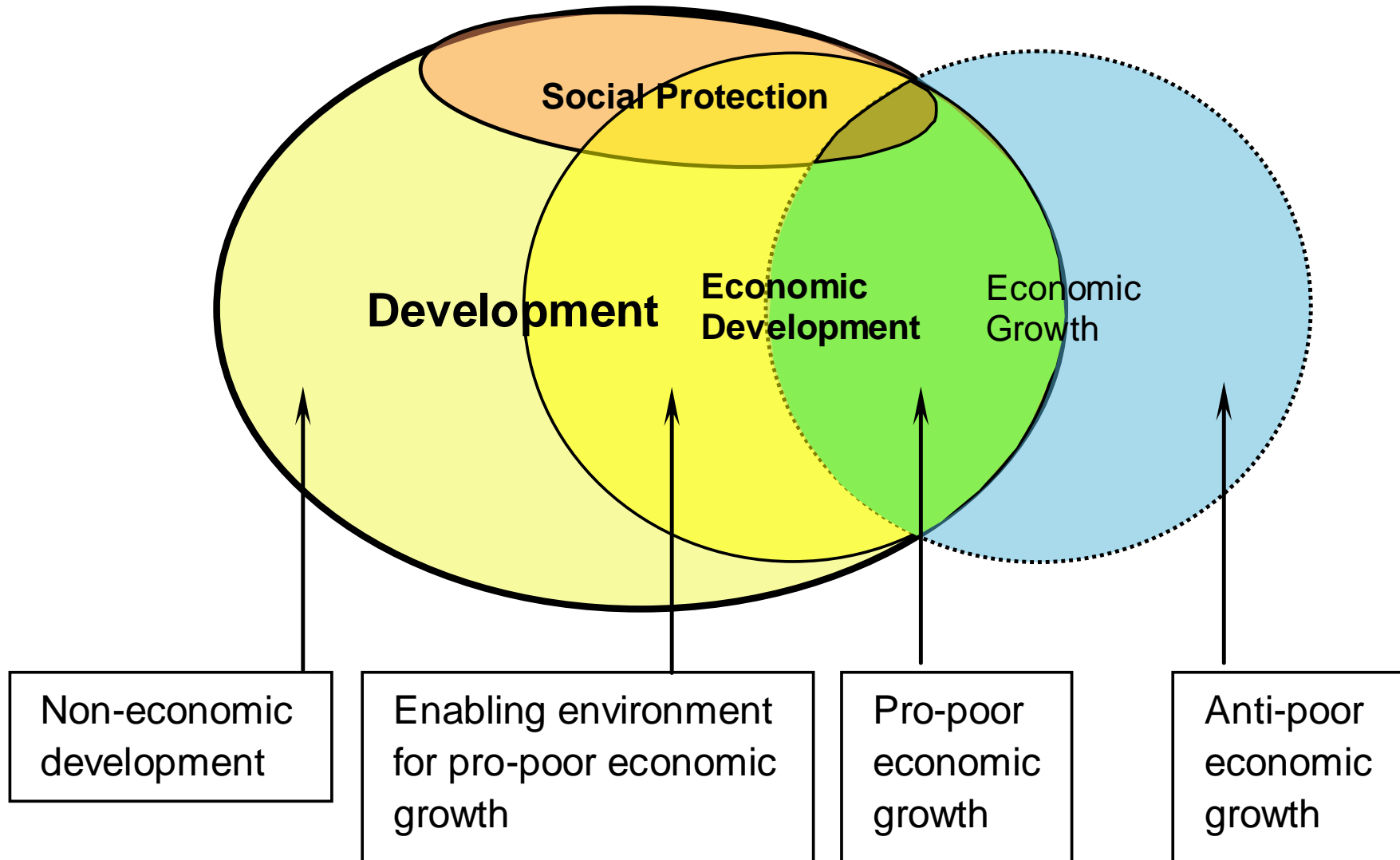
System boundaries: E.g. *Net growth*

To see the lake level rise, we have to watch what's coming in, *and* what's going out.



System boundaries:

E.g. What is 'economic development'?



Nonlinearity

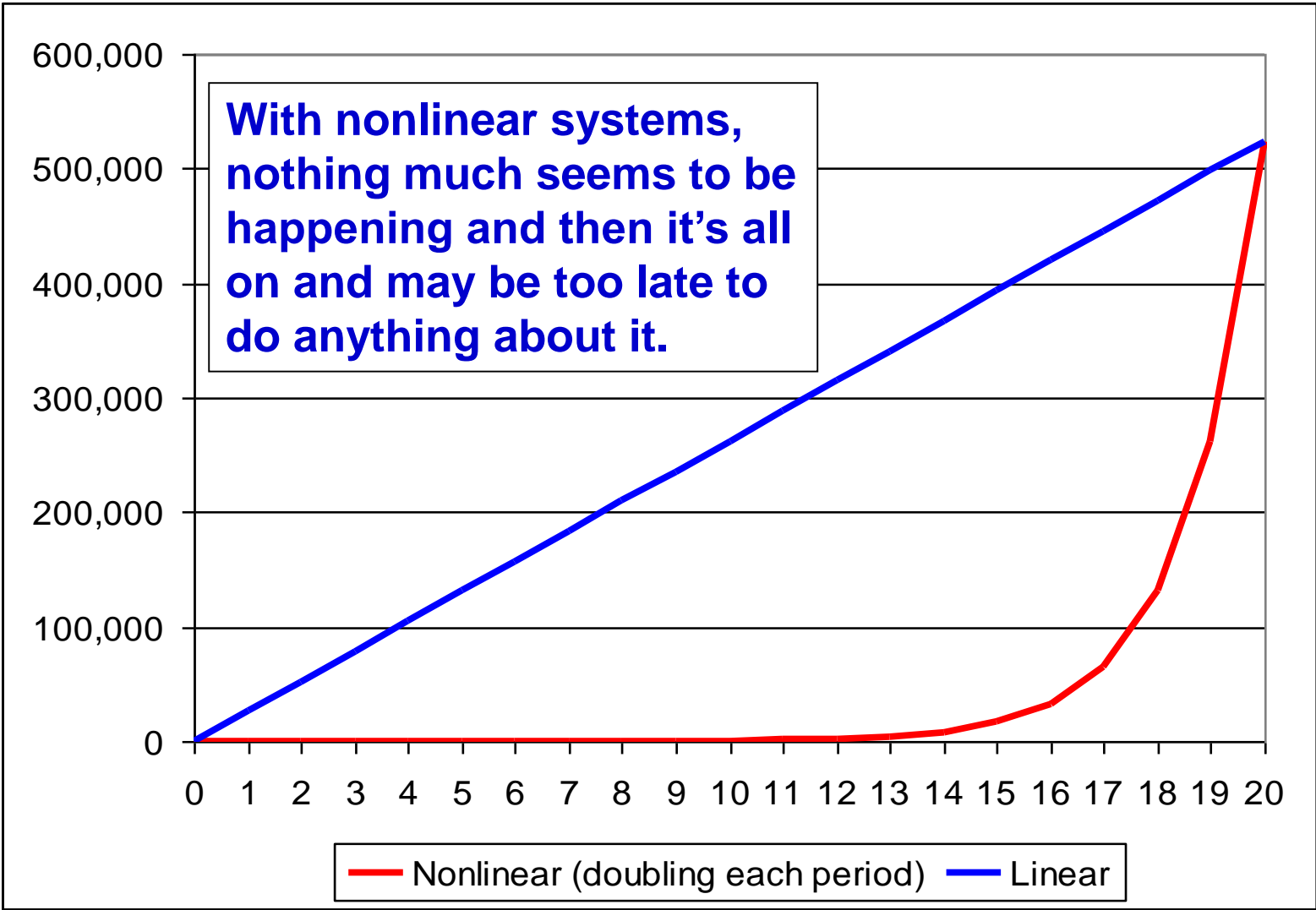
➤ Linear systems:

- Responses are proportional to forces and effects proportional to causes
- Problems can be broken down into pieces & each piece analysed separately (*ceteris paribus!* Latin: 'holding all else equal')
- Separate answers can be recombined to give answer to original problem
- The whole is exactly equivalent to the sum of the parts (a.k.a. *resultant*)
- If $A \rightarrow X$ & $B \rightarrow Y$ then $A + B \rightarrow X + Y$

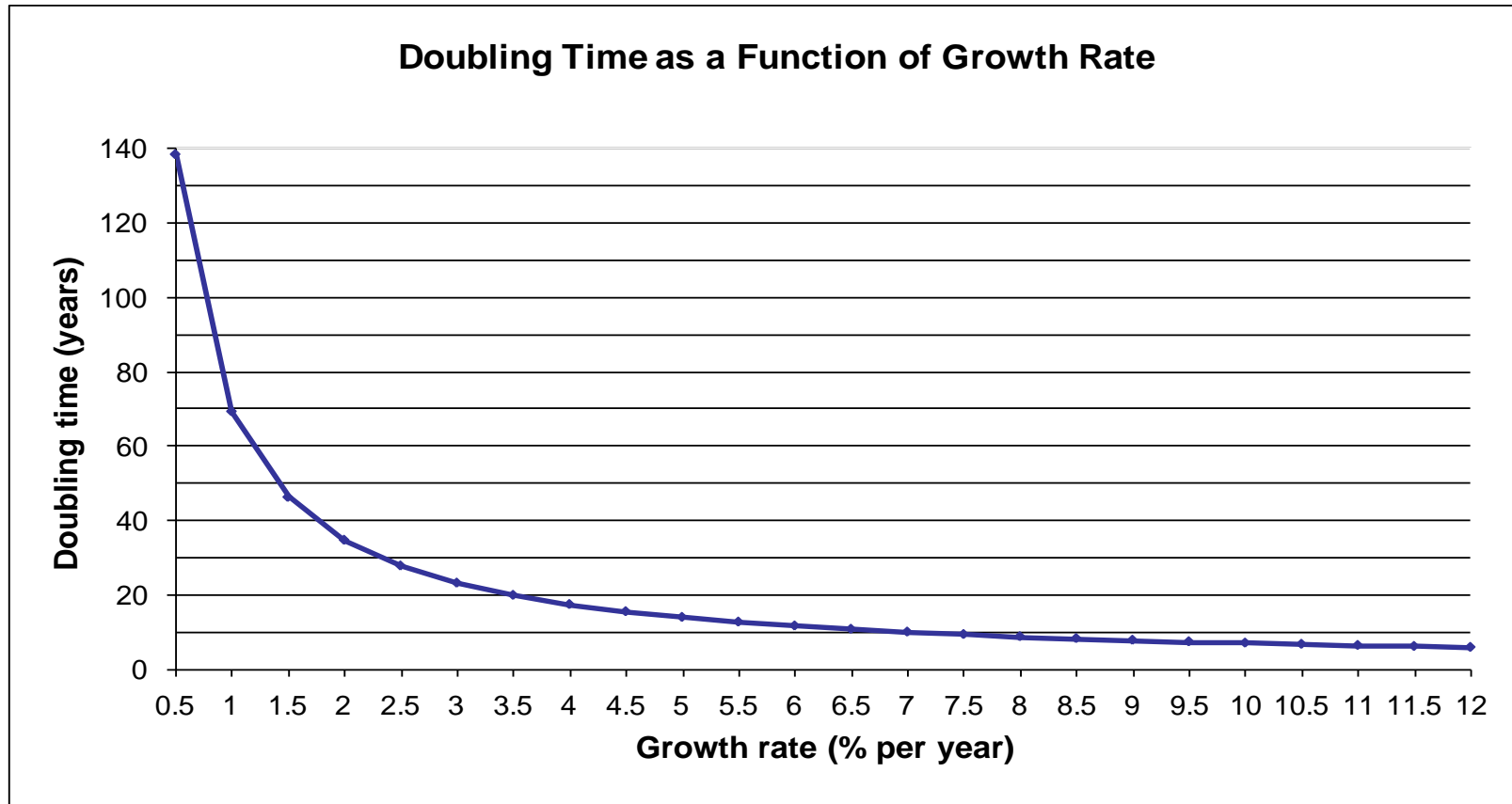
➤ Nonlinear systems:

- Relationships *can't* simply be taken apart and examined separately – there's no 'independent variable'
- "Nonlinear" is like classifying most animals as "non-elephants" – disguises huge variety
- Nonlinear feedbacks – changes in output not necessarily proportional to input
- If $A \rightarrow X$ & $B \rightarrow Y$ then $A + B$ may $\rightarrow Z$ & $Z \neq X + Y$

Linear vs. Nonlinear Systems



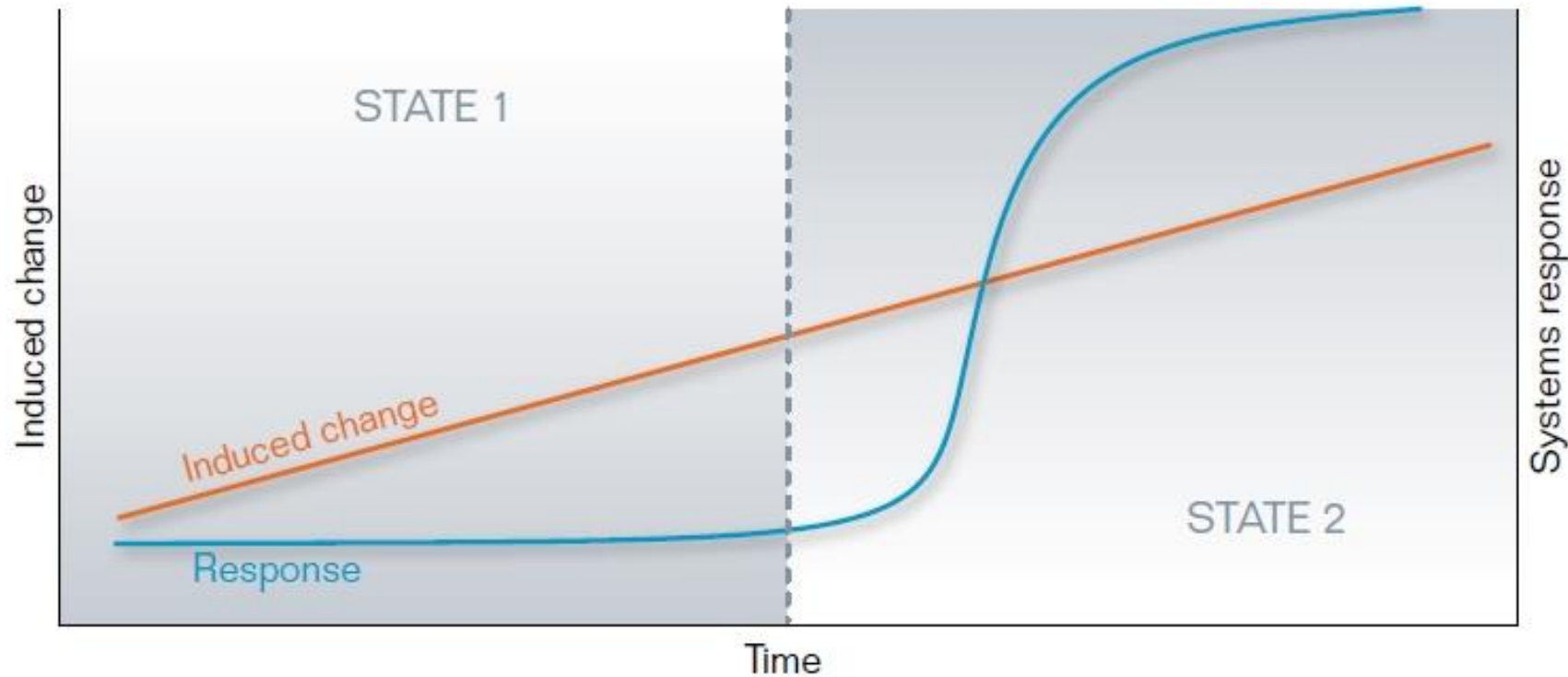
Doubling times



- Rule of 70: **Doubling time = 70/Growth rate.**
- So China's economy will double in size in 10 years at 7% growth per year.

Lags & thresholds

Figure 4.8 Abrupt or rapid climate change showing the lack of response until a threshold is reached

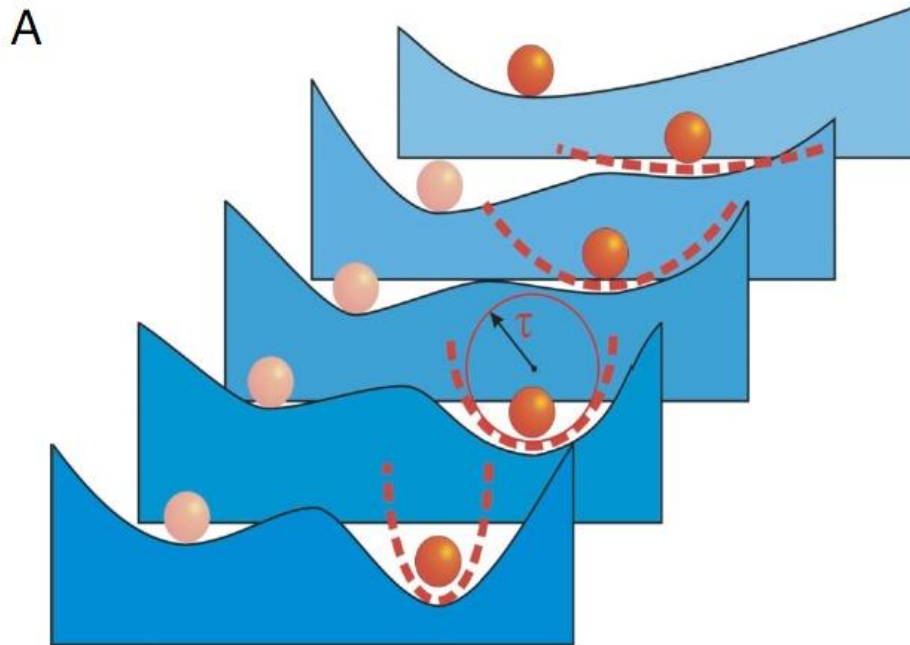


Source: Based on Steffen et al. (2004).

Source: Garnaut, R., (2008) *The Garnaut Climate Change Review: Final Report*, Cambridge University Press, Melbourne, xlv + 616 pp.

Tipping points

➤ **Thresholds, tipping points & phase changes:** Points beyond which the system begins to behave very differently from previously. They are characteristic of nonlinear systems and can sneak up on us.



➤ Eg. China & India both reaching point where enough people rich enough to want cars, air conditioning & refrigeration. **Massive** energy implications .

Lenton, T.M., et al.(2008) "Tipping Elements in the Earth's Climate System", *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 105, No. 6, 12 February, pp. 1786-1793; p. 1792.



Nonlinearity: Temps & Crop Yields

“We find that yields increase with temperature up to 29° C for corn, 30° C for soybeans, and 32° C for cotton but that temperatures above these **thresholds** are very harmful. ... Holding current growing regions fixed, area-weighted **average yields are predicted to decrease by 30–46%** before the end of the century under the **slowest (B1) warming scenario** and **decrease by 63–82%** under the **most rapid warming scenario (A1FI)** .

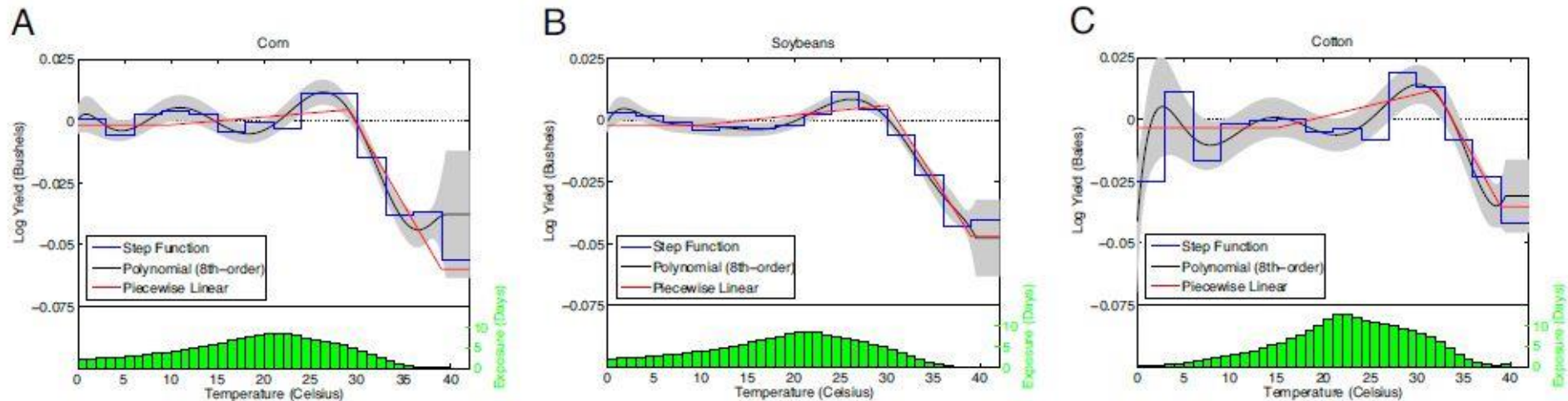


Fig. 1. Nonlinear relation between temperature and yields. Graphs at the top of each frame display changes in log yield if the crop is exposed for one day to a particular 1° C temperature interval where we sum the fraction of a day during which temperatures fall within each interval. The 95% confidence band, after adjusting for spatial correlation, is added as gray area for the polynomial regression. Curves are centered so that the exposure-weighted impact is zero. Histograms at the bottom of each frame display the average temperature exposure among all counties in the data.

Source: Schlenker, W. and Roberts, M.J., (2009) "Nonlinear Temperature Effects Indicate Severe Damages to U.S. Crop Yields Under Climate Change", *Proceedings of the National Academy of Sciences*, Vol. 106, No. 37, 15 September, pp. 15594-15598.

Thresholds matter: What is a 'toxin' or 'pollutant'?

"THE DOSE MAKES THE POISON"

APPLE SEEDS



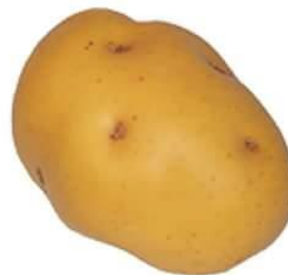
CONTAIN AMYGDALIN
~0.6g/kg of seeds

PEARS



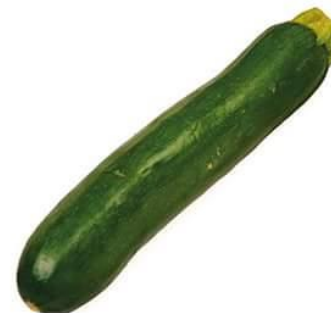
CONTAIN FORMALDEHYDE
~0.06g/kg

POTATOES



CONTAIN SOLANIN
~0.2g/kg
(higher in green potatoes)

COURGETTES



CONTAIN CUCURBITACIN E
Variable
(higher in bitter courgettes)

ALL OF THE FOOD ITEMS ABOVE CONTAIN NATURAL CHEMICALS THAT ARE TOXIC TO HUMANS. HOWEVER, THEY ARE USUALLY PRESENT IN VERY SMALL AMOUNTS, FAR BELOW THE HARMFUL DOSE.

**JUST BECAUSE A CHEMICAL IS PRESENT, DOES NOT
MEAN THAT IT IS HARMFUL IN THE *AMOUNT* PRESENT.**

Network vulnerabilities

➤ Network structure heavily influences vulnerability to attack or error.

Eg. New York, 14 Aug 2003



Albert, R., Jeong, H. and Barabási, A.-L., (2000) "Error and Attack Tolerance of Complex Networks", *Nature*, Vol. 406, No. 6794, 27 July, pp. 378-382.

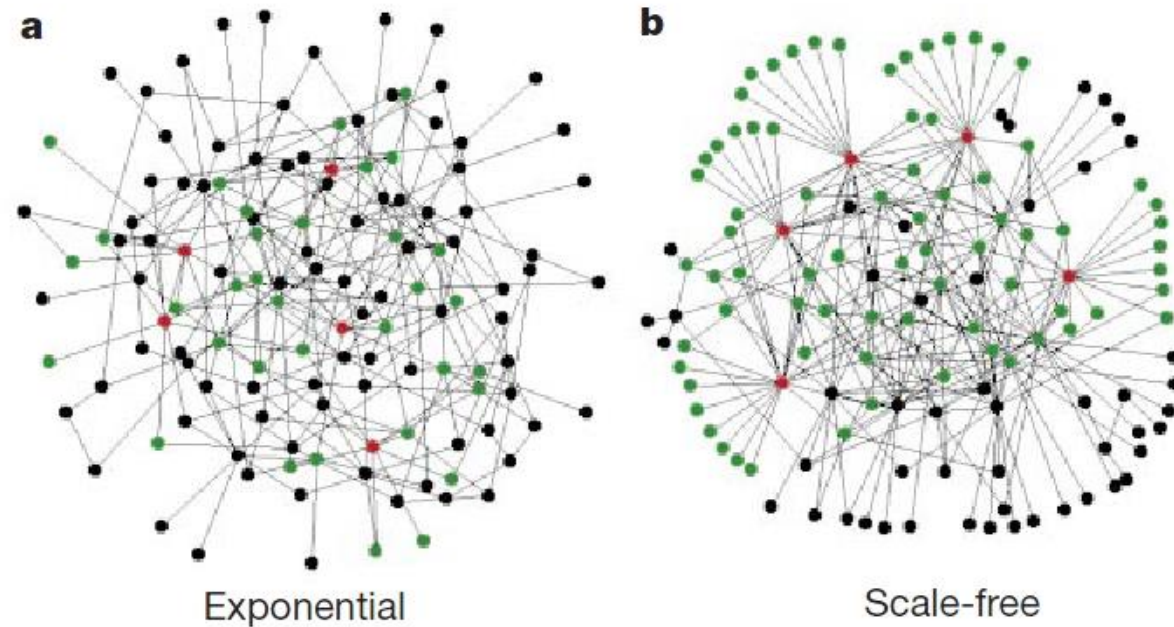


Figure 1 Visual illustration of the difference between an exponential and a scale-free network. **a**, The exponential network is homogeneous: most nodes have approximately the same number of links. **b**, The scale-free network is inhomogeneous: the majority of the nodes have one or two links but a few nodes have a large number of links, guaranteeing that the system is fully connected. Red, the five nodes with the highest number of links; green, their first neighbours. Although in the exponential network only 27% of the nodes are reached by the five most connected nodes, in the scale-free network more than 60% are reached, demonstrating the importance of the connected nodes in the scale-free network. Both networks contain 130 nodes and 215 links ($\langle k \rangle = 3.3$). The network visualization was done using the Pajek program for large network analysis: (<http://vlado.fmf.uni-lj.si/pub/networks/pajek/pajekman.htm>).

Adaptive Agents - Resilience

➤ Resilience always context/system specific – resilient with respect to what? Nothing is absolutely resilient. (Eg. tree in the wind)

➤ The goal is long-run, dynamic efficiency - not merely allocative efficiency optimised for *current* system state (the overwhelming emphasis of neoclassical economics)

➤ Resilience requires:

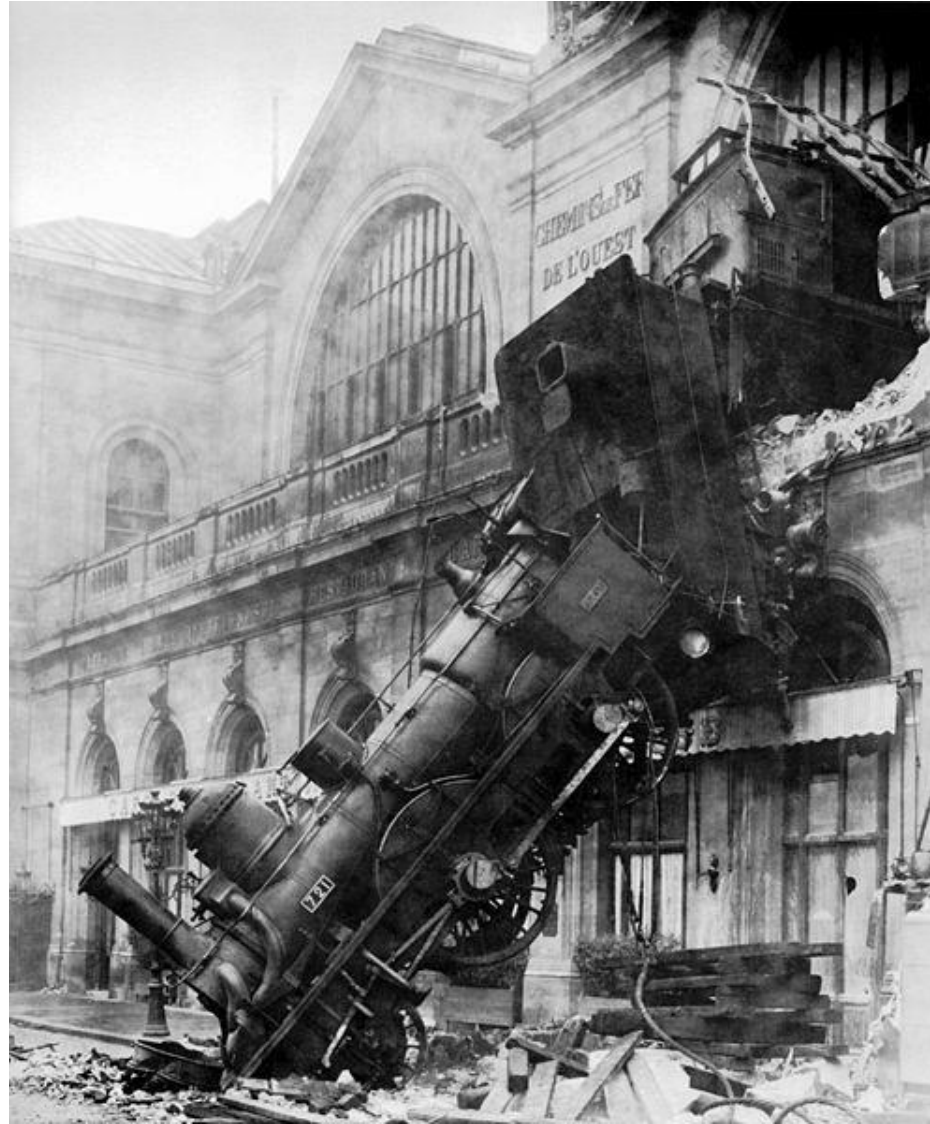
- Adaptability
- Flexibility
- Redundancy (resources & network structures critical)
- Capacity to evolve into different kind of system or to relocate
- Systems perspective & expertise to discern when to resist, adapt, move or evolve. (Eg. “creative destruction” in economic development)



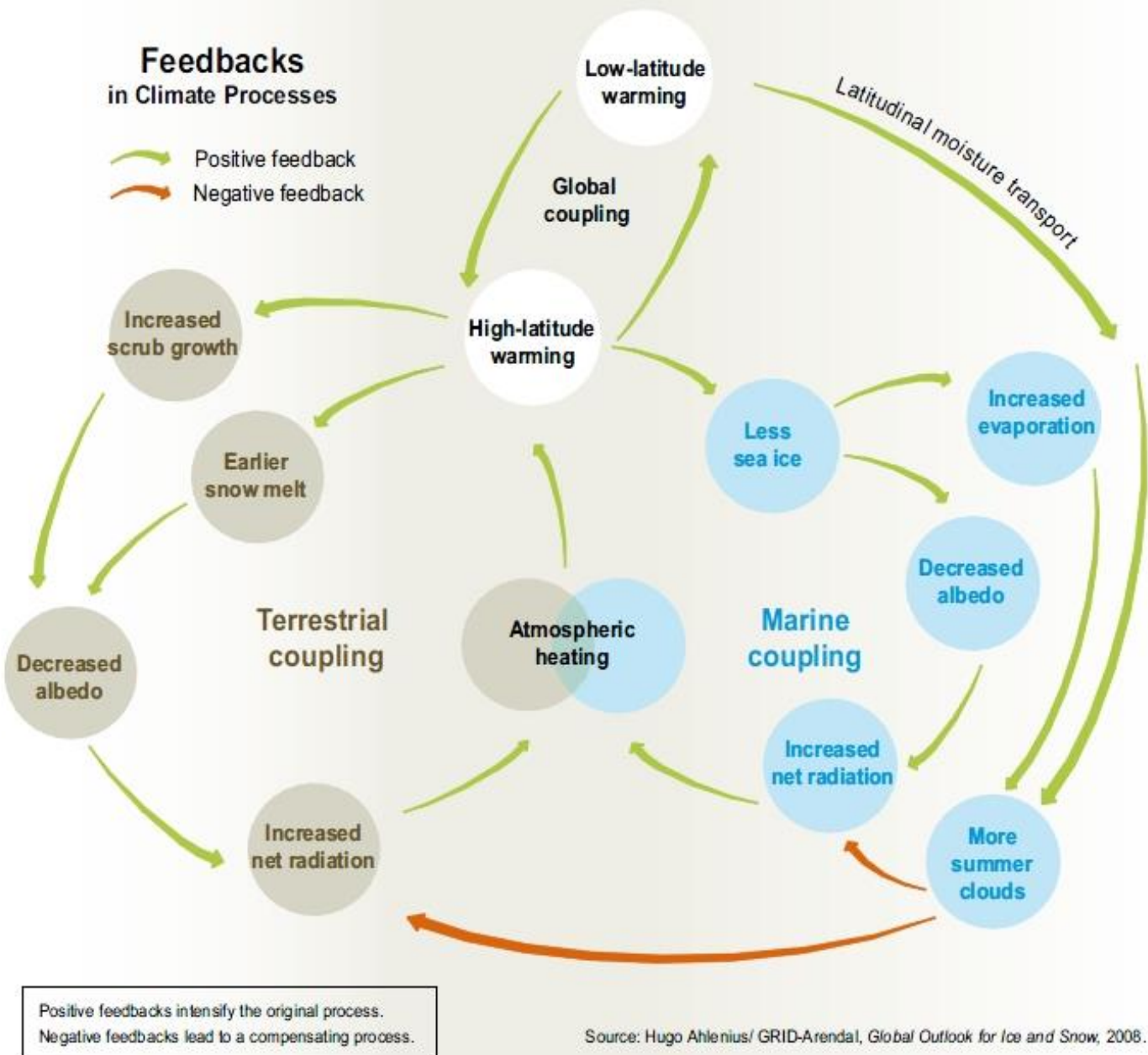
System momentum

➤ **System momentum:**
Can carry us beyond a
critical threshold well
after we've tried to stop.
Eg. WW I? Climate
change?

21 October 1895, La
Gare Montparnasse,
Paris



Feedback effects: E.g. Climate



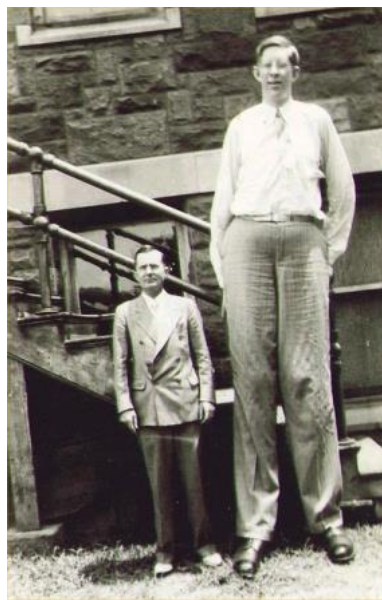
Source: UNEP, (2009) *Climate in Peril: A Popular Guide to the Latest IPCC Reports*, GRID-Arendal & SMI Books: Arendal, Norway & United Nations Environment Program: Nairobi, Kenya, p. 23.

Source: Hugo Ahlenius/ GRID-Arendal, *Global Outlook for Ice and Snow*, 2008.

Fat tails: Changing structure of probability

- Normal probability distributions
- Fat tailed probability distributions

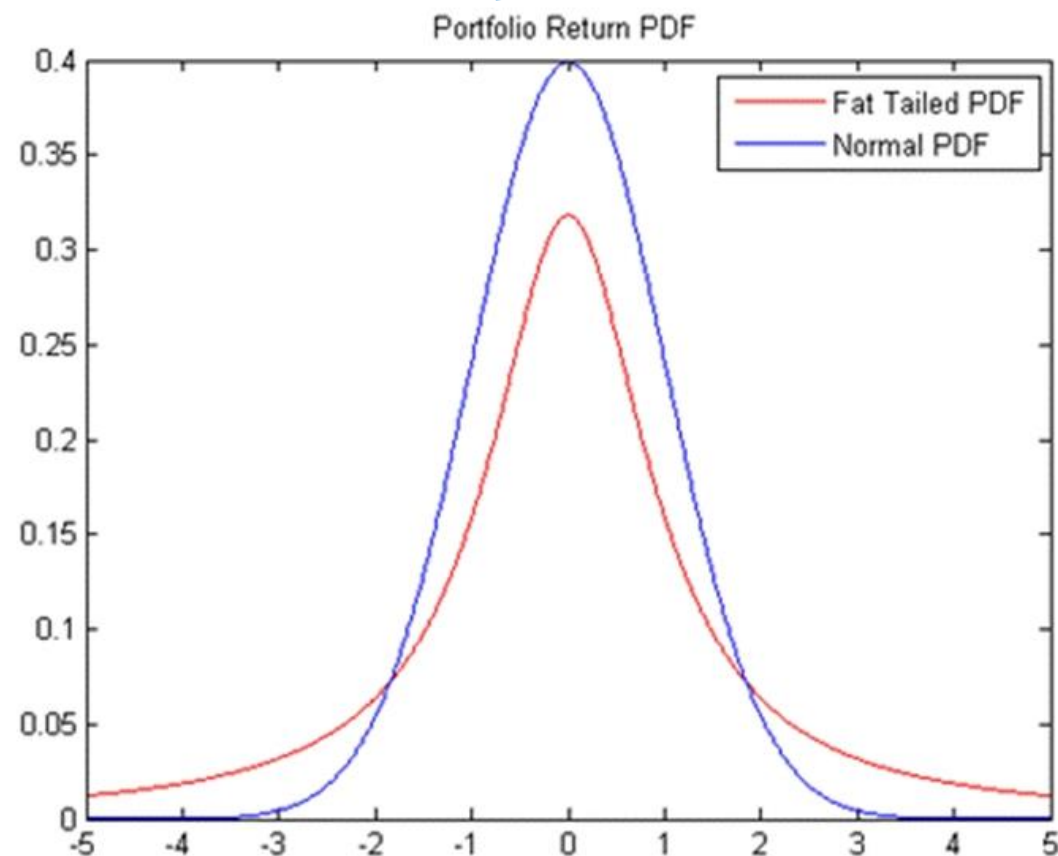
“Everything seemed just fine, and the money rolled in. Until one day a 20 foot man appeared. An underlying price changes by an amount which is effectively ruled out by the assumption of normality.”



Paul Ormerod (2010) "The Current Crisis and the Culpability of Macroeconomic Theory", *Twenty-First Century Society*, Vol. 5, No. 1, February, pp. 5-18.

<http://www.paulormerod.com/pdf/accsoct09%20br.pdf>

PDF = Probability distribution function.
Area under each curve = 1



Emergence

➤ **Emergence:** System properties or behaviours that emerge at higher levels which cannot be explained simply as the sum of individual components - “More is different”

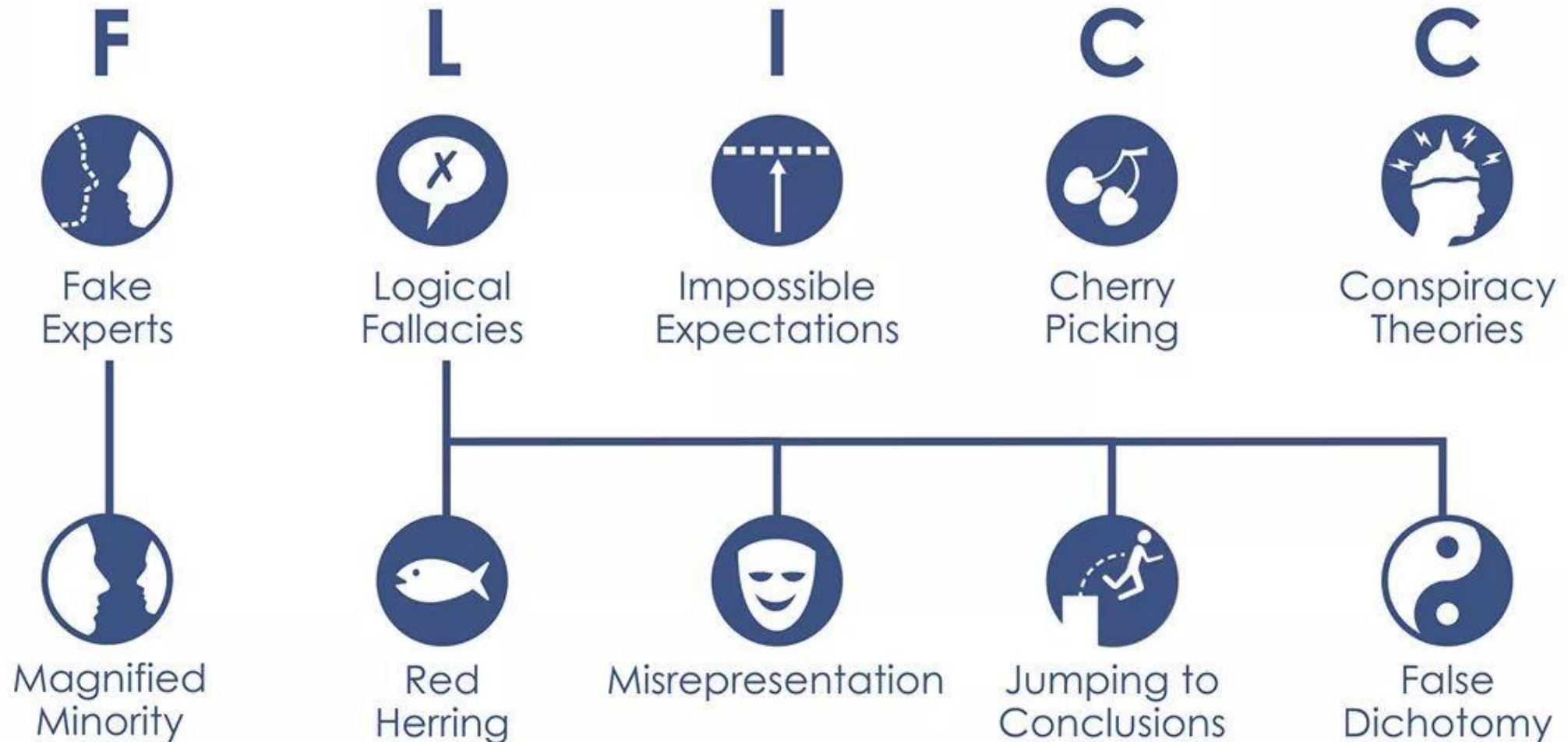
- Local rules of interaction lead to higher-level regularities or structures that could not be deduced simply from examining the individual components or taking the system apart.
- Eg. The ‘invisible hand’, ‘business confidence’, ‘financial panic’, attitudes to climate change. Not just about individuals but about what opinions are deemed ‘sensible’, rather than ‘scaremongering’ or ‘radical’.
- When speaking of higher level properties, ‘**emergent**’ contrasts with ‘**resultant**’ – where macro-properties *are* simply the sum of individual components.

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Science Denial

5 CHARACTERISTICS OF SCIENCE DENIAL



Logical fallacies



strawman

Misrepresenting someone's argument to make it easier to attack.

After Will said that we should put more money into health and education, Warren responded by saying that he was surprised that Will takes our country so much that he wants to leave it defenceless by cutting military spending.

false cause

Presuming that a real or perceived relationship between things means that one is the cause of the other.

Pointing to a fancy chart, Roger shows how temperatures have been rising over the past few centuries, whilst at the same time the numbers of crimes have been decreasing: thus proves cool the world and global warming is a hoax.

slippery slope

Asserting that if we allow A to happen, then Z will consequently happen too, therefore A should not happen.

Colin Closet asserts that if we allow same-sex couples to marry, then the next thing we know we'll be allowing people to marry their parents, their cars and even monkeys.

ad hominem

Attacking your opponent's character or personal traits instead of engaging with their argument.

After Sally presents an eloquent and compelling case for a more equitable taxation system, Sam asks the audience whether we should believe anything from a woman who isn't married, was once arrested, and smells a bit weird.

special pleading

Moving the goalposts to create exceptions when a claim is shown to be false.

Edward Johns claimed to be psychic, but when his abilities were tested under proper scientific conditions, they magically disappeared. Edward explained this saying that one had to have faith in his abilities for them to work.

loaded question

Asking a question that has an assumption built into it so that it can't be answered without appearing guilty.

Grace and Helen were both romantically interested in Brad. One day, with Brad sitting within earshot, Grace asked in an inquisitive tone whether Helen was having any problems with a drug habit.

the gambler's fallacy

Believing that 'runs' occur to statistically independent phenomena such as roulette wheel spins.

Red had come up six times in a row on the roulette wheel, so Greg knew that it was close to certain that black would be next up. Suffering an economic form of natural selection with this thinking, he soon lost all of his savings.

bandwagon

Appealing to popularity or the fact that many people do something as an attempted form of validation.

Shamus pointed a drunken finger at Sean and asked him to explain how so many people could believe in leprechauns if they're only a silly old superstition. Sean, however, had had a few too many Guinness himself and fell off his chair.

black-or-white

Where two alternative states are presented as the only possibilities, when in fact more possibilities exist.

Whilst rallying support for his plan to fundamentally undermine citizens' rights, the Supreme Leader told the people they were either on his side, or on the side of the enemy.

begging the question

A circular argument in which the conclusion is included in the premise.

The word of Zorbo the Great is flawless and perfect. We know this because it says so in The Great and Infalible Book of Zorbo's Best and Most Trust Things that are Definitely True and Should Not Ever Be Questioned.

appeal to authority

Using the opinion or position of an authority figure, or institution of authority, in place of an actual argument.

Not able to defend his position that evolution isn't true! Bob says that he knows a scientist who also questions evolution (and presumably isn't a primate).

composition/division

Assuming that what's true about one part of something has to be applied to all, or other, parts of it.

Daniel was a precocious child and had a thing for logic. He reasoned that atoms are invisible, and that he was made of atoms and therefore invisible too. Unfortunately, despite his thinny skills, he lost the game of hide and go seek.

appeal to nature

Making the argument that because something is 'natural' it is therefore valid, justified, inevitable, or ideal.

The medicine man rolled into town on his bandwagon offering various natural remedies, such as very special plain water. He said that it was only natural that people should be wary of artificial medicines such as antibiotics.

anecdotal

Using personal experience or an isolated example instead of a valid argument, especially to dismiss statistics.

Jason said that that was all cool and everything, but his grandfather smoked, like, 30 cigarettes a day and lived until 97 - so don't believe everything you read about meta-analyses of random studies showing proven causal relationships.

appeal to emotion

Manipulating an emotional response in place of a valid or compelling argument.

Luke didn't want to eat his sheep's brains with chopped liver and Brussels sprouts, but his father told him to think about the poor, starving children in a third world country who weren't fortunate enough to have any food at all.

the fallacy fallacy

Presuming that because a claim has been poorly argued, or a fallacy has been made, that it is necessarily wrong.

Recognising that Amanda had committed a fallacy in arguing that we should eat healthy food because it was popular, Alyse resolved to eat bacon double cheeseburgers every day.

tu quoque

Avoiding having to engage with criticism by turning it back on the accuser - answering criticism with criticism.

The blue candidate accused the red candidate of committing the tu quoque fallacy. The red candidate responded by accusing the blue candidate of the same, after which ensued an hour of back and forth criticism with not much progress.

burden of proof

Saying that the burden of proof lies not with the person making the claim, but with someone else to disprove.

Bernard declares that a teapot is, at this very moment, in orbit around the Sun between the Earth and Mars, and that because no one can prove him wrong his claim is therefore a valid one.

no true scotsman

Making what could be called an appeal to purity as a way to dismiss relevant criticisms or flaws of an argument.

Angus declares that Scotsmen do not put sugar on their porridge, to which Lachlan points out that he is a Scotsman and puts sugar on his porridge. Furious, like a true Scot, Angus yells that no true Scotsman sugars his porridge.

genetic

Judging something good or bad on the basis of where it comes from, or from whom it comes.

Accused on the 6 o'clock news of corruption and taking bribes, the senator said that we should all be very wary of the things we hear in the media, because we all know how very unreliable the media can be.

the texas sharpshooter

Cherry-picking data clusters to suit an argument, or finding a pattern to fit a presumption.

The makers of Sugurette Candy Drinks point to research showing that of the five countries where Sugurette drinks sell the most units, three of them are in the top ten healthiest countries on Earth, therefore Sugurette drinks are healthy.

middle ground

Saying that a compromise, or middle point, between two extremes is the truth.

Holly said that vaccinations caused autism in children, but her scientifically well-read friend Caleb said that this claim had been debunked and proven false. Their friend Alice offered a compromise that vaccinations cause some autism.


thou shalt not commit logical fallacies

A logical fallacy is often what has happened when someone is wrong about something. It's a flaw in reasoning. They're like tricks or illusions of thought, and they're often very sneakily used by politicians, the media, and others to fool people. Don't be fooled! This poster has been designed to help you identify and call out dodgy logic wherever it may raise its ugly, incoherent head. If you see someone committing a logical fallacy online, link them to the relevant fallacy to school them in thinly awesomeness e.g. yourlogicalfallacyis.com/strawman. More in-depth explanations and examples of these fallacies can also be found at the website.

© This poster is published under a Creative Commons BY-NC-ND license. You are free to print, copy, and redistribute this poster, with the following proviso that you reproduce it in full so that others may share also. This poster can be downloaded as a high-resolution pdf from the website for printing at various sizes. yourlogicalfallacyis.com

Anecdotes are not data

your logical fallacy is



anecdotal

You used a personal experience or an isolated example instead of a sound argument or compelling evidence.

It's often much easier for people to believe someone's testimony as opposed to understanding complex data and variation across a continuum. Quantitative scientific measures are almost always more accurate than personal perceptions and experiences, but our inclination is to believe that which is tangible to us, and/or the word of someone we trust over a more 'abstract' statistical reality.

Example: Jason said that that was all cool and everything, but his grandfather smoked, like, 30 cigarettes a day and lived until 97 - so don't believe everything you read about meta analyses of methodologically sound studies showing proven causal relationships.



Anecdotal evidence reliable?

One man says “yes”.

A STUDY CONDUCTED YESTERDAY by a man on himself concluded that self-reported anecdotal evidence is, in fact, both reliable and relevant.

The landmark study, conducted by Mark Mattingly of Virginia Beach in his apartment, concluded with 100% accuracy that data collected from personal experience can disprove other data conducted by reputable scientific institutions, thereby proving once and for all that “statistics can’t be trusted”.

In a press release Mr. Mattingly took aim at his detractors saying that “...this study shows what I’ve been telling people on the internet for years: all your fancy evidence and statistics don’t mean nothing in the real world.”.

A frequenter of internet forums, comment sections, and social media, Mr. Mattingly recounts that he was inspired to undertake the study when someone reportedly kept insisting that he provide evidence for his claims. “I think everyone’s entitled to an opinion, and that my opinion is worth just as much as anyone else’s” Mr. Mattingly said.

Academic types have criticised the study, and papers who are publishing it, saying that it lacks everything and makes no sense. When shown the study, Emeritus Professor James Albrecht of Carnegie Mellon University looked all confused and hopeless before making pining, guttural sounds.



Mr. Mattingly in his apartment looking all smug.

Mr. Mattingly has responded saying that this is just the first of many studies he intends to conduct, and that a meta-analysis of people who have opinions and anecdotal experiences independent of controls, methodological rigor, blinding and peer review are soon to be published, adding further weight to his initial findings.

Example: Rising sea-levels: The Australian vs. the CSIRO

THE AUSTRALIAN

Penny Wong signals doom for iconic beaches

Lanai Vasek and Matthew Franklin | The Australian | February 19, 2010 12:00AM

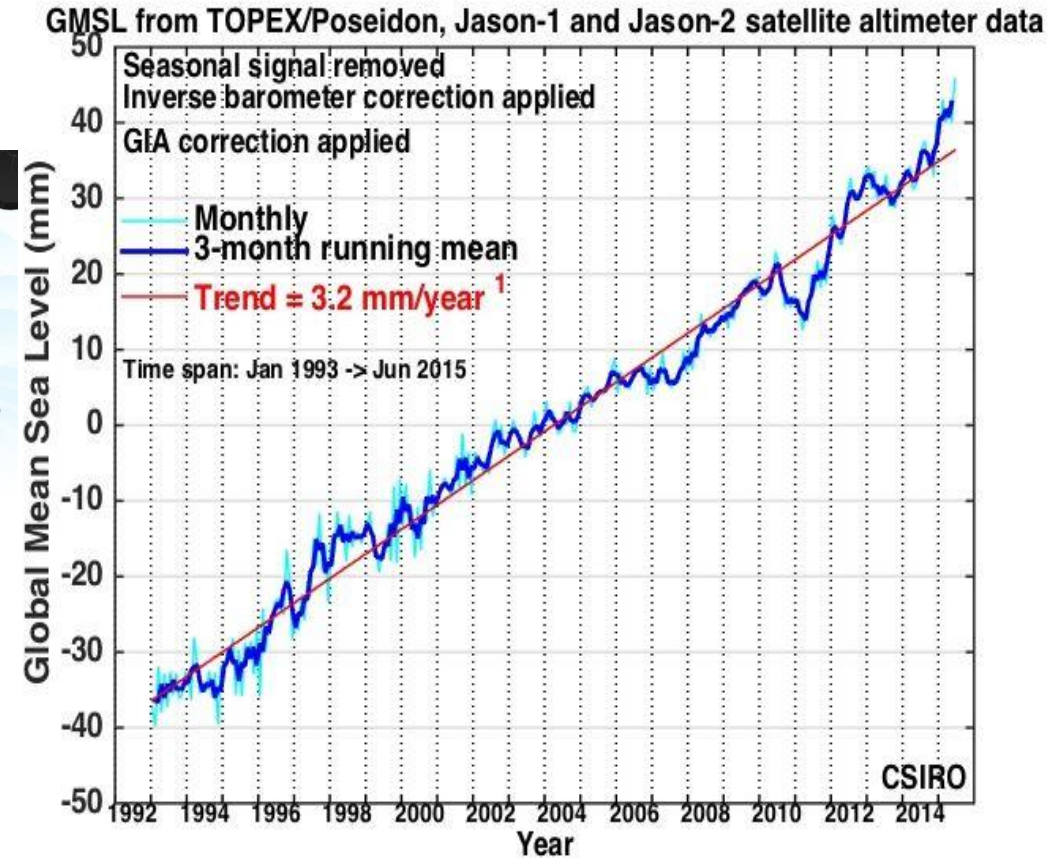
11 retweet

in Share

AUSTRALIA'S most iconic beaches, including Bondi, Bells and those on the Sunshine Coast, could erode away or recede by hundreds of metres over the coming century, according to Climate Change Minister Penny Wong.

But locals aren't so sure.

Bondi veteran Lee Boman has swum at the beach for more than 30 years and was adamant he had seen "no change" to the coastline over that period. "Nothing too drastic that indicates it is going to be changed in the future," said Mr Boman, 53.



Source:

http://www.cmar.csiro.au/sealevel/sl_hist_last_decades.html



Appeal to authority (use with care!)

your logical fallacy is



appeal to authority

You said that because an authority thinks something, it must therefore be true.

It's important to note that this fallacy should not be used to dismiss the claims of experts, or scientific consensus. Appeals to authority are not valid arguments, but nor is it reasonable to disregard the claims of experts who have a demonstrated depth of knowledge unless one has a similar level of understanding and/or access to empirical evidence. However it is, entirely possible that the opinion of a person or institution of authority is wrong; therefore the authority that such a person or institution holds does not have any intrinsic bearing upon whether their claims are true or not.

Example: Not able to defend his position that evolution 'isn't true' Bob says that he knows a scientist who also questions evolution (and presumably isn't a primate).

Appeal to authority can be a useful heuristic. What matters is how authority is derived. Are there good reasons for believing the authority knows what they are talking about? E.g. Exhaustive (and exhausting!) IPCC process to distil and synthesise climate science. Approval by fossil fuel-dependent governments ensures 'Summaries for policymakers' are solid.

Our tendency to disbelieve what we don't understand

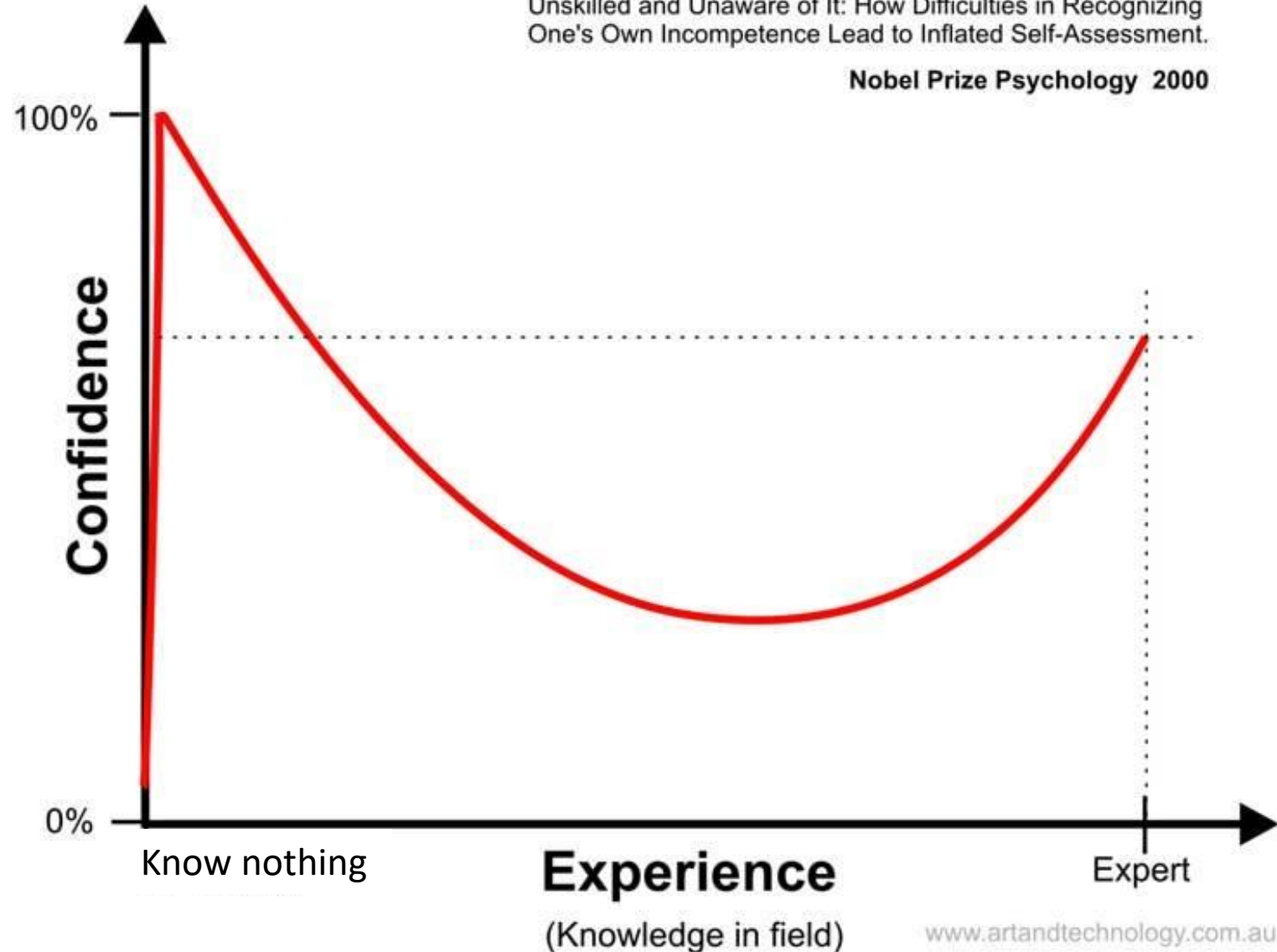


<https://yourlogicalfallacyis.com/>

Dunning-Kruger Effect

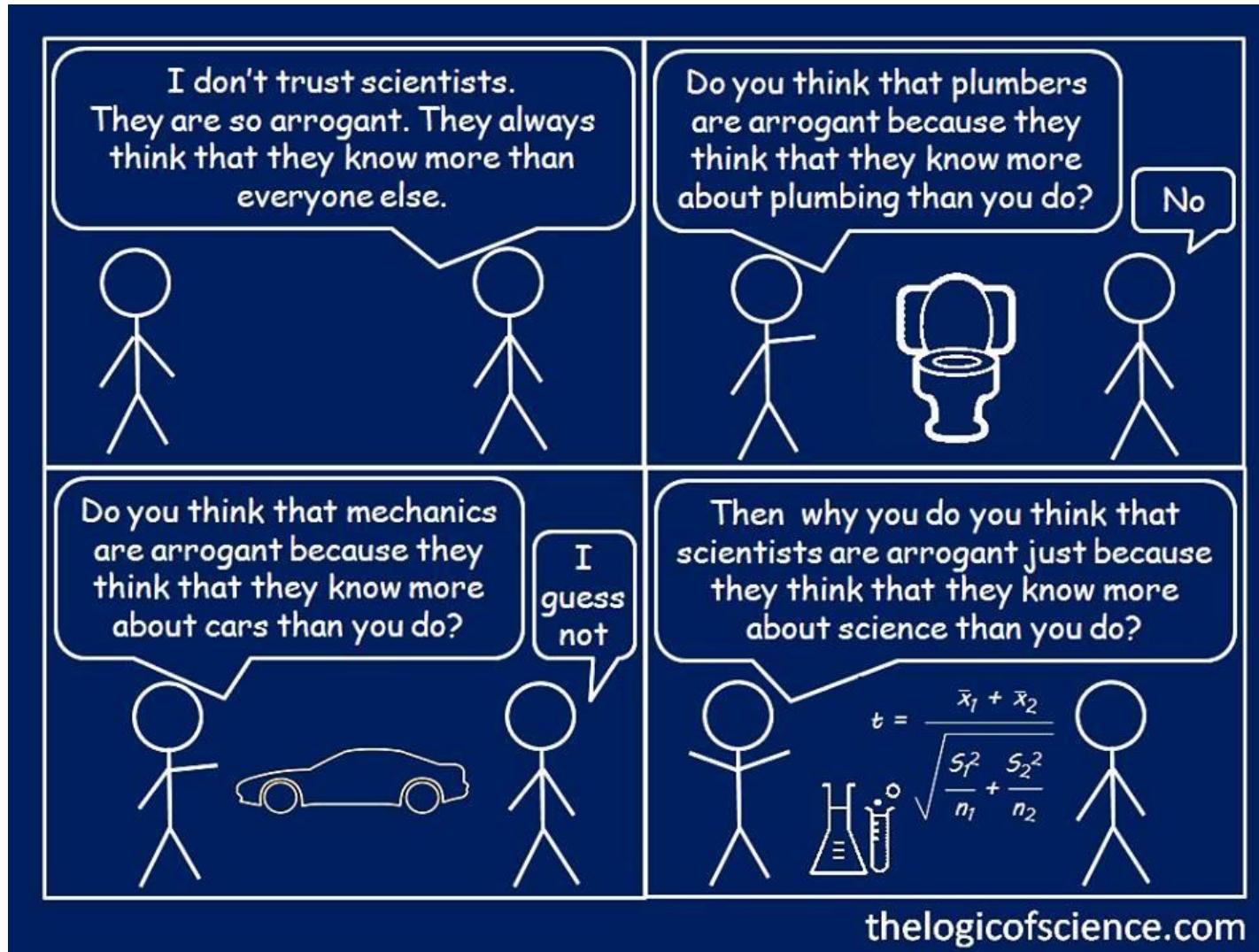
Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessment.

Nobel Prize Psychology 2000



Kruger, J. and Dunning, D., (1999) "Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments", *Journal of Personality and Social Psychology*, Vol. 77, No. 6, pp. 1121-1134.
<https://www.math.ucdavis.edu/~suh/metacognition.pdf>

No, your opinion is (probably) not as valid as that of an expert



Example: CO₂ is natural - how can it be a pollutant?

“Carbon-dioxide: They call it pollution. We call it life.”

- Competitive Enterprise Institute TV ad.

<http://www.youtube.com/watch?v=7sGKvDNdJNA>



your logical fallacy is



personal incredulity

Because you found something difficult to understand, or are unaware of how it works, you made out like it's probably not true.

Complex subjects like biological evolution through natural selection require some amount of understanding before one is able to make an informed judgement about the subject at hand; this fallacy is usually used in place of that understanding.

Example: Kirk drew a picture of a fish and a human and with effusive disdain asked Richard if he really thought we were stupid enough to believe that a fish somehow turned into a human through just, like, random things happening over time.

➤ A: Whether something is natural or not is irrelevant. It all depends on its *concentration* and *effects* on the system

- Manure is natural. Some on your fields is good. Neck deep isn't.
- A fraction of a drop of nerve agent VX (less than 10 milligrams) will kill you stone dead (0.000014% of 70kg body weight, compared with atmospheric CO₂ concentration 400 parts per million or 0.04%).
- CO₂ is only one (the most important) of around 60 greenhouse gases

“THE DOSE MAKES THE POISON”

APPLE SEEDS PEAR POTATOES COURGETTES



CONTAIN AMYGDALIN ~0.6g/kg of seeds CONTAIN FORMALDEHYDE ~0.06g/kg CONTAIN SOLANIN ~0.2g/kg (higher in green potatoes) CONTAIN CUCURBITACIN E Variable (higher in bitter courgettes)

ALL OF THE FOOD ITEMS ABOVE CONTAIN NATURAL CHEMICALS THAT ARE TOXIC TO HUMANS. HOWEVER, THEY ARE USUALLY PRESENT IN VERY SMALL AMOUNTS, FAR BELOW THE HARMFUL DOSE.

JUST BECAUSE A CHEMICAL IS PRESENT, DOES NOT MEAN THAT IT IS HARMFUL IN THE AMOUNT PRESENT.

The truth is probably somewhere in the middle?



Anchoring determines what is considered 'extreme'

Anchoring

Anchoring or focalism is a cognitive bias that describes the common human tendency to rely too heavily on the first piece of information offered (the "anchor") when making decisions. During decision making, anchoring occurs when individuals use an initial piece of information to make subsequent judgments.



**COGNITIVE
BIAS**

Dismissing an argument because of where it comes from

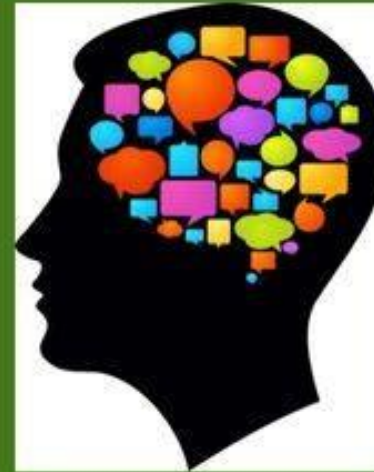


'Genetic' as in 'Genesis', the origin of something, not 'genetics'.

Confirmation bias

Confirmation Bias

Confirmation bias is the tendency of people to favor information that confirms their beliefs or hypotheses. People display this bias when they gather or remember information selectively, or when they interpret it in a biased way. The effect is stronger for emotionally charged issues and for deeply entrenched beliefs. People also tend to interpret ambiguous evidence as supporting their existing position.



**COGNITIVE
BIAS**

Cherry picking

your logical fallacy is



the texas sharpshooter

You cherry-picked a data cluster to suit your argument, or found a pattern to fit a presumption.

This 'false cause' fallacy is coined after a marksman shooting randomly at barns and then painting bullseye targets around the spot where the most bullet holes appear, making it appear as if he's a really good shot. Clusters naturally appear by chance, but don't necessarily indicate that there is a causal relationship.

Example: The makers of Sugarette Candy Drinks point to research showing that of the five countries where Sugarette drinks sell the most units, three of them are in the top ten healthiest countries on Earth, therefore Sugarette drinks are healthy.

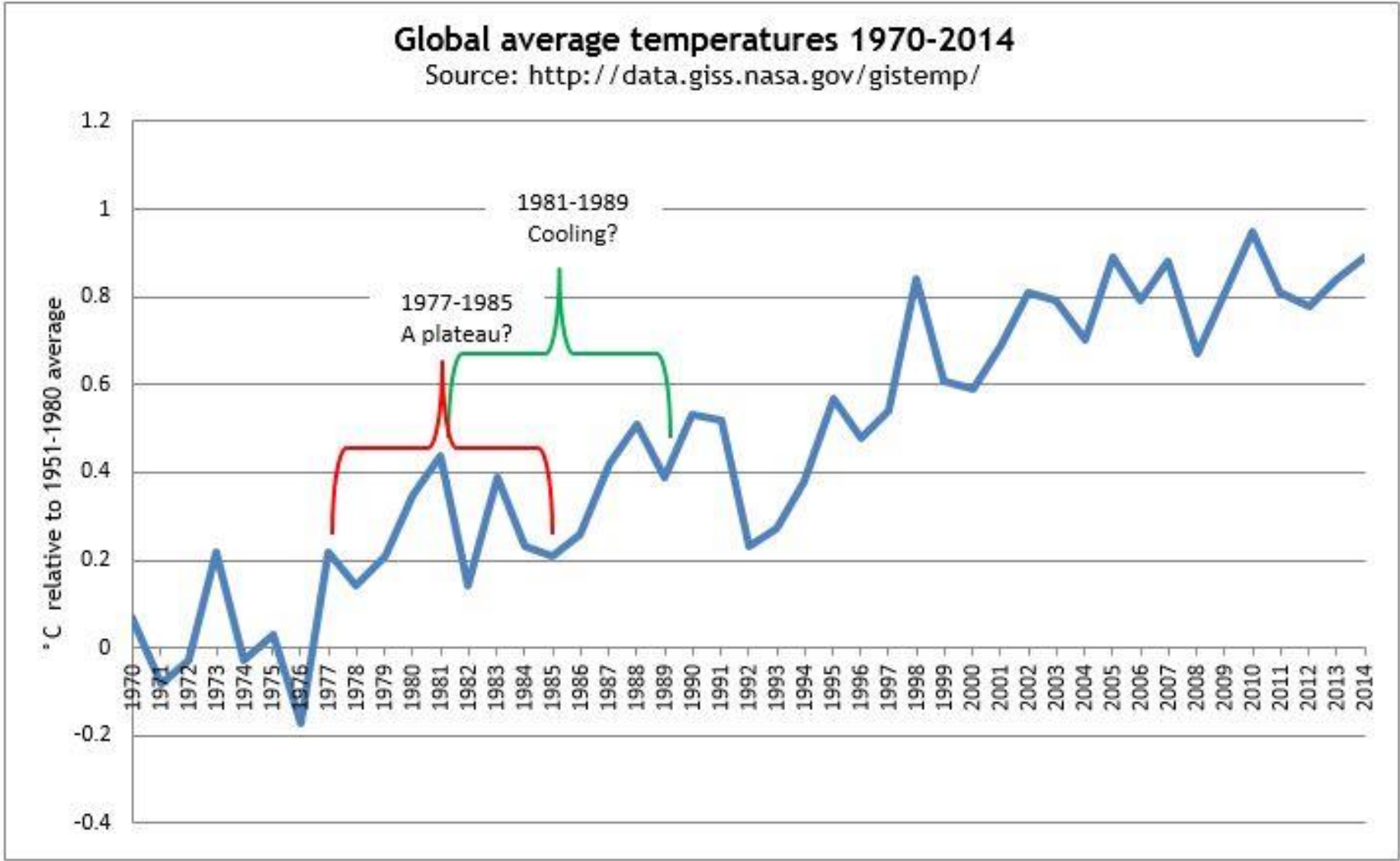
 **Pseudoscience Detected!**

Cherry Picking

The overemphasis of token data that supports a preferred conclusion, excluding all contradictory evidence.



Cherry-picking data



Cognitive dissonance



Sometimes people hold a core belief that is very strong. When they are presented with evidence that works against that belief, the new evidence cannot be accepted. It would create a feeling that is extremely uncomfortable, called cognitive dissonance. And because it is so important to protect the core belief, they will rationalize, ignore and even deny anything that doesn't fit in with the core belief.

—Frantz Fanon

facebook.com/FreeYourMindandThink



“It is difficult to get a man to understand something when his salary depends upon his not understanding it.”

~ Upton Sinclair

What are you are unable to let yourself understand?

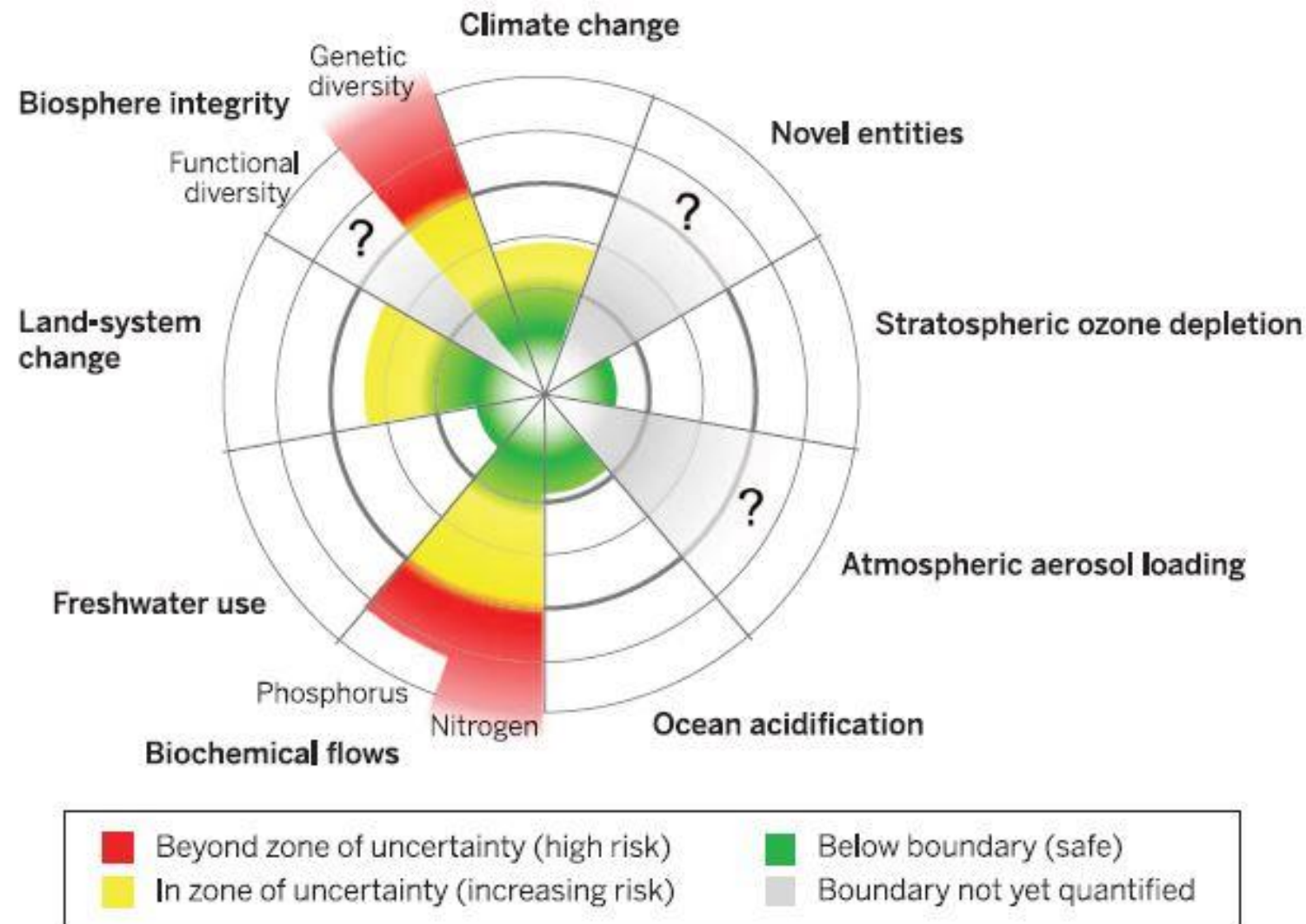
Outline

- Complex systems: Getting better information
- Logical fallacies & cognitive biases
- **A sustainability reality check**
- Why spirituality matters – even if you're an atheist

The sustainability problem

We've crossed some boundaries already

Source: Steffen, W., *et al.* (2015) "Planetary Boundaries: Guiding Human Development on a Changing Planet", *Science*, Vol. 347, No. 6223, 13 February, pp. 736 & 1259855-1-10.
<http://www.sciencemag.org/content/347/6223/1259855.abstract>.



Current status of the control variables for seven of the planetary boundaries. The green zone is the safe operating space, the yellow represents the zone of uncertainty (increasing risk), and the red is a high-risk zone. The planetary boundary itself lies at the intersection of the green and yellow zones. The control variables have been normalized for the zone of uncertainty; the center of the

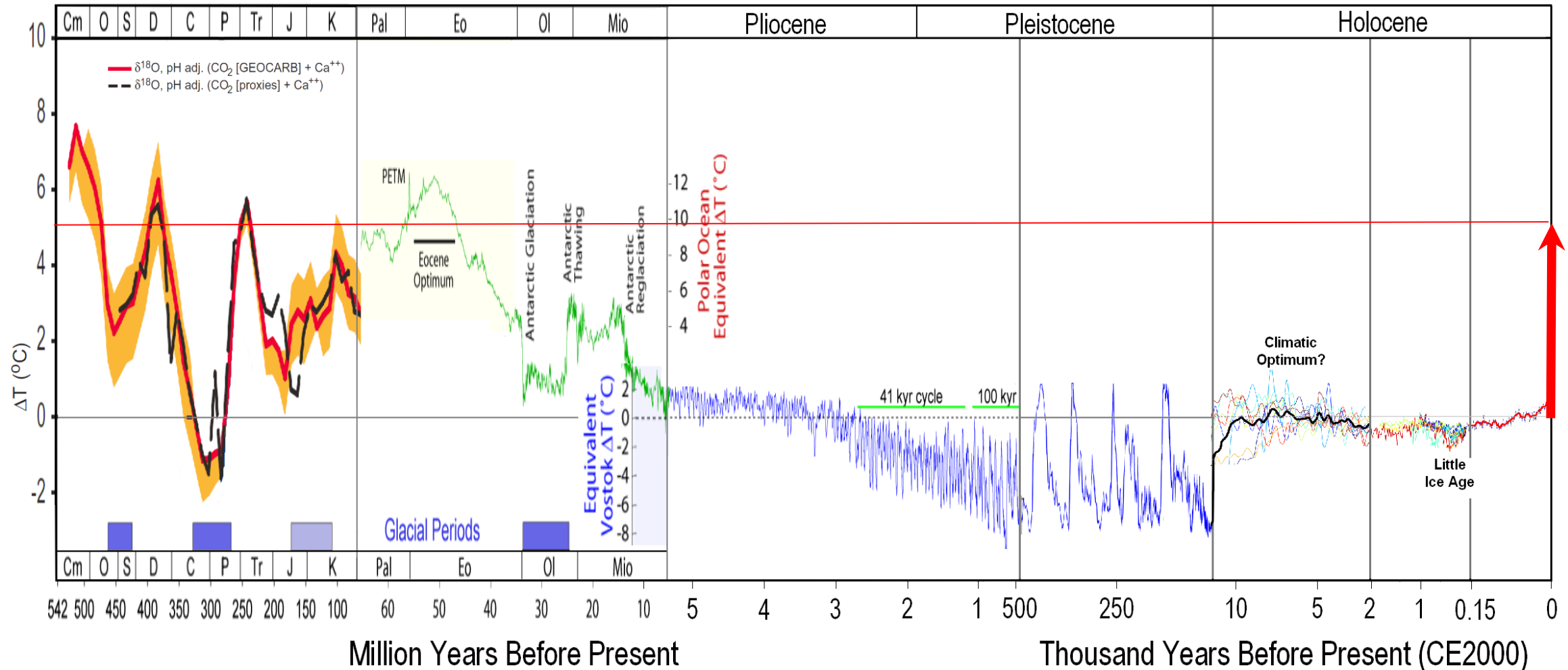
figure therefore does not represent values of 0 for the control variables. The control variable shown for climate change is atmospheric CO₂ concentration. Processes for which global-level boundaries cannot yet be quantified are represented by gray wedges; these are atmospheric aerosol loading, novel entities, and the functional role of biosphere integrity.



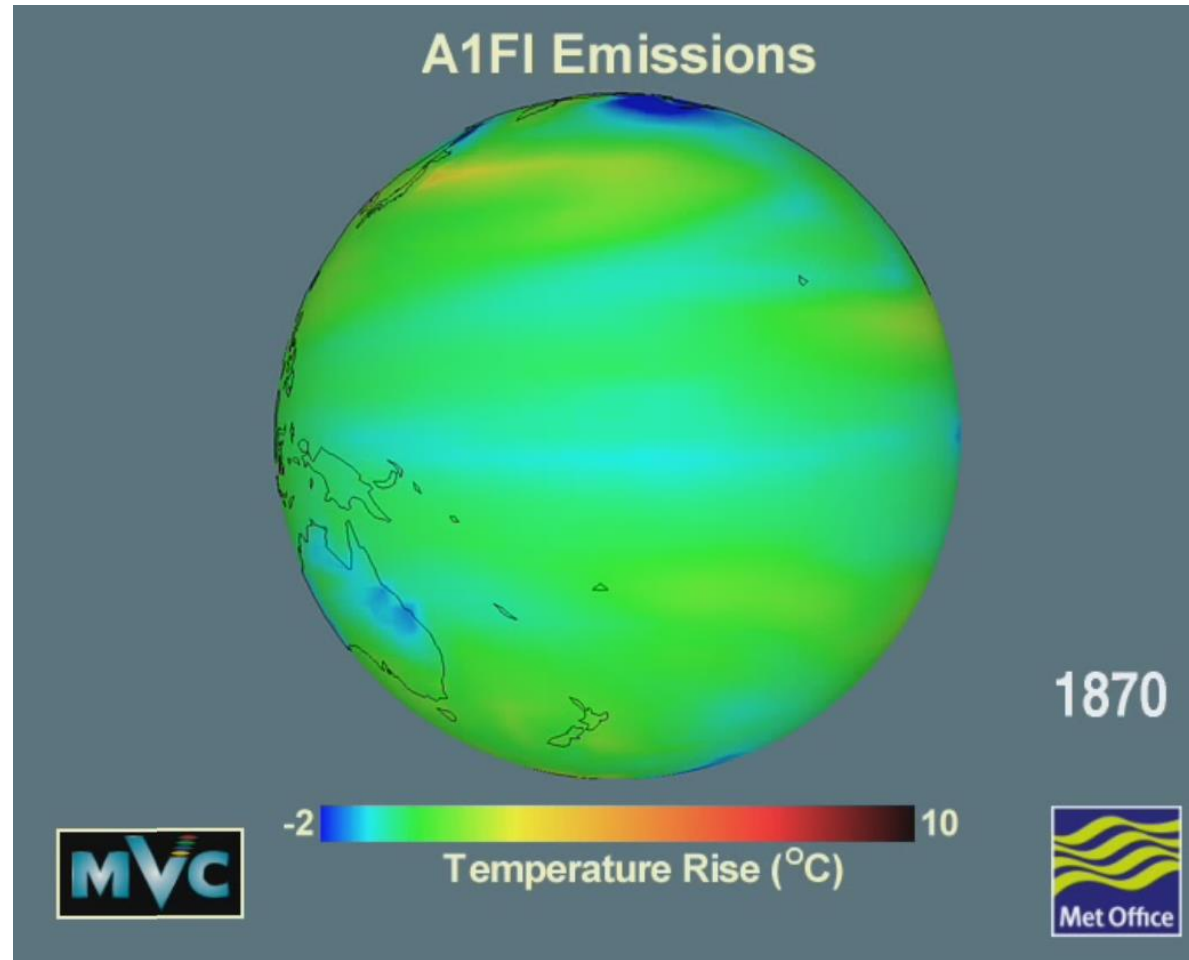
No historical precedent for 100 year projection

(Composite from various studies)

Temperature of Planet Earth



Where are we heading currently?



Three numbers

Global Warming's Terrifying New Math

Three simple numbers that add up to global catastrophe - and that make clear who the real enemy is

By **BILL MCKIBBEN**

JULY 19, 2012 9:35 AM ET

1. 2°C

Most conservative estimate of 'dangerous' climate change

2. 565 Gigatonnes

Amount of CO₂ that can be released into atmosphere by 2050 to still have 'reasonable' (80%) chance of staying under 2°C. At current rate, we will use up this budget entirely by 2028.

3. 2,795 Gigatonnes

Amount of CO₂ that would be released by combustion of *current* fossil fuel reserves. Value: \$27 trillion

Rolling Stone
POLITICS

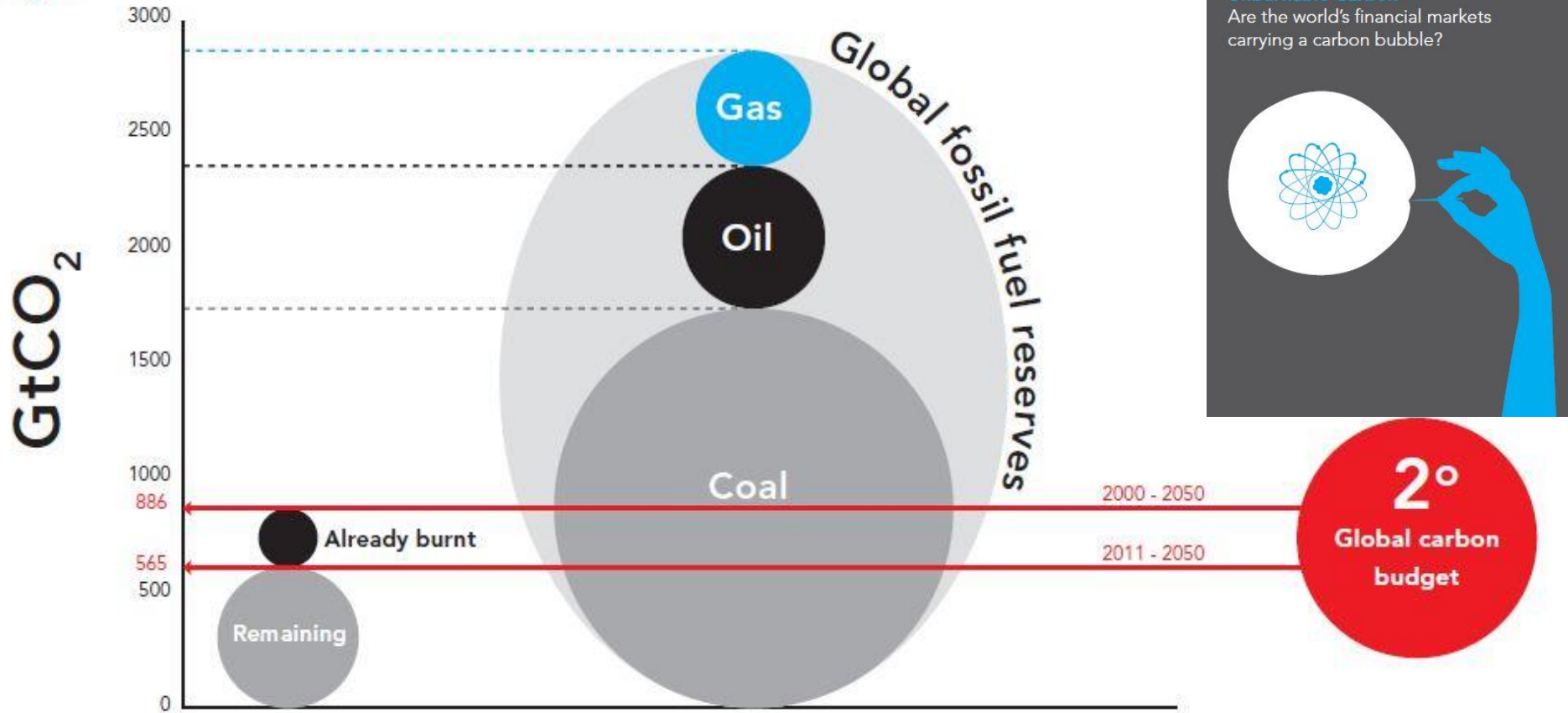
“We have five times as much oil and coal and gas on the books as climate scientists think is safe to burn. We'd have to keep 80 percent of those reserves locked away underground to avoid that fate.”



Carbon budget vs. fossil fuel reserves

Comparison of the global 2°C carbon budget with fossil fuel reserves CO₂ emissions potential

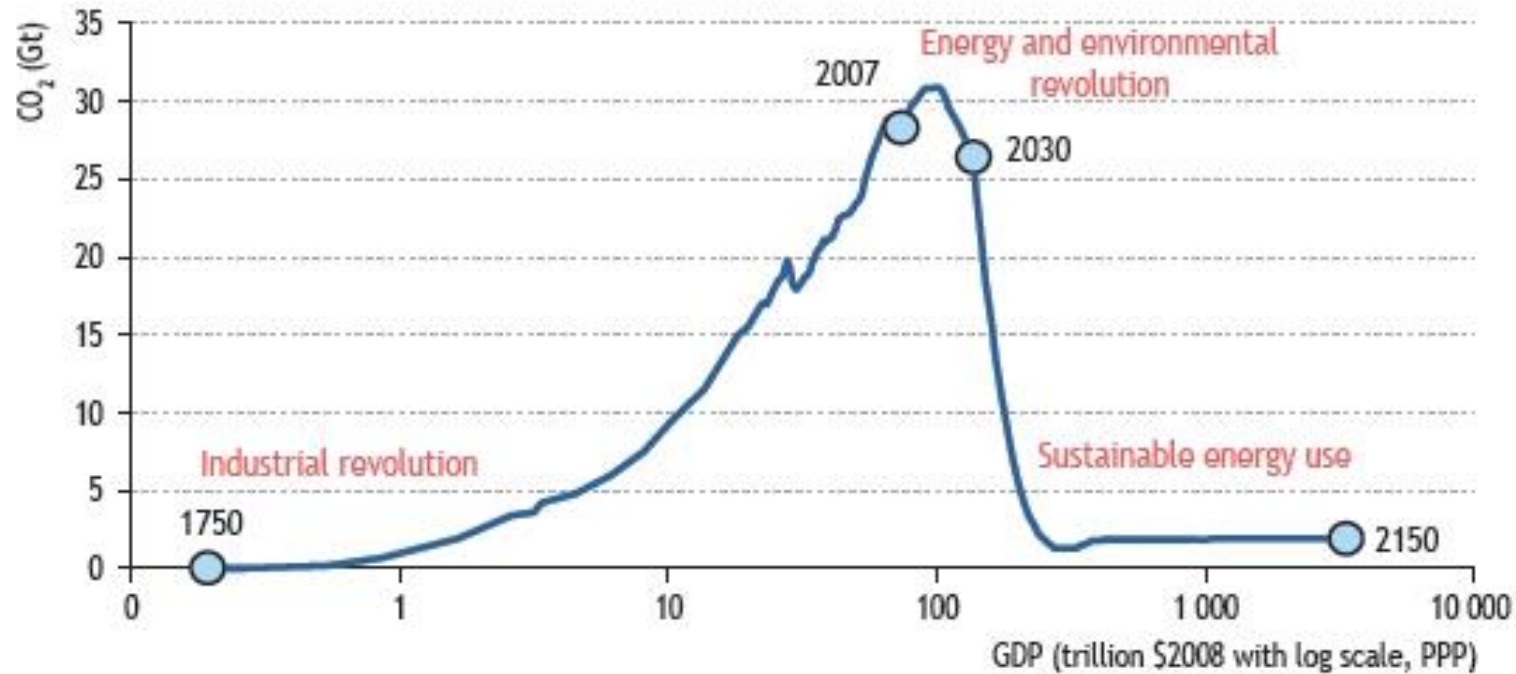
Fig.1



Source: Carbon Tracker (2012) Unburnable Carbon: Are the World's Financial Markets Carrying a Carbon Bubble?
<http://www.carbontracker.org/wp-content/uploads/downloads/2011/07/Unburnable-Carbon-Full-rev2.pdf>

The task

Figure 4.3 ● Historical link between energy-related CO₂ emissions and economic output, and the pathway to achieving a 450 Scenario



Note: The projected trend approximates that required to achieve long-term stabilisation of the total greenhouse-gas concentration in the atmosphere at 450 ppm CO₂-eq, corresponding to a global average temperature increase of around 2°C. World GDP is assumed to grow at a rate of 2.7% per year after 2030.

Source: IEA databases and analysis.

The Social Cost of Carbon: U.S. Government

**Technical Support Document: -
Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis -
Under Executive Order 12866 -**

Interagency Working Group on Social Cost of Carbon, United States Government

With participation by

Council of Economic Advisers
Council on Environmental Quality
Department of Agriculture
Department of Commerce
Department of Energy
Department of Transportation
Environmental Protection Agency
National Economic Council
Office of Management and Budget
Office of Science and Technology Policy
Department of the Treasury

May 2013

Source: United States Government, (2013) "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866", Washington DC, Interagency Working Group on Social Cost of Carbon, May, 21 pp.
http://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf

Global damage per tonne of coal burnt (US Govt, in 2015 A\$)

Discount rate:	Damage:
5%	A\$46
3%	A\$147
2%	A\$224
3%(95 th pctile)	A\$421

Source: United States Government, (2013) "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866", Washington DC, Interagency Working Group on Social Cost of Carbon, May, 21 pp; p. 18.
http://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf

Source: OCE, (2015) "Resources and Energy Quarterly", Canberra, Office of the Chief Economist, Department of Industry & Science, Australian Government, June Quarter, 76 pp.
<http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/req/REQ-June15.pdf> ; pp.24, & 28.

Figure 5.2: JFY thermal coal prices

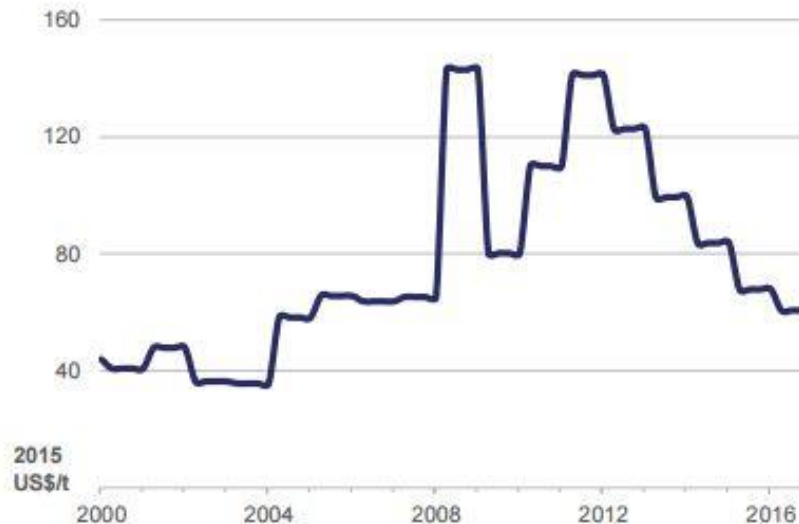
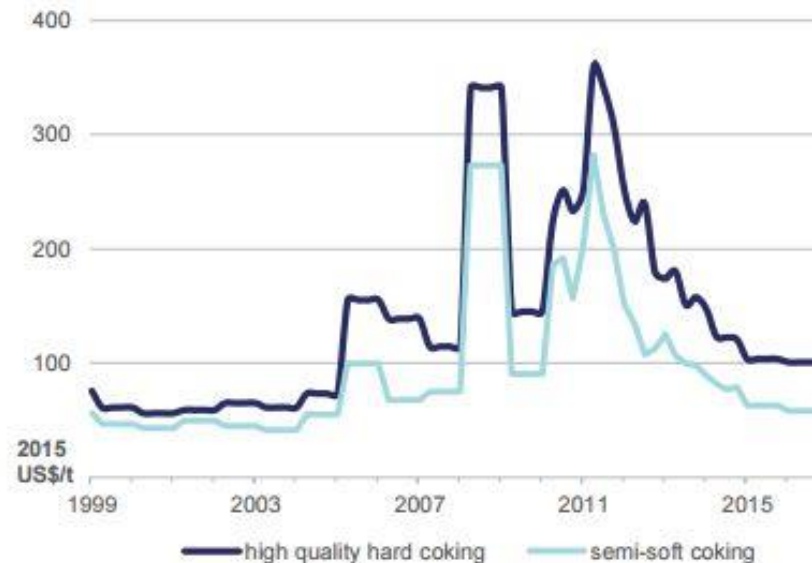


Figure 4.2: Metallurgical coal benchmark prices, FOB Australia





13 September 2013, 6:51am AEST

Expanding coal exports is bad news for Australia and the world



We need to look at the economic and social cost of our coal. Beyond Coal and Gas

Australia's black coal exports in FY2014-15 were 387 million tonnes (Mt). Combustion will release around 923 Mt CO₂-equivalent. (Germany's CO₂ emissions in 2012 were just 818 Mt). Based on conservative US Government estimates, **our current coal exports are causing between A\$16 billion and A\$152 billion of damage globally each year** (in 2015 dollars) for revenues of only \$37.3 billion (profits are much less).

This damage is not included in the coal export price.

Sources: <http://theconversation.com/expanding-coal-exports-is-bad-news-for-australia-and-the-world-17937>

OCE, (2015) "Resources and Energy Quarterly", Canberra, Office of the Chief Economist, Department of Industry & Science, Australian

Government, June Quarter, 76 pp. <http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/req/REQ-June15.pdf>

United States Government, (2013) "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866", Washington DC, Interagency Working Group on Social Cost of Carbon, May, 21 pp; p. 18.

http://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf

UNFCCC Emissions data: http://unfccc.int/ghg_data/ghg_data_unfccc/time_series_annex_i/items/3844.php

Damage estimates are very conservative

Journal of Economic Literature 2013, 51(3), 838–859
<http://dx.doi.org/10.1257/jel.51.3.838>

The Structure of Economic Modeling of the Potential Impacts of Climate Change: Grafting Gross Underestimation of Risk onto Already Narrow Science Models[†]

NICHOLAS STERN*

Scientists describe the scale of the risks from unmanaged climate change as potentially immense. However, the scientific models, because they omit key factors that are hard to capture precisely, appear to substantially underestimate these risks. Many economic models add further gross underassessment of risk because the assumptions built into the economic modeling on growth, damages and risks, come close to assuming directly that the impacts and costs will be modest and close to excluding the possibility of catastrophic outcomes. A new generation of models is needed in all three of climate science, impact and economics with a still stronger focus on lives and livelihoods, including the risks of large-scale migration and conflicts. (JEL C51, Q54, Q58)

Incentives for disproving link between greenhouse gases and climate change

Climate scientists:

- Nobel Prize
- Lasting fame
- Thanks of a grateful world
- Huge research grants



Source: http://nobelprize.org/educational/nobelprize_info/

Fossil-fuel intensive industries:

- Hundreds of billions of \$ in future revenues
- Higher asset values & stock prices
- Increased ability to attract talented staff
- Improved brand image

Conclusion?

- VERY strong incentives for climate scientists to disprove link. **Still hasn't happened.**
- VERY strong incentives for fossil-fuel intensive industries to try to disprove or create doubt about link.

What have we seen?




1990 Liberal Campaign Pledge

Millennium Milestones

The specific goals and targets of a Liberal Government to the year 2001 include:


- The area of land to be rehabilitated under our Soil Conservation Strategy
- Plants and animals to be safeguarded until they can be taken off the Endangered Species List
- The amount of new forest lands and land for Priority and National Parks
- A date for uniform national standards on air and water pollution
- A complete phase out of CFCs and halons by 1995, and a ban on their export
- An achievable level of energy use from 'alternate' fuel sources
- A tax review to promote sound environmental practices in industry
- A reduction in 'greenhouse gas' emissions of at least 20% by the year 2000
- Reduced salinity in the Murray Darling River Basin
- A goal of 20% reduction in energy use by government authorities
- A set date for a national facility for the disposal of intractable wastes
- Specific reductions in vehicle and power station 'greenhouse gas' emissions
- Tax rewards for industries that take steps to protect the environment, and that do not
- History of rivers and waterways in need of rehabilitation, including urban waterways
- A Recycling Programme to identify amounts of paper, oil and other products that can be recovered on a national scale



SENATOR CHRIS PUPLUCK
Shadow Minister for the Environment and the Arts

"We embrace the philosophy of sustainable development – we reject the false dichotomy of jobs versus the environment. We can have both, at the same time pursuing strategies of ecologically responsible development which improves our standards of living while promoting responsible conservation policies which improve our quality of life."

We will work with all Australians to achieve these goals and with the States, the conservation movement, industry, scientists and all concerned citizens. We seek a co-operative federalist approach to the solution of environmental problems but we will never renege from a willingness to act in the genuine national interest wherever that is required."




ANDREW PEACOCK

Andrew Peacock

A reduction in 'greenhouse gas' emissions of at least 20% by the year 2000

Canberra: 1990-1991, 1992-1993, 1994-1995, 1996-1997, 1998-1999, 2000-2001
Can Blackall & Macquarie St, Canberra ACT 2600
Printed by Online Offset, 5/79 Gladstone St, Fishwick ACT 2609
Printed on 100% Recycled Paper.

A fair go for the environment



LIBERAL

➤ Liberal leader John Hewson took the same policy to the 1993 election



Results?

- Right-wings of conservative parties & some media in Australia & US sided with those denying link – See eg: http://scienceblogs.com/deltoid/the_war_on_science/
- The field of constructive engagement on *solutions* has been vacated to the centre & the left of politics.
- A time bomb of opposition to good science was smuggled into conservative / libertarian politics. At some point it will blow up in their faces. Should be of major concern to thoughtful conservatives.
- Now too: Opposition to sound economics! Virtually ALL economists say market-based approach is best. ALP in favour of market-based mechanism while Coalition introduces government regulated, expensive, bureaucratic ‘direct action’. Bizarre situation.
- Conservatives are in the process of losing entire generations of potential supporters: as they face the consequences of climate change in future, they will remember.

Who will you trust?

➤ Strong statements affirming the reality of human contribution to climate change have been released by the **National Academies of Science** of: Australia, Belgium, Brazil, Canada, the Caribbean, China, France, Germany, India, Indonesia, Ireland, Italy, Japan, Malaysia, Mexico, New Zealand, Russia, South Africa, Sweden, the US and UK.

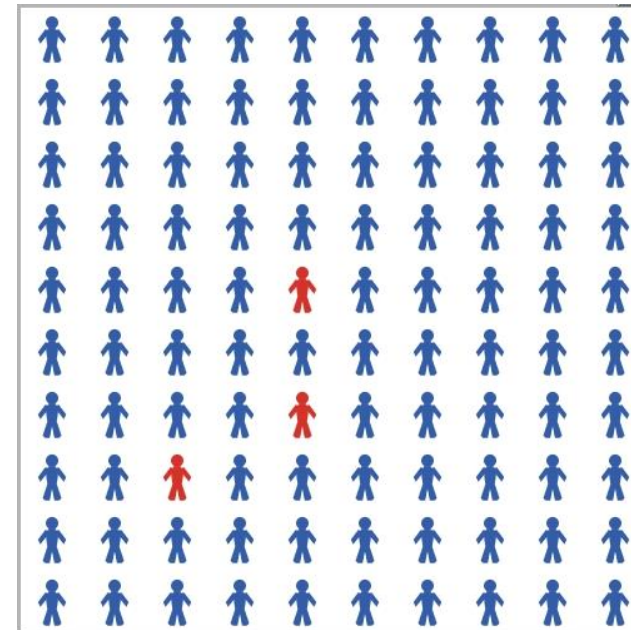
➤ Scientists are specialists. Would you ask a GP to do your heart surgery?

➤ “They laughed at Galileo. They laughed at Newton. But they also laughed at Bozo the Clown.” (Carl Sagan)

➤ When asked “Do you think human activity is a significant contributing factor in changing mean global temperatures?” 97% of scientists with more than 50% of published research papers on climate change said ‘Yes’.

Doran, P.T. and Zimmerman, M.K., (2009) "Examining the Scientific Consensus on Climate Change", *EOS: Transactions of the American Geophysical Union*, Vol. 90, No. 3, 20 January, pp. 22-23.
http://tigger.uic.edu/~pdoran/012009_Doran_final.pdf

➤ Where are the published models that say ‘No problem’? None have survived scrutiny.



Rich country pledges 2015

	Consistent with 2°C?	Annual rate of emissions reductions	Per capita emissions (t CO ₂ e)	Emissions intensity (t CO ₂ e/ GDP PPP)	Change on base year		
		Post-2020	2030	2030	2005	2000	1990
Australia (26% by 2030)	NO	-1.6%	16	198	-26%	-19%	-20%
Canada	NO	-1.6%	14	190	-30%	-18%	+6%
EU	POSSIBLE	-2.6%	6	104	-34%	-33%	-40%
Germany	NA	-2.6%	7	89	-45%	-46%	-55%
Japan	NO	-2.4%	8	134	-25%	-25%	-19%
New Zealand**	NO	-0.5%	11	175	-30%	-23%	-10%
Norway	POSSIBLE	-1.5%	4	41	-18%	-20%	-40%
Excluding LULUCF		-1.5%	5	51	-44%	-44%	-40%
Switzerland	POSSIBLE	-4.1%	3	32	-51%	-51%	-50%
UK	NA	-5.1%	5	74	-49%	-51%	-64%
USA	POSSIBLE	-2.3%	11	113	-39%	-40%	-29%
Average (excluding Australia)		-2.5%	8	116	-36%	-36%	-35%
<div><div></div> Not consistent with 2°C</div> <div><div></div> Green is credible pathways to 2°C exist*</div> <div><div></div> Worst among developed countries</div> <div><div></div> Australia in worst three</div> <div><div></div> Blue is best among developed countries</div>							
Notes: NA - Not applicable as country is part of the EU and independent assessments of their contribution to the 2°C goal have not been undertaken. * Consistent on some assessments - credible pathways to 2°C exist, high probability of avoiding 2°C requires an acceleration of effort to 2050. ** Excluding LULUCF							

Source: Hughes, L. and Steffen, W., (2015) "Climate Change 2015: Growing Risks, Critical Choices", Sydney, Climate Council of Australia, August, p. 66.
<http://www.climatecouncil.org.au/climate-change-2015-growing-risks-critical-choices>

Figure 39: Comparison of the emission reduction targets that various countries will take into the Paris COP meeting later this year. Source: The Climate Institute 2015.

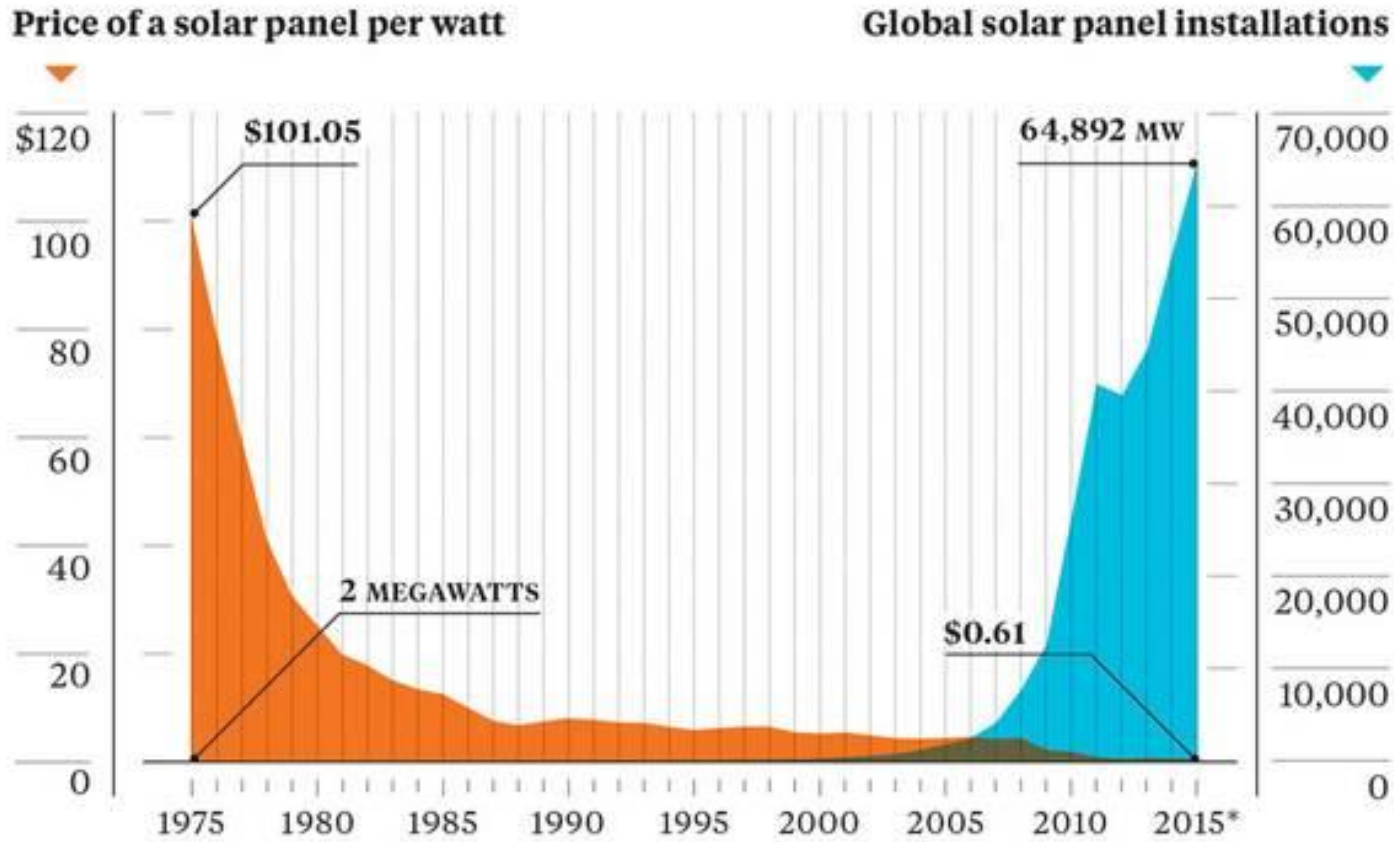
Renewable energy costs have plummeted

Power Plant Type	Cost \$/kW-hr
Coal	\$0.10-0.14
Natural Gas	\$0.07-0.13
Nuclear	\$0.10
Wind	\$0.08-0.20
Solar PV	\$0.13
Solar Thermal	\$0.24
Geothermal	\$0.05
Biomass	\$0.10
Hydro	\$0.08

Adapted from US DOE²

Renewables are now comparable or within striking range of fossil fuel sources even without pricing the damage caused by CO₂ emissions from fossil fuels.

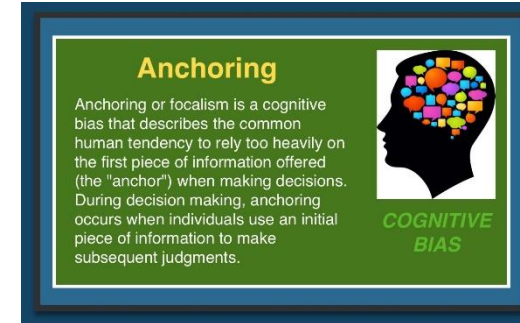
Source: <http://www.renewable-energysources.com/>



Source:
<http://www.treehugger.com/renewable-energy/striking-chart-showing-solar-power-will-take-over-world.html>

‘Responsible’ vs. ‘Extreme’

- Acceptable framing of debate in public discourse (emergence of ‘acceptable’ framing)
- Can’t say whether a response is ‘responsible’ & ‘measured’ as opposed to ‘extreme’ & ‘reckless’ without considering the **scale of the threat**.
 - eg. response to invasion fleet? Is failure to mobilise ‘measured & responsible’ or reckless?
- Who are the ‘extremists’?
 - Those arguing we should consider making a fraction of the effort of the WWII generation to avert an irreversible global catastrophe? OR
 - Those content to flip a coin to see how we go with more than 2°C warming? (450 ppm CO2-eq path gives about 50% chance of staying under 2°C) OR
 - Those happy to do nothing and chance the luck of their grandchildren with whatever the opposite of an ice-age looks like, with 4 ... 7°C?



Dangerous extremism!

Case Study: Karen

Karen grew up in a loving family who never participated in activism of any sort. When she moved out of home to attend university Karen became involved in the alternative music scene, student politics and left-wing activism. In hindsight she thinks this was just "typical teenage rebellion" that went further than most. One afternoon Karen attended an environmental protest with some of her friends. It was exhilarating, fun and she felt like she was doing the 'right thing' for society. She enjoyed spending time with this crowd. Over the next six months Karen progressively dropped out of university in order to live full-time in a forest camp, where she remained for a year. Her family were confused and disappointed and stopped supporting her financially.

The goal of the forest camp was to disrupt logging activities by barricading areas that were being logged, spiking trees, and sabotaging machinery. There was no intent to harm people but inevitably fighting broke out between protesters and loggers. Sometimes the locals and the police became involved in these incidents. Karen was arrested on numerous occasions for trespass, damaging property, assault and obstructing police. She said at the time she felt like she was a "soldier for the environment so breaking the law didn't matter". It became all-consuming for Karen and she became totally cut off from her family and previous set of friends.

After years of participating in direct-action campaigns, Karen finally became disillusioned by persistent in-group fighting. She also began to question the effectiveness of the protesting methods used by the group. It seemed they might make short-term gains but that there was no sustainable change unless it was translated into wider community support and government policies. She took a paid job with a mainstream environmentalist organisation and was subsequently rejected by her group who felt completely betrayed.

This was the beginning of a painful transition out of radical activism, where Karen struggled to recover, define her identity and her role in society. Over the course of a number of years she began making new friends, trying out new interests and hobbies and eventually made contact with her family and non-activist friends again. She completed her university studies and now works broadly in the environmental field. Karen also explored her beliefs and adopted a more moderate eco-philosophy. She now thinks illegal or aggressive direct-action campaigns only produce short-term solutions, and she is much more interested in working towards developing a sustainable solution using the legal system.



Source: Commonwealth of Australia, (2015) "Preventing Violent Extremism and Radicalisation in Australia", Canberra, Attorney-General's Department, p. 11.
<https://www.livingsafetogether.gov.au/informationadvice/Documents/preventing-violent-extremism-and-radicalisation-in-australia.pdf>

Dangerous extremism?

Case Study: Jesus

Jesus grew up in a broken home, raised by his mother and stepfather surrounded by religious fanaticism. They exposed him to dangerous ideas from a very young age. Even while pregnant, his mother Mary introduced him to alternative music about 'casting down the mighty' and 'sending the rich empty away'. While in his infancy, his parents defied a legal government directive, choosing instead to secretly submit to a foreign power.

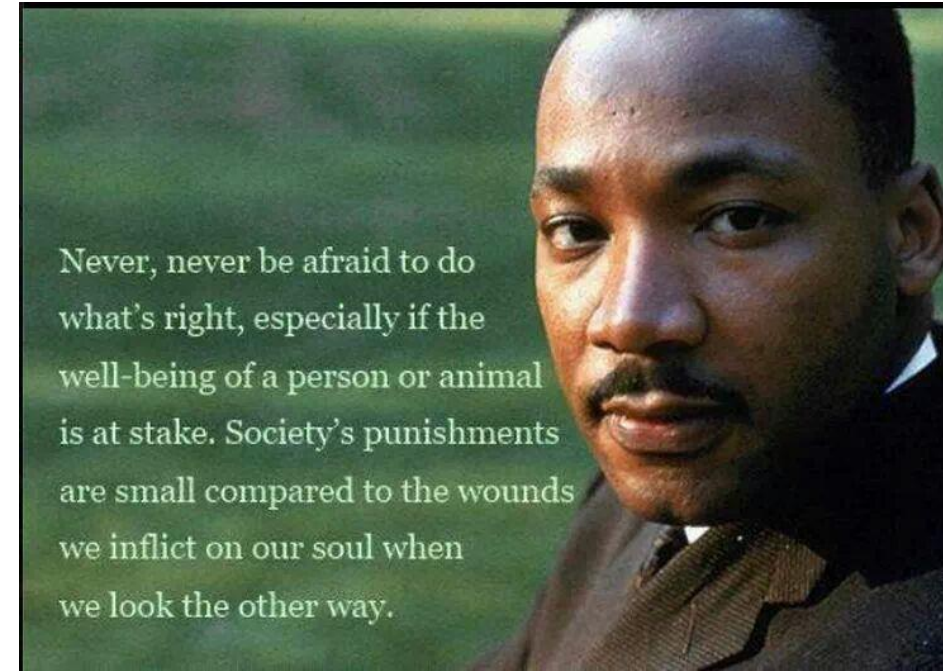
Jesus was able to rise above his parents' subversive activity, gaining both a trade qualification and a sound knowledge of the law. After nearly a decade of stable, law-abiding existence, he became involved with a desert-dwelling cult leader who advocated overthrow of the government. He participated in an illicit ritual and began having psychotic episodes in which he heard supernatural messages. For a time, he lived alone in a remote 're-education' camp.

Despite the pleas of his extended family, Jesus participated in public demonstrations and 'teach-ins'. He provoked racial tension and encouraged people to subvert religious and civil authority. The goal of his radical syndicate was to abolish civil authority and to inaugurate a new form of 'divine' governance, purportedly based on 'love'. Euphemistically summarised as 'good news', it encouraged people to forsake possessions and flout the law. There was no intent to harm people, but there were often violent clashes between this fringe group and mainstream members of society.

On one occasion, Jesus was nearly throw off a cliff after claiming that he had been chosen to 'bring good news to the poor'. The 'Kingdom of God' became all-consuming for Jesus and he cut off contact with his family and home town.

After three years of direct-action campaigns, Jesus became disillusioned with in-fighting within the organisation, and frustrated by the lack of progress. He began to question the methods used by the movement. People were occasionally healed and there were some impressively large gatherings, but there could be no sustainable change unless it translated into wider community support and government policies.

This was the beginning of transition out of radical activism, where Jesus struggled to recover, define his identity and his role in society. Over the next few years, he took on new hobbies, made new friends, and gradually restored contact with his family. He learned Greek and Latin and now works broadly in the public policy field. Jesus explored his beliefs and adopted a more moderate theological and political worldview. He now thinks that collaboration with the ruling authorities is the only way to produce long-term solutions. Jesus regrets his former involvement in activities that could never have changed the world for the better, and is now committed to working with the military occupation to effect incremental changes for people in the occupied territories.



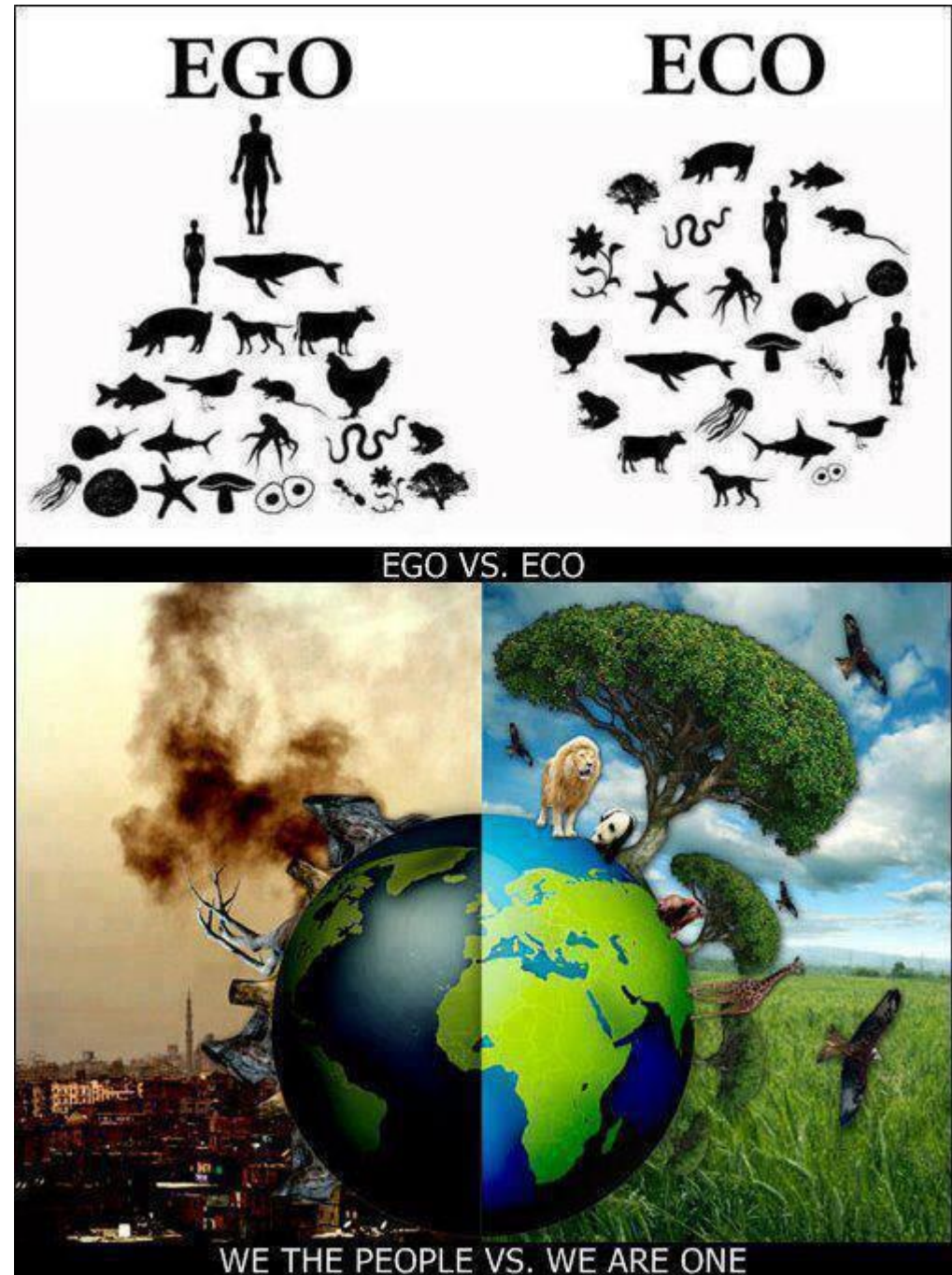
Martin Luther King Jr.

Source: Someone very clever on the interwebs.

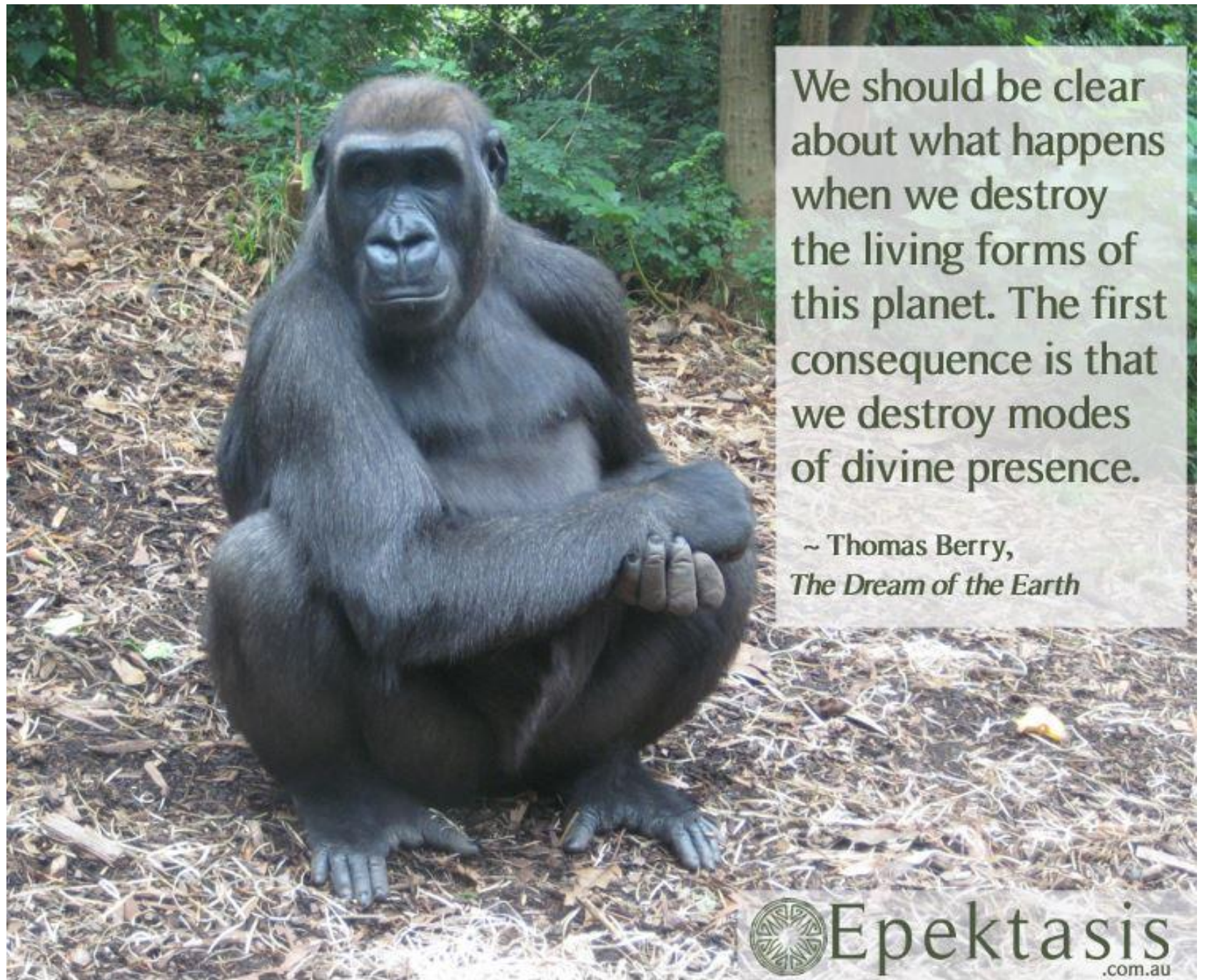
Outline

- Complex systems: Getting better information
- Logical fallacies & cognitive biases
- A sustainability reality check
- **Why spirituality matters – even if you're an atheist**

**Our spiritual
worldview
affects our
understanding
of our place on
Earth**



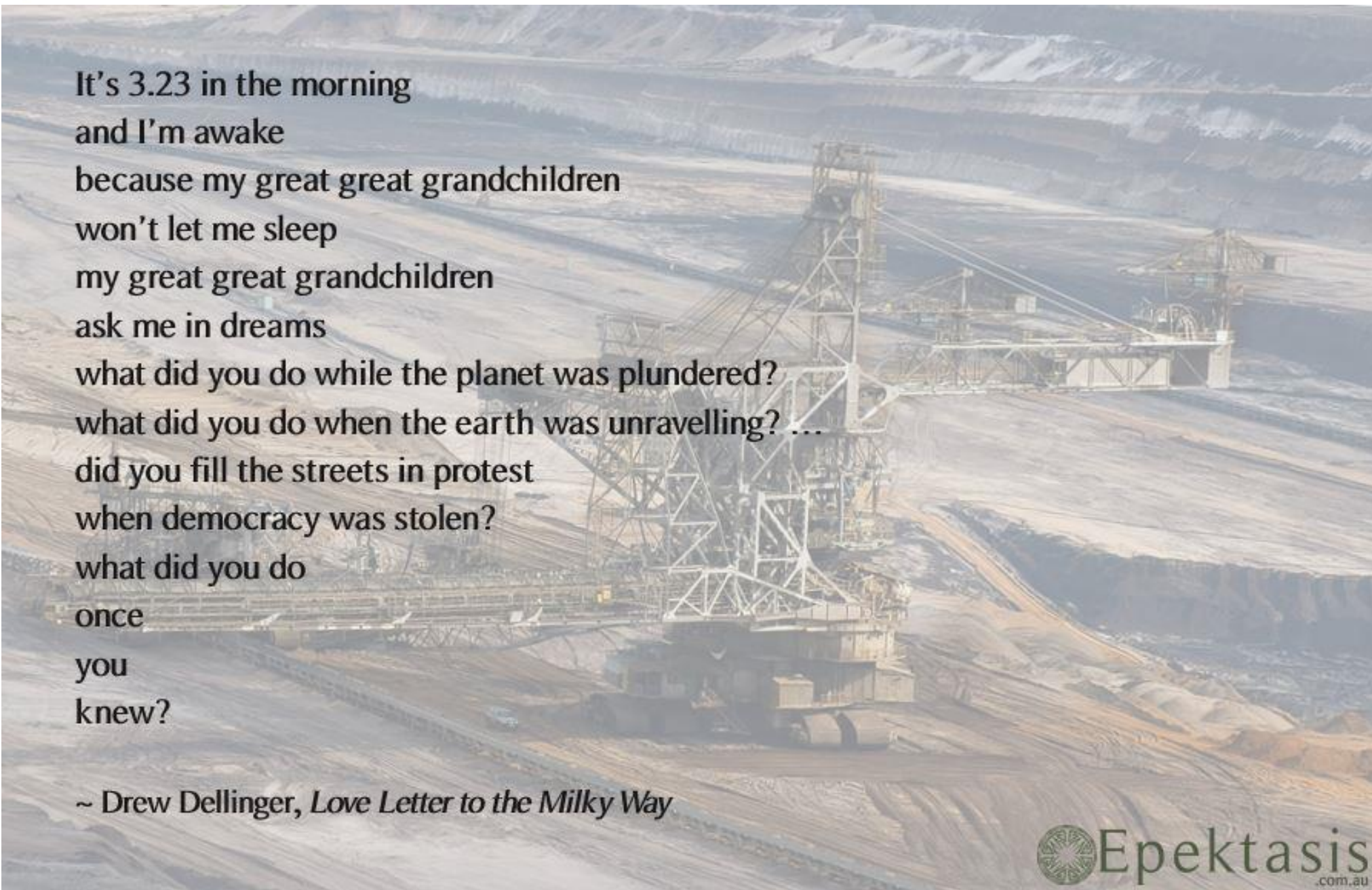
Seeing other animals
and ecosystems as
'sacred' carries
radical ethical
implications.



We should be clear
about what happens
when we destroy
the living forms of
this planet. The first
consequence is that
we destroy modes
of divine presence.

~ Thomas Berry,
The Dream of the Earth

Poetry vs prose



It's 3.23 in the morning
and I'm awake
because my great great grandchildren
won't let me sleep
my great great grandchildren
ask me in dreams
what did you do while the planet was plundered?
what did you do when the earth was unravelling? ...
did you fill the streets in protest
when democracy was stolen?
what did you do
once
you
knew?

~ Drew Dellinger, *Love Letter to the Milky Way*

Sacred Activism

- Understands the role of worldviews and spiritual evolution
- Seeks transformation, not simply to become the majority
- Understands that at root, the sustainability crisis is a crisis of spirituality and meaning-making
- Speaks not just in prose, but poetry, song, music, art, action - the languages of the heart
- Beyond 'enlightened self-interest'
- Spiritual practice for personal transformation and sustenance

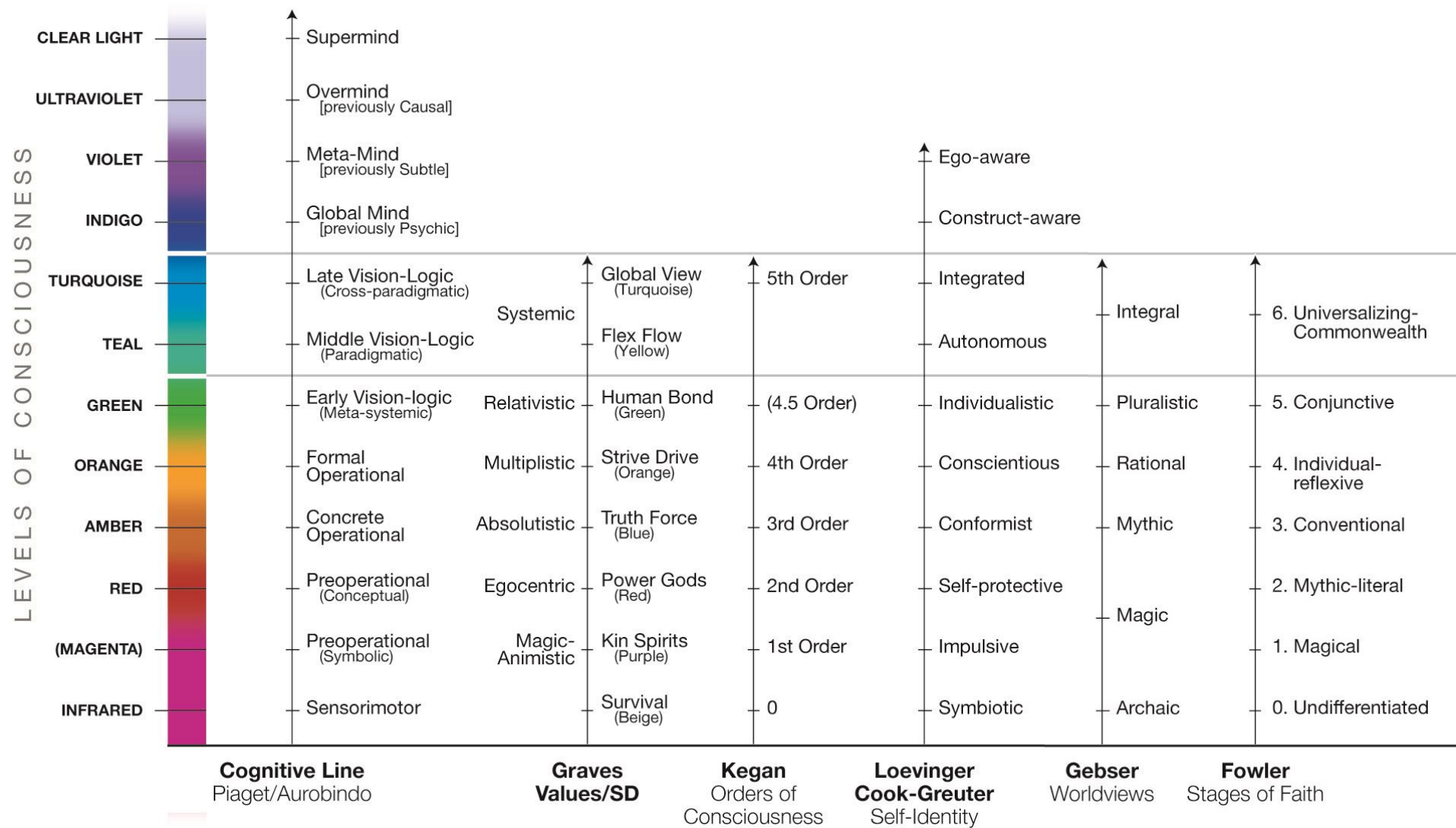
<http://www.meetup.com/sacred-activism-melbourne/>

<https://www.epektasis.com.au/sacred-activism/>

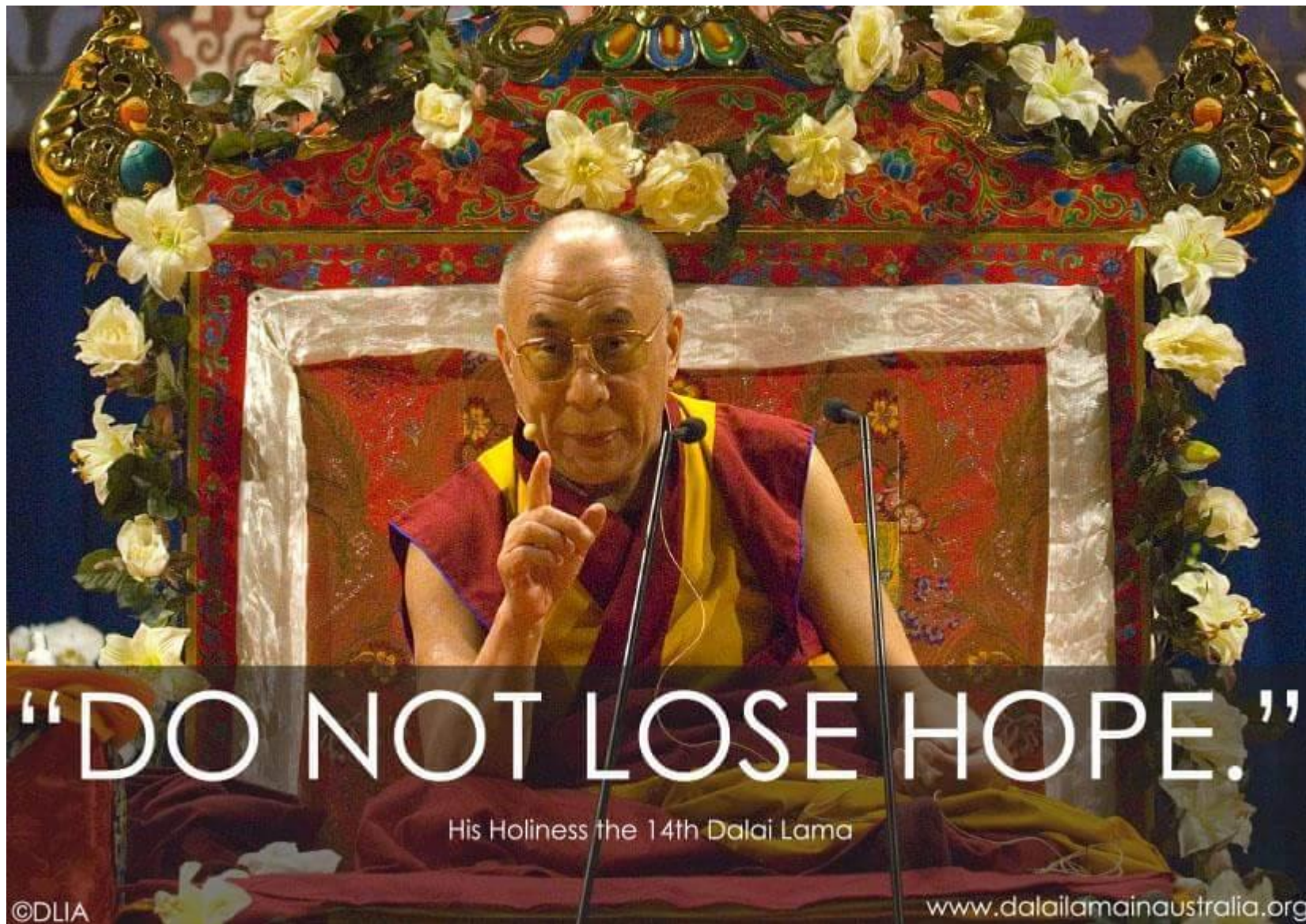




Stages of psycho-spiritual development



- Ken Wilber's scheme is on the left axis
- They're just models - LOTS of scope for debate.
- Recognise that communications, policies, strategies, etc need to take account of different personality types and stages of psycho-spiritual development.



“DO NOT LOSE HOPE.”

His Holiness the 14th Dalai Lama