Crap detection for non-scientists

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1. Crap detection

In about 1950, when Ernest Hemingway was asked if there was one quality every good writer needed, he said "The most essential gift for a good writer is a built-in, shock-proof shit detector." A whole industry has arisen from Hemingway's teachings. Here are some good crap detection criteria:

1. How recent is the information? (Criterion: Currency)
2. Is it current enough for the topic? (Criterion: Currency)

3. What kind of information is included in the content? (Criteria: Relevance, Reliability)
4. Is the information meaningful / useful for the audience? (Criterion: Relevance)
5. Who is the creator or author? What is that person's expertise on the topic, and credentials?(Criteria: Authority, Reliability)
6. What are the auspices of the author, ie, to whose Christmas gift benevolence is the author beholden? (Criteria: Bias, Point of view)
7. Who is the author's publisher or sponsor / financial supporter? Are they reputable? (Criteria: Authority, Reliability, Bias)
8. What is the publisher's interest (if any) in this information? (Criteria: Authority, Reliability)
9. Is it data, mandate or opinion? If it's the latter, is it balanced? (Criteria: Purpose, Point of View)
10. If data, how were the data gathered and analysed, ie, what instruments and methodology were used? (Criteria: Reliability, Validity, Triangulation)
11. Does the author provide references or sources for data or quotations? (Criteria: Purpose, Point of View, Reliability)
12. Is the author trying to sell you something? (Criteria: Purpose, Point of View, Reliability)

Probably ten of these twelve criteria for good crap detection are illustrated in this paper, directly or indirectly. Crap detection is about credibility and reliability – it's not about truth.
See https://elearningindustry.com/content-curation-crap-detection-10-ways-detect-crap

Also see *Aristotle*, and *Campbell and Stanley*.

This paper is about how science works to tease out causality, ie, filters out crap.

2. What is 'knowledge'?

When we say "we know something" we usually mean that we know the principles and process of causality, ie, we know irrevocably that A causes B.

Here is *Richard Feynman* (1964): 'In general we look for a new law by this process:
First we guess it. Then we compute the consequences of the guess to see what would be implied if our guess is correct. Then we compare the result of the computation to nature, with experiment or experience, compare it directly with observation, to see if it works.

If it disagrees with nature, it is wrong.

In that simple sentence is the key to science. It does not make any difference how beautiful your guess is. It does not matter how smart you are, who made the guess, or what his name is, if it disagrees with nature, it is wrong.'

Here is *Professor Francesca Iacopi* (2018):

Throughout my career in academia and industry ... my best understanding has come out of experimental failures and understanding why a certain thing has failed.

When we are told that increasing carbon dioxide (hereafter CO_2) causes temperature rise, we are really opening Pandora's Box on that demon, causality.

In the scientific realm – not the economic, journalism, political, social or virtual (ie, IT) realms – to explain causality adequately, there are at least four requirements:

1. The cause and the effect are inextricably **correlated**, ie, a change in the causal agent is always accompanied by a concomitant change in the effect. And- **correlation** can be negative.
2. The cause precedes the effect – **temporality.** This requirement may, of course, be an aberration in our brains – we are programmed to use the words 'cause' and 'effect' in this way by the etymologists who inform our dictionaries.

3. There are clear **mechanisms** linking the causal agents and the end effect.
4. Null **hypotheses** have been tested with real data – experimental or natural – to tease out the mechanisms.
5. A requirement that meets journalistic demands is Occam's Razor – it must be simple, and hopefully transmissible in a 30-s TV bite. No media editor ever lost money by underestimating clients' IQs.
6. A requirement that meets political demands is that the cause can be manipulated – and taxed.
7. Politicians don't have scientific skills; so, they get people with relevant higher degrees to inform them – you know, you always go to the electrician with the Gold Certificate qualification to get your brain surgery done. Come back Dr Barry Jones – all is forgiven.
8. And a requirement that the tree-hugging greenies like is that 'it feels right', or 'it's beautiful'.

Let's look at the first four with examples. I'll throw hand grenades at some of the others.

2.1. Correlation

This requirement, often referred to as Mill's Canons, is spelled out in the beautiful language of the 19th century philosopher, John Stuart Mill, as his methods of scientific investigation. Mill's focus was on the *relationships between variables*.

When you eat overripe fruit and then have an upset tummy, and it happens every time, you have a correlation between **cause** (input - eating overripe fruit) and **effect** (output - exhaust issues).

If you sit around in cold, wet clothes and then come down with a cold, do you have a correlation, or an etymological conundrum?

Dr Michael Mann of the Intergovernmental Panel on Climate Change (IPCC) produced his famous 'hockey-stick' graph (Figure 9 *et seq* in the IPCC's First Assessment Report, and Figure TS.6 of the 4th Assessment Report) showing how the rise in measured temperature was in lock-step with the rise in measured CO_2. And it appeared to be a positive exponential curve – so, dire consequences were imminent. Wasn't that convincing? Al Gore and Tim Flannery thought so. And so did the left side of the ABC and many politicians around the Earth. Why? Was it a disguised armchair attack on OPEC's control of the sale of oil in the western world, ie, lounge-room disestablishmentarianism?

Wee problem 1: When I started doing research, I read in a text on SPSS that if you do an all-by-all correlation analysis, over 95% of the ensuing correlation coefficients will be statistically significant - and totally meaningless. This came across clearly in research for my Masters degree.

Wee problem 2: 1990 was before we started measuring temperature of the Earth's surface from satellites. So, where were temperatures measured? They were taken from meteorological stations that are mostly concentrated around conurbations and commercial airfields. How is that representative of Earth?? What about sea surface temperature? Do these places allow representative, simultaneous sampling of the cause and effect? Where were the CO_2 concentrations measured? Vostok, Antarctica? Tree rings in virgin forests? Coral growth? Hmmm. See *Mechanism*, and in particular *Some simple physics* ...

Wee problem 3: Briffa, reported in *McIntyre*, analysed the data from 1000 AD to the present and came up with a time-based graph that showed temperature variation, but not the dramatic exponential climb of Mann's. Many assert that Mann's 'hockey stick' is an artefact of the statistical methods he used.

Wee problem 4: When you look very carefully at Dr Mann's time vs temperature scale, you notice that the mini ice ages of the 13th to 19th centuries have been ironed out. How could that happen, I wonder? An inconvenient truth, perhaps? All working from the same, un-queried, un-triangulated data?

The correlations that the IPCC had found between CO_2 concentration change and temperature only seem to apply since about 1980. When we include data from the 18th century and even as far back as the 13th century, there were episodes when the River Thames (UK) froze over - agriculture froze, people died of hypothermia and starvation - and the Gulf Stream current went around the west of Ireland and warmed Greenland, this correlation coefficient approaches zero. Yet, scientists tell us that there must be a clear and demonstrable

correlation between cause and effect **every time the cause is observed.** The Industrial Revolution, that awful event as far as Luddites and the Greenies are concerned, that led to the growth of anthropogenic (ie, man-made) CO_2 concentration, did not really get underway till the late 18th century. So, was the most recent 1500-year mini ice age caused by a lack of CO_2 and water vapour? Hmmm, this was a time of major storms and enormous consumption of coal and wood to heat unglazed houses that had fireplaces in every room. (Only royalty and the rich could afford glazing; nonetheless, at least 80% of the energy went up the chimneys) Sorry, the correlation must apply in both directions. See *Plimer (2009)* on variability of weather patterns. Also see *Mechanism: Where does carbon dioxide come from?*

Some IPCC data gatherers claim that we have CO_2 level data going back 160 000 years. Really? They have ice cores, yes. And the ice cores have been investigated for chemical content and physical irregularities. Where did these ice cores come from? (mostly Antarctica) Were temperatures measured there 160,000 years ago? But CO_2 evaporates at -78.5°C; so, what are these data gatherers measuring at room temperature? They are measuring what they call 'proxies'. This means that they look at other things that seem to go along with CO_2, like temperature rise (eg, re-gelation of ice crystals) and then claim they find a correlation. Err, what?

Δx correlates with a proxy for Δx? How very surprising!

Scientific investigation into the oceans' deep sea currents is just getting underway – yet now, many meteorologists believe that these currents that seem to be associated with the North Atlantic Oscillation and Southern Oscillation indices, are likely to be better predictors of the Earth's surface temperatures than atmospheric concentrations of CO_2, carbon quadrihydride (CH_4, of if you prefer, methane) or nitrous oxide. In particular, what no-one understands yet is what tips the oscillation from one state to the other. All we seem to be able to do is wring our collective hands afterwards, like some latter-day, 20:20 hind-sighted mouth-organist, saying, "I told you so."

2.2. Temporality

When you eat overripe fruit and then get an upset tummy, and it happens every time, you have a *post hoc ergo propter hoc* event (after the fact, therefore because of it). This is a good demonstration of temporality.

However, getting a cold (effect) after being wet and cold (putative cause), is not. Why? Not all people who get cold and wet catch colds and some people catch colds when they're not cold and wet. Also see *Mechanism*.

There does seem to be a correlation between CO_2 concentration in the atmosphere and temperature rise. However, ...

The Earth's oceans are composed of dihydrogen monoxide (H_2O or, if you prefer, water) and transorb huge quantities of CO_2. When the temperature rises, the oceans release CO_2 as gas – alternately, when the temperature falls, the oceans absorb CO_2. The present temperature profile of the oceans is high temperature at the upper surface and lower temperatures at the lower levels – the specific gravity of water is directly related to temperature (above 4°C at normal atmospheric pressure). So, the CO_2 is mostly present at the lower levels. Dihydrogen monoxide is a very poor conductor of heat: remember those experiments in physics at high school where you held a test tube of water over a Bunsen burner, with the flame heating the upper part of the test tube, but you held the lower part comfortably in your fingers even when the water at the top was boiling? Same mechanism: it takes many years of heating at the top to get the oceans to give up their CO_2 molecules from the lower levels. Perhaps this is why temperature rise is followed, with a very high correlation, by rises in CO_2 concentration in our Earth's atmosphere, ***but about 800 years later.***

Unfortunately for the IPCC and similarly well-educated political bodies, scientists have this strange belief that **cause must precede effect** – not the other way around.

2.3. Mechanism

Your cold is symptomatic of a mild influenza attack by a virus that got past your immune system when it was compromised by your cold, wet environment, or when your immune system didn't have a map of this particular strain of the virus – immunisation gives your immune system this map to get into its inventory. The influenza virus constantly mutates in each host; so, your immune system's memory of previous

influenza intrusions will not help you. You can catch a cold far more reliably by travelling in an air-conditioned train where cold and flu sufferers cough and sneeze, distributing infected droplets that you inhale, getting them into your blood system via the alveoli in your lungs. This is **mechanism** - beaut stuff.

Aristotle (4th century BC) noticed there were concentrations of animal fossils in rocks long distances from oceans, but that the fossils were of animals no longer around. He theorised that the Earth had once been flooded. He got 'sent to Coventry', err sorry, Macedonia, his home country and was not permitted Athenian citizenship; so, he was cut off from educating the young. Later theoreticians such as Jahiz (9th century) and da Vinci (15th century) noticed concentrations of specific but different plants in certain locations on the Earth's surface, but that there were striking similarities between the plants. Did these plants arrive fully formed by Divine Intervention simultaneously at different locations? Wallace and Darwin (mid 19th century) came to the conclusion that all these observations showed the **causal** influence of environments on species – but that the **effects** could take millions of years. Of course, these findings were declared heretical because they ran counter to the Creationist view demanded by the religious fathers who had royalty (and tithes and tax income) in their pockets. Nonetheless, Wallace and Darwin had discovered the **mechanism** of transmutation, what we now call evolution. (Note: it was Wallace who coined the term 'survival of the fittest'; Darwin preferred 'survival of the species best adapted to its environment'.)

2.3.1. Some simple physics of radiation

Figure 1 of the IPCC's First Assessment Report gives a simple picture of *El Sol*'s radiation in and out of the Earth, the **mechanism** of heat transfer and hence, temperature change.

- The more that infra-red (IR) long wave, heating radiation reaches the Earth's surface, the greater the Earth's surface temperature rise.
- The more that IR radiation is blocked from reaching the Earth's surface, the smaller the Earth's surface temperature rise.
- The more that IR radiation is blocked from re-radiating into space, the less the Earth's surface temperature fall.
- The different absorptivity, emissivity and reflectivity of different kinds of surfaces on the Earth will affect the amount of heat retained by the Earth. Water (sea, ice, snow, lakes and rivers) is generally a good reflector; rough surfaces like desert sand, brown, dried soil, and forest canopies, are generally good absorbers and poor emitters (except after bushfires).
- If the heat gains exceed the losses, the surface temperature will rise.

These effects are **local**, ie, the surface temperature changes are related to local changes in IR reception, absorption, emission and reflection – scientists call this *albedo*.

So, if we have large amounts of sunshine and clear skies in the morning and then massive clouds of dihydrogen monoxide in the afternoon, the local surface temperature will rise.

If we have no clouds of dihydrogen monoxide overnight, then heat from the Earth is radiated out into the -273ºC of space, the Earth's surface gets very cold and we see frost in the morning.

If we have large clouds of dihydrogen monoxide overnight, there is little loss of heat and the local surface temperature stays relatively constant.

2.3.2. Effect of atmospheric gases on IR absorption

The bulk of the Earth's atmospheric gases are oxygen and nitrogen (about 97%); these are relatively transparent to IR radiation. The remaining gases absorb IR radiation – more or less. I've left out the CFCs (used in refrigerators and women's hair sprays) because, since their banning, their effect has gone away.

Gas	% by volume in Earth's atmosphere	Specific IR absorption effect cf with CO_2	Weighted absorption effect	Weighted absorption effect, normalised to CO_2
Water, H_2O	2 to 4	10 to 20	20 to 80	500 to 2600
Carbon dioxide, CO_2	0.031 to 0.038	1	0.031 to 0.038	1
Methane, CH_4	0.000 17	0.1	1.7×10^{-5}	$5.5 \text{ to } 6.7 \times 10^{-5}$
Nitrous oxide, N_2O	0.000 000 3	0.000 1	3×10^{-10}	$9.7 \text{ to } 12 \times 10^{-10}$

Inspection of this table shows that CO_2 concentration would need to increase by a factor of between 500 and 2600 to approach having an effect like dihydrogen monoxide.

And all that journalistic fever about the exhaust gases of ruminating bovine vertebrates? Harrumph.

2.3.3. What can we do?

Clearly, we should do all we can to outlaw the production and use of dihydrogen monoxide. Our human bodies comprise about 60% of this noxious compound and require a throughput of approximately 2 L per day of it. Furthermore, plants transport vast quantities of dihydrogen monoxide from their root systems to their leaf systems in order to process the CO_2 we humans produce, in turn providing us with fibre, food and oxygen that we and other vertebrates need for survival.

So, we must cut down more trees to prevent this spreading of dihydrogen monoxide into the atmosphere. Unfortunately, that will cut down oxygen production and vertebrates will die. Them's the breaks when your government encourages deforestation and development. Perhaps we should get the politicians to tax oxygen consumption – that would fix the problem, wouldn't it? Er, no; not all vertebrates pay tax.

2.3.4. Where does carbon dioxide come from?

The total amount of man-made CO_2 is about 3% of the total generated by the Earth. Human beings at rest produce about 1 kg of CO_2 per day, up to even 8 times more if energetic; so, the Australian population is producing at least 25,000 tonnes of CO_2 per day. Most CO_2 is generated by volcanoes orogenetically. 85% of all volcanoes are under the sea. (See *Appendix 1*) 15 of the 16 coldest summers recorded between 500 BC and 1,000 AD followed large volcanic eruptions - with four of the coldest occurring shortly after the largest volcanic events found on record, eg, Mt Etna, Krakatoa and Mt Pinatubo. The CO_2 belched out underwater gets absorbed into the water at the lower, colder levels and then moves via undersea currents driven by centrifugal force ($F_C = m\acute{\omega}^2r$) to warmer areas, such as the tropics, where it rises in the water column and gets released. Perhaps you've noticed that the tropics have the highest concentrations of living, green plants? CO_2 is a major contributor to plant nutrition and growth.

Neither undersea currents nor the output from volcanoes appears in the IPCC models. So, tell Al Gore to go away - he is an ignorant mouth-organist. Beware of Brian Cox, too; his knowledge of chemistry is wonky.

The proportion of CO_2 in the air has been very much higher than now - when the Earth's average temperature has been arctic. Oh dear; isn't that the opposite of what the climate change vendors want us to hear?

The time between CO_2 increase and temperature increase ranges between 200 and 1000 years, with an average of 800 years. But here's the kicker - the CO_2 concentration rises AFTER the temperature rise.

2.4. Hypotheses tested

2.4.1. Sea level rise

Jeremy Legget (Engineers Australia Forum # 1 on Climate Change) claimed that if all the ice on Greenland melted, the world's oceans would rise by **7 m.**

See *Appendix 2* where I have done the calculations. Legget's 7 m is within a reasonable range of my calculations, if:

- Greenland, under its ice, is perfectly flat, ie, has no mountains
- the covering ice sheet is uniformly 3 km thick (so says Legget)
- the ice upper surface is uniformly horizontal, or quaquaversal, ie, uniformly conical (which?)
- the cliff faces over which glaciers will calve icebergs are perfectly vertical for between 100 m and 3 km
- there will be no erosion of the coastline
- as the ice melts to become water, the laws of physics regarding vapour pressure and the formation of water vapour will suddenly fail, and there will be no cloud formation to alter heat loss or gain
- the Earth is absolutely spherical
- the Earth's gravitation is absolutely uniform over all the Earth's surface, including its oceans.

How many land masses this size are totally flat? Where in the world are ice masses uniformly horizontal or conical? Further, all glacial movements have been accompanied by massive erosion; when there is coastal erosion, the rise in sea level will be less. If we allow that some of this ice is floating around Greenland, ie, not sitting on granite, then the water level rise would be even less.

Bear in mind that up to the 15th century, Greenland was then, as its name suggests, green, and a major agricultural country– though now it's only ~1% arable. Were the Earth's oceans 7 m higher then?

Is 7 m sea rise all that dramatic? Archaeologists working around the site of the Battle of Hastings – Senlac Hill - opine that at the time of that Norman invasion (1066), this area was at sea level. It is now 30 m above mean sea level, without the aid of volcanic activity; the last volcanic activity in UK was 946 AD. Hey, that's an average of 32 mm sea level **fall** per annum since 1066. Where did all that water go?

We tend to criticise maps of early navigators because the land masses look different today; they probably were different and those early maps may have been more accurate than school geography teachers aver.

2.4.2. Is temperature rise all that bad?

When the Earth's temperature has been higher than now, as in the 17th to mid 19th centuries, concomitantly, there was unprecedented growth in:

- **exploration** – Columbus, Cook, Frobisher, da Gama, Hudson, Magellan, Tasman
- new **technology** – steam engines, trains, improved agricultural and industrial methods
- **knowledge** - Ampere, Bacon, Boyle, Charles, Darwin, Faraday, Galvani, Henry, Hooke, Newton, Ohm, Volta, Wallace.

As noted earlier, the lushness of the green vegetation near the tropics is vital for our survival – as source for oxygen, fibre and food for vertebrates. I wonder if that's why people grow hothouses.

There have been larger temperature variations than we experience presently – and vertebrate life has survived. In the mid 19th century, Dickens diarised high temperatures that prostrated him in London[1]. In the 1970s, Thomas Dolby froze in London in summer. Of course, if you try to walk across the Simpson or Gobi Deserts without adequate provision for your hydration, you will die. And if you wander out into an Antarctic

[1] It could also have been the open sewers of pre-Bazalgette London – its streets. The first London sewers were 1866.

blizzard, as per Captain Oates, you will die. Even today, vertebrates live in higher and lower average temperatures, viz: Egypt and Siberia, and experience wide diurnal temperature variations. It's only because of the economic push to work in cities with their air-conditioned buildings and the subsequent advent of small domestic air conditioners that we humans persuade ourselves we are experiencing too much temperature variation and 'they' must do something about it. Who? The government? The UN? God?

Worst of all for the Climate Change hustlers, the average temperature of the Earth's surface has been falling since 1998. Of course, weather reporters, even now, like to make a big thing of 'highest temperature on record' and they may even be telling the truth – but which record? Not all records go back 6.5 million years, the beginning of hominid life on Earth.

It does not take a genius to realise that the Ingenuous Pigpen Coffee Club [IPCC] comprises almost entirely meteorologists but few (if any) archaeologists, geologists, oceanographers or palaeontologists. The IPCC is, after all, a body of the World Meteorological Society. Meteorologists are mostly concerned with weather forecasting, ie, very short time scales. Most of its critics who look much further into the past, and who could have provided some leavening, have either resigned or been pushed off this so-called elite body. Further, Dr Mann has retained the names and references of these critics in his various papers and counted them as supporting; however, only about 20% of the listed references actually support Mann. Isn't that wonderfully honest scientific reporting?

2.5. Simplicity

Richard Feynman (1995), this time discussing gravity:

'The answer to all these questions may not be simple. I know there are some scientists who go about preaching that Nature always takes on the simplest solutions. Yet the simplest solution by far would be nothing, that there should be nothing at all in the universe. Nature is far more inventive than that, so I refuse to go along with the thinking it always has to be simple.'

So, like Newton's Laws, Ohm's Law and Occam's Razor, simplicity may be a starting point, but it may be incorrect.

2.6. Beauty

This is the one the greenies love because it fits so neatly with their cosmetic view of life and learning.

Richard Feynman (1995) again, discussing gravity:

'We must not fool ourselves into thinking that a beautiful result is more reliable simply because of its 'beauty', which is in part an artificial result of our assumptions.'

When you inspect Mann's hockey stick, isn't it beautiful? But does it match nature?

3. Should we cut down use of fossil fuels?

Is CO_2 the nasty culprit we must control and ban? And even if we could, would the reduction of CO_2 in the atmosphere have the effect we want? Or would we be slamming money at the effect long before we have gotten the slightest idea of the cause?

If we really wish to reduce CO_2 in the atmosphere, would it not be better to try to use carbon-based fuels more efficiently, as in Japan, presently achieving 40% conversion efficiency of Australian coal?

Geologists tell us that the amount of material we have on Earth stays constant. All we do is change the compounds made with the materials. Carbon is one of the lighter materials readily available near the surface of the Earth's crust. When we burn carbon, we produce carbon dioxide [preferred] and carbon monoxide [unhappily]. But we have no simple ways of converting these oxides of carbon back into their constituent elements. In other words, apart from the employment of leafy objects, as when we burn carbon, we do so mostly irreversibly. It is possible to calculate when we will have consumed all the economically readily-extractable carbon – there may be a slight extension to the deadline because as carbon becomes scarcer, its price will rise, making it more economic to extract from the more intractable sources, thus making it more attractive to tax gatherers. And so that we don't get any fancy ideas about returning carbon to the Earth in a

useful form, we already have advocates of carbon sequestration. Isn't that wonderful? If we reduce the amount of carbon available, won't that push up the price of carbon?

3.1. Oil-fuelled motors

Should we go back to Stanley's Steamer? This was the motor vehicle that used steam to provide locomotive power for motor vehicles in the early 20th century. The romantics claim that its exhaust was steam, a harmless gas that condenses into clouds that would return to Earth as rain. What heated the water to produce the steam? It was oil; that is, before the oil companies bought up all of Stanley's patents and then buried the Steamer vehicle. They knew an invention that would kill the demand for oil in motor vehicles. Smart!

About this time, along came one M'sieu Nicolas Carnot who delivered unto us the 4-stroke internal combustion (IC) engine. In its early incarnations, it used any old oil product that could be vaporised, mixed with air and burned under controlled circumstances to push a piston. When you burn oil-based fuel with air, you get water, CO_2, CO, and oxides of phosphorous, sulphur and nitrogen. The best 4-stroke IC engine can convert about 25% of the fuel energy into shaft power, eg, the Jaguar IC engine with the Brian Mays head.

Many of our lawn mowers use 2-stroke IC engines. Instead of having 4 strokes to each power stroke, with a 2-stroke there are only two. Isn't this more efficient? No – the fuel-air mixture cannot be compressed to a sufficiently high pressure to get more than about 10% overall efficiency. So, we have to use around 2.5 times the input fuel for the same shaft output power. And for the cheaper engines, to save on the cost of running engine ancillaries, such as oil pumps for lubricating the crankshaft bearings, pistons and piston rings, oil is added to the fuel. Where does this oil go? Straight up your nose. I wonder if there is a correlation between the wonderfully clipped lawns on the west coast of California and its afternoon smog.

Perhaps we should shift from petrol to liquefied petroleum gas [LPG], which requires less processing than petrol before use. In terms of cost per kW delivered to the road, it is cheaper. But because it has lower octane content, it requires a lower compression ratio, and consequently, it delivers less power per cubic centimetre of engine displacement, per revolution. Can't we get more power just by running the engine faster? Unfortunately, no: why? LPG ignites more slowly than petrol because it has lower octane content. In terms of pollution, it produces the same as a petrol-fuelled engine, though there may be differences in oxides of phosphorous and sulphur, depending on the source content of the LPG. How many fuel stations do you see offering LPG alongside petrol? So, for consumer convenience it is far better as a political gas outlet.

The same argument applies to Johnnie Howard's alcohol-based fuels - less octane content. But there is worse to come; alcohol-based fuels eat some of the plastic components of cars' fuel systems, thus making car maintenance a very lucrative occupation.

Aha, what about Herr Doktor Rudolf Diesel's invention of the compression ignition IC engine? The compression ratio that we can get away with in petrol-fuelled IC engines, using the [@#$%] fuel available in most countries, is about 8:1, ie, the fuel-air mixture can only be compressed to 8 atmospheres before the mixture self-detonates, causing untold benefit to engine restorers. The Diesel engine can easily run with a compression ratio of about 16:1, giving a possible power conversion efficiency of closer to 40%, giving much more shaft power– but the fuel needs to be more highly refined, and so, is more expensive to produce. And the engine must be heavier to handle the greater pressures on cylinder heads, journals and crankpins. Why does Diesel fuel appear to be about the same price as petrol at the bowsers? That is a political decision to help the farmers for whom air pollution is immaterial. The Diesel engine produces all the same exhaust products as petrol-powered engines, with a higher proportion of the phosphorous and nitrous oxides along with particulate matter when higher compression ratios are used. This makes political and economic sense to farmers, because their pollution, as a proportion of a country's total, is very small. However, when Diesel engines are used in built-up areas, especially when there are strong incentives to keep heavy vehicles running rather than to service their fuel injection systems to operate properly, we find that the amount of population-specific asthma increases in proportion to the volume of heavy vehicles using Diesel engines. Now, to be good scientists, we should ask: does the asthma cause the pollution, or is it the other way around, or is there some other, yet to be detected, common cause, such as that noisy highways depress rents → a concentration of low-wage greenies with poor diet and health, or are there many simultaneous causal agents?

3.2. Electric vehicles

Should we embrace electric vehicles (EVs)? If EVs replace all fossil-fuelled vehicles, we would need an additional 7.6 times the present grid capacity. Or we could go for solar PV roof panels; that would require 176 km^2, say, 3.5 million homes @ 50 m^2 / home – a bit over the housing stock of NSW. See *Appendix 3.*

At the present level of technological development of cells, the silver-zinc cell has the highest energy density, but is only available in very small forms. The most readily available in large capacity, the lead-acid cell, gives the most power per kg. But vehicles using lead-acid batteries and wheel motors are much heavier than petrol and Diesel powered vehicles, per kW delivered to the road. When lithium-based and other cell technologies are better developed, we will have lighter electric cars, viz, the Tesla motor vehicle and the SA backup to its grid. But lithium is not a nice material to have sprayed all over the population in motor vehicle accidents. In SA, Elon Musk's lithium cells are connected in series-parallel without fuses between cells; this improves charge-discharge efficiency (reduced I^2R losses). Unfortunately, when a short develops in a cell, there is massive power available to make smoke. Oh, dearie dearie me, what will he think of next?

3.3. Emissions trading – boon or bane?

The main purpose of emissions trading is to get people to use scarce resources more efficiently - the purported aim to reduce CO_2 emissions is pure furphy. Even if we accept the claim that power stations produce 40% of man-made CO_2, this only constitutes 1.2% of the Earth's total. Even if we change over completely to nuclear power, the effect on the total CO_2 is infinitesimal. To change to wind, solar, wave or geothermal energy, or all of them, won't get anywhere near current human electricity consumption. What might be more effective would be to:

- turn off unused electrical appliances
- use manual power: why do I keep hearing 2-stroke IC-engine powered leaf blowers when a rake would be just as effective and, as a bonus, give the user some skeletal muscle exercise?
- design and construct cities that encourage walking
- design and build pavements that allow safe use of bicycles

but to get these ideas realised, re-education needs to start in the first four years of a child's life.

4. Conclusion

Unfortunately, pollies and other wallies add sustainability and the use of carbon / fossil fuel to the climate change argument. I, for one, can find no way through this intellectual [archaeology, chemistry, geology, palaeontology and physics] soup to connect them. Can you?

What should we do? There are at least 5 things we can do.

In the list here, the first two are to do with the development and spread of knowledge, ie, the canning of crap. As Feynman and Popper would probably have said, we can never know the final 'truth'; all we can do, by diligent application of the scientific method, is get closer and closer to the dinkum oil.

The last three are about climate variation.

1. Educate all polluters of the public domain, including ABC editors, in the mechanics of causality – so we can move away from prognostications based on spurious correlations (of which our present journos, including in programs like *Catalyst* and *Trust me, I'm a doctor,* seem so enamoured). Even as late as 1851, Dickens was bemoaning the general lack of education – 'startling depths of mental ignorance and neglect concealed beneath our hollow shows of civilisation.' Dickens was ahead of his time; the first Education Act in the UK appeared in 1870.
2. Learn how knowledge grows. Repetition of classroom so-called 'experiments' does not constitute growth in scientifically-derived knowledge. Knowledge grows when there is disagreement and disputation, and hence, paradigm shifts (see Kuhn). The claim that 'all scientists agree …' or 'the science is in' is nonsense. It tells us that the IPCC, ABC journalists and our well-intentioned pollies think knowledge is some kind of democratically-derived product. Sorry, It ain't necessarily so, with

apologies to the Gershwin brothers. An inconvenient truth, perhaps? with no apology to the crapper, Gory Al.[2]

3. Carry out properly-targeted scientific investigations – natural and experimental - into the causes of climate variation. This means setting up or observing null hypotheses in action.
4. About the Kyoto, Paris and other agreements? Do you know what 2% (reduction target) of 40% (power station output) of 3% (man-made contribution to atmospheric CO_2) of ~0.03% (average atmospheric concentration of CO_2) is? It is ~7.2 x 10^{-8}%, or 7.2 x 10^{-10} per unit, ie, SFA – almost as good as homeopathy, you know, the good old eye-dropper in a swimming pool mantra.
5. Learn how to live with temperature variation; many of our forebears did, and for millions of years.

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[2] In 2016, I visited the Adelaide Hills Amateur Radio Society where a friend of the club's president was presenting on Climate Change. He claimed that Al Gore had an advanced degree in climatology. Al Gore failed his first and only attempt to gain an undergraduate science degree because of his pot-habituated non-attendance at classes, and his poor maths. He then changed to getting a double Bachelor's degree in Divinity and Government, his highest earned qualification. No maths. No climate science. He got his PhD from the same university as Dolly Parton, for the same reason, and it wasn't the size of his tits.

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Appendix 1: Ian Plimer on atmospheric CO_2

[Ian is Professor of Geology at Melbourne University and of Earth Sciences at Adelaide University. He is also a major shareholder in coal mining ventures.]

All of you out there across the globe who have fought so hard to tackle the hideous enemy of our planet, namely carbon emissions, you know ... that bogus god you worship of "Climate Change" or "Global Warming"... well, I feel it is necessary to inform you of some bad news. It really does pain me to have to bring you this disappointing information.

Are you sitting down?

Okay, here's the bombshell. The current volcanic eruption going on in Iceland, since its first spewing of volcanic ash has, in just FOUR DAYS, NEGATED EVERY SINGLE EFFORT you have made in the past five years to control CO_2 emissions on our planet - all of you.

Of course you know about this evil carbon dioxide that we are trying to suppress - it's that vital chemical compound that every plant requires to live and grow and to synthesise into oxygen for us humans and all animal life.

I know, I know ... (group hug) ... it's very disheartening to realise that all of the carbon emission savings you have accomplished while suffering the inconvenience and expense of: driving Prius hybrids, buying fabric grocery bags, sitting up till midnight to finish your kid's "The Green Revolution" science project, throwing out all of your non-green cleaning supplies, using only two squares of toilet paper, putting a brick in your toilet tank reservoir, selling your SUV and speedboat, vacationing at home instead of Bali, nearly getting hit every day on your bicycle, replacing all of your 50c light bulbs with $10 compact fluorescent or LED light bulbs ... well, all of those things you have done have all gone down the tubes in just four days.

The volcanic ash emitted into the Earth's atmosphere in just four days - yes - FOUR DAYS ONLY by that volcano in Iceland, has totally erased every single effort you have made to reduce the evil beast, carbon. And there are around 200 active volcanoes on the planet spewing out this crud any one time - EVERY DAY.

Oh, I don't really want to rain on your parade too much, but I should mention that when the volcano Mt Pinatubo erupted in the Philippines in 1991, it spewed out more greenhouse gases into the atmosphere than the entire human race had emitted in its entire 40 MILLION YEARS on earth. Yes folks, Mt Pinatubo was active for over one year - think about it.

Of course I shouldn't spoil this touchy-feely tree-hugging moment and mention the effect of solar and cosmic activity and the well-recognised 800-year global heating and cooling cycle, which keeps happening, despite our completely insignificant efforts to affect climate change.

I'm so sorry. And I do wish I had a silver lining to this volcanic ash cloud but the fact of the matter is that the bush fire season across the western USA and Australia this year alone will negate all your efforts to reduce carbon in our world for the next two to three years. And it happens every year?

Just remember that your government just tried to impose a whopping carbon tax on you on the basis of the bogus "human-caused" climate change scenario. No mention of a Tax on all the emissions caused by Prescribed Bush Fire Burning?

The Prescribed forest burning in Victoria alone puts more CO_2 into the atmosphere than all power generation in Australia in one year?

Hey, isn't it interesting how they don't mention "Global Warming" any more, but just "Climate Change" - you know why? It's because the planet has COOLED by 0.7 degrees in the past century and these global warming bullshit artists got caught with their pants down.

And just keep in mind that now the same government is in control, you will have an Emissions Trading Scheme - that whopping new tax - imposed on you, that will achieve absolutely nothing except make you poorer. It won't stop any volcanoes from erupting, that's for sure!

Please pass this on in order that everyone will know the truth on Global Warming, Climate Change and the 'con job' by Governments to introduce a new tax.

Appendix 2: Sea rise

Here are some wee facts, stories and conundra:

1. The area of the Earth's oceans is currently 71% of 510 x 10^{12} m^2 (World Almanac) = **361 x 10^{12} m^2**.
2. Douglas Lord (Engineers Australia Forum # 1 on Climate Change.) said: currently, sea levels are rising at about 3 mm/year but are likely to rise by up to 9.6 mm per year in the coming century.
3. So, if all the increase is coming from ice melt, then the volume needed would be about 361 x (3 to 9.6) x 10^9 m^3 = **1.083 to 3.47 x 10^{12} m^3** per year. That's equivalent to the tip of an ice cube about 10 to 15 km on each side. However, as the density of ice is about 0.9 compared with water, we actually need 10 times this amount of iceberg to melt, ie, an iceberg between 22 and 32 km on each side, say, the distance between Sydney and Gymea, cubed.
4. Jeremy Legget (Engineers Australia Forum # 1 on Climate Change) claimed that if all the ice on Greenland melted, the world's oceans would rise by **7 m** – he amended that to 6.7 m under questioning.
5. The area of the ice-cap on Greenland is currently 1.834 x 10^{12} m^2 (World Almanac). Legget (op sit) claimed the ice on Greenland was up to 3 km thick. If we assume this is an ice sheet 3 km thick, the volume of ice would be 1.834 x 10^{12} x 3 km = **5.502 x 10^{15} m^3**. If we assume that the ice is in a glacial form and that the sea cliffs are 100 m high, ie, the ice sheet has uniformly conical sloping sides, then the volume would be about **2.75 x 10^{15} m^3**.
6. Were all this water to melt and eventually settle evenly over all the Earth's oceans, the sea rise would be between 0.9 x 2,750 / 361 m and 0.9 x 5,502 / 361, ie, **between 6.86 m and 13.7 m**, sort of encompassing Legget's prediction.
7. The Earth is an oblate spheroid, not spherical. It's gravitational field is not uniform. So, the probability of ice-melt settling evenly over the Earth's oceans is negligible.
8. Icebergs calve because of moraine laid down thousands of years ago. Sea temperature has no effect until the calved iceberg falls off the cliff into the sea. Iceberg cliff faces get eroded by high-temperature sea water, wind and waves, not air temperature or IR radiation – ice is a good reflector. Yet, since 2000, the ABC has been showing footage of glaciers calving icebergs, even on 2018-10-08. This could have been the news cycle – by 2018-10-10, the IPCC flurry had gone again.
9. At the present reported rate of ocean rise, a rise of 13.7 m would take about 4,500 years. At the accelerated rate, that would be about 1,450 years. Whichever prediction is taken, there would have been another mini ice age in between and all these linear extrapolations would be inappropriate – temperatures would fall and ice melt would be reversed. And who knows, the Gulf Stream may divert again.
10. When temperature rises, the vapour pressure of water increases. This means that the amount of water in the atmosphere increases. So, even if icebergs melt, not all this water will stay as liquid. Further, if this water forms clouds of dihydrogen monoxide (actually ice), this will increase the wet blanket effect and temperatures at the Earth's surface will increase a bit more [see: *Some simple physics* ...]. This may be aided by the amount of hot air generated by politicians and journalists, for whom any scientific knowledge, let alone skill, is a foreign country – and xenophobia rules, right? Well, for Dutton and Hansen, yes.
11. Even if the time scale is slightly askew, a major problem with making linear extrapolations is that we have no idea of:
    - the actual amount of floating vs granite-anchored ice
    - the cause of temperature rise, that is, the alleged main cause.

Appendix 3: Electric vehicles

There are two main types available – pure and hybrid.

Pure battery EVs – aka PEVs

The purest form of EVs uses batteries alone to drive electric wheel motors. The romantics tell us there is only one moving part per wheel, carefully ignoring the complexity of the control system. Where does the energy come from to fill the batteries? From the electricity mains. So, all we do is shift the carbon combustion products from the street to the power generators? Simple, eh?

Has anyone done the sums to calculate how much bigger the electric power generation system would need to be to change over from oil / fossil fuels to EVs? Roy Leembruggen, a mechanical engineer and ex-President of Australian Electric Vehicle Association, thought power stations would be free-wheeling overnight. Quaint? Yes.

I have done some preliminary data gathering and calculations:

- Australia's present electricity generation capacity is about 46 GW ($G = 10^9$)
- Australia's peak demand (in 2009) was about 36 GW; peak demand in 2018 was 31 GW
- The average weekly car fuel refill is reckoned at about 385 kWh (40L @ 9.6 kWh / L)
- Australia's total fossil fuel consumption for 16 Million cars, trucks and buses in 2011-12 was 32 GL; this is equivalent to 3.07 PWh ($P = 10^{15}$) over the year, requiring generating capacity of 350 GW
- Rail, by contrast consumed 1.67 GL equivalent over the same period, equiv 160 TWh ($T = 10^{12}$)
- If EVs replace IC vehicles, and if there is no nuclear or new coal-powered electricity generation, where will we get the extra at least 350 GW of electric power capacity? The 15 GW gap between present capacity and demand is a mere 4.3% of 350 GW. So, sunshine?
- Allowing average daily sunshine of 9 hours, incoming solar energy of 1 kW / m^2 and best energy conversion (Martin Green's [UNSW] PV panels) of 22%, the area of required solar PV panels would be 176 km^2. Say, 3.5 million homes @ 50 m^2 / home – a bit over the housing stock of NSW. Yeah, that'll work, won't it?

How long does it take to re-charge the batteries? A bit longer than you have been driving. What is the efficiency of the charge-discharge system for lead-acid batteries? Can be up to 80%. But you also need to consider the efficiency of converting carbon fuel to electricity, currently averaging 33%, ie, overall system efficiency (well to wheel) of up to 26%. Lithium ion batteries can achieve 45% well to wheel efficiency.

Hybrid EVs – aka HEVs

The other major contender is the hybrid; this uses electric wheel motors powered from a battery like the PEV. Instead of charging the battery from the mains, an onboard IC engine, using oil-derived fuel, is run at a constant speed, to achieve maximum fuel conversion efficiency. Its protagonists claim lower pollution levels and higher miles per gallon, or lower litres per km. But, now we have an inherently more complex device that the average owner / leaser / user cannot maintain. What a wonderful world for motor vehicle maintainers! And the efficiency? Could be as high as 30% overall.

Perhaps we should move to using a small thermo-nuclear power generator (U_{235} can deliver 24 GWh / kg, compared with fossil fuel at 12 kWh / kg) to charge the battery? Then we could go back to the Luddites and have people waving red flags preceding such vehicles as they wend their low pollution way.

Efficiency

Is overall well-to-wheel efficiency of between 26 and 45 % socially and economically sustainable? Put another way, can the human race continue to chuck away half to three-quarters of all fossil fuel? For how long? Also, bear in mind that, not included in these efficiency figures, is the cost of building and maintaining the infrastructure, not only to extract and refine the fossil fuel, but also to extract, refine and process all the materials used in packaging, distribution and lies, er, marketing.