Climate – A Personal Perspective

Dai Llewellyn Davies, March 2015, brindabella.id.au

Growing up in Australia with its diverse geography I experienced a few different climates. The first was beach-side Sydney with its mild to hot weather – wet by Australian standards and moderated by the influence of the sea. One of my earliest memories is of someone talking about the need to move the house we were living in further back from the sea out of the reach of king tides. I later dreamt of waking to find the sea lapping about my bed. If the adults had been speaking with fear in their voices the dream would have been a nightmare.

After writing the above I started to wonder what had really happened and contacted my elder sister. She just remembers coming home from school one day to find that the house had been moved and sent some photos showing the impact of the tides.

Narrabeen beach, circa 1950

A year or two later we moved to Canberra – a little further south but the best part of a kilometre higher with colder winters and hot summers but regular sea breezes providing some relief late in midsummer afternoons. Though we are over a hundred kilometres from the sea they are cooled by the uplift over the coastal escarpment. Hobart – much further south but coastal, was cold with only a week or so in summer warm enough for swimming but provided my first experience of snow. Then inland New South Wales – hot, dry, and not Welsh by any stretch of the imagination. Later I lived for a while in northern NSW – wet, humid, and sub-tropical with regular heavy rains rolling in late in the afternoon in summer providing a welcome opportunity to wash off the day's sweat and dust.

In high-school I was fortunate to have an excellent geography teacher who had travelled widely and conducted lessons with a backdrop of photos he'd taken of the part of the world we were discussing. He taught us a system for understanding the climatic regions of continents. Although I've forgotten most of the details it left me with an intuitive understanding that I've found valuable ever since. The only thing I can clearly remember him saying was '*Dai Davis and Dai Morgan what **are** ye doon?*'.

The scheme divided continents into three longitudinal zones – west, central, and east – and several latitudinal zones ranging from tropical to temperate then sub-polar, or thereabouts. Within these were other factors such as the influence of altitude, nearby mountain ranges, distance from the sea, ocean currents, and so on. He quantified it all with average monthly figures for maximum and minimum temperatures and rainfall distribution through a typical year. By the end of the term he could present us with a set of figures and we – individually or as a class – could determine the town or city with surprising accuracy. For the southern hemisphere the common error was to pick the wrong continent. With the northern hemisphere the system was not as reliable. High school geography taught me that there was a lot more to climate than annual average temperatures and there was no such thing as global climate.

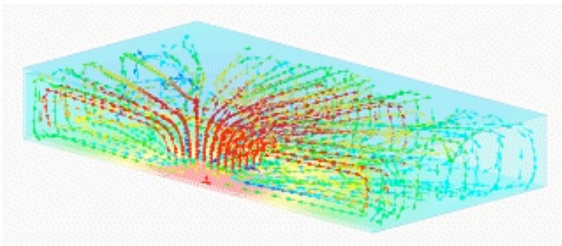
In the late 1960s I became aware that some scientists were predicting a global cooling similar to the Little Ice Age but along with most others I doubted that anyone could predict future climates with any reliability. I did believe that with the help of the emerging computing power we might extend weather prediction usefully, and that was where I hoped to head after graduating in mathematics and physics.

Meteorology and Climate

I joined the Met Bureau as a cadet. To fill time before the start of an introductory course in meteorology I was given a desk in the library and told to start learning some meteorology. Canberra had an artificial lake at its centre that had filled just a few years earlier and it was being accused of increasing fog at the airport. I had all the historical weather records at hand so I set out to see if this was likely. It didn't take long to realise that if there was any evidence at all it was weak.

There was another lake, Lake George, over twenty kilometres from the airport that did have an influence. It was usually a much larger lake but varied from tens of square kilometres down to next to nothing. The wind patterns on relatively still nights were in the right direction with cool air moving in to replace the rising air heated by the city. I 'crunched the numbers' using the pay-clerk's luggable adding machine and a slide-rule to produce an algorithm for fog prediction that usually worked when the conditions were right.

There were two take-home results from this work that later influenced my thinking about climate modelling and meteorological data. The first was the image I developed of the impact of city heat on local air flows. The heat generated in a large town can, on still nights, draw cold air from a radius of twenty kilometres or more, depending on local topography. It's worth noting that there are low hills between Lake George and the airport so impacts can extend beyond line of sight. Near a large city, the effect would be much greater. Urban temperatures can be elevated by five degrees Celsius and more. This effect is usually referred to as an 'urban heat island' but the word 'island' is misleading. Its impact is clearly not restricted to the city limits.



Model of convection currents. (HTML animation from Wikipedia, Heat_Pipe)

When mild winds sweep the city heat horizontally temperature gauges tens to hundreds of kilometres downwind could be effected. Australian cities are widely separated but this is not the case in more heavily populated countries. Most towns and cities have grown over the last century so the impact of urban heat has been increasing. Even far from cities there are changes in crops, soil moisture retention, tilling and irrigation practices, prevailing wind directions, and so on that can systematically effect temperature readings over long time periods.

The second lesson concerned the use of weather data – its reliability, since I found obvious errors – and its accuracy, since weather reports only require one degree accuracy at best. Temperatures fluctuate wildly over a day if there is intermittent, but sometimes quite regular, cloud cover so the timing of records is significant if you want to take averages to one tenth of a degree. I've since worked with various manually compiled data sets and designed algorithms to detect outliers and sudden shifts in mean values. It's an imprecise art. Automated data-loggers can be more reliable but prone to slow drift which is much harder to detect – usually impossible without multiple measurements using different technologies. All very messy, but not necessarily random. You can't just assume it all averages out.

Critics of the use of meteorological data in climate analysis and politics have pointed out extreme examples such as a station sited a few metres from an air conditioning outlet and have worked their way through other sites showing smaller but potentially significant issues building lists of stations that they deem to be unreliable. Meteorologists consider a distance of 20 to 100 metres from an object of influence to be adequate for their work and I don't argue with that. Who cares if the weather prediction is a degree out? Would you have changed you choice of clothing or canceled an outdoor event if you'd known it was going to be two degrees colder than you expected?

Trying to use the data to determine tenth of a degree trends over a long time span is another matter altogether. The issue, to my mind, is not which stations are unreliable but rather: is there any station that can be scientifically proven to be reliable over a period of decades, let alone a century or more? Meteorologists around the world have been struggling to get a slice of the climate action and funding. To create a more even geographical spread of data some have used models to interpolate between existing stations and treated the numbers as if they were actual measurements. As mining geologists have pointed out, they'd end up in jail for doing that. Meteorologists should stick to where their real skills lie – predicting the weather a few days, or now even weeks, ahead.

A few carbon warriors in Australia's Bureau of Meteorology continue to torture the temperature data to get it to tell them what they want to hear: that Australia has warmed over the last century. Do they realise that they are debasing the Bureau's reputation in an attempt to support a straw man argument? Nobody seriously argues against this warming. We're still rising from the Little Ice Age – or were till recently. There are theoretical and observational indications that we are heading for cooler times.

IPCC Climate Models

"Rather than seeing models as describing literal truth, we ought to see them as convenient fictions which try to provide something useful." Dr D.J. Frame, climate modeler, Oxford University, Royal Society Publishing, 2007.

This brings us to the subject of modelling – crystal balls built with silicon chips. My first encounter with climate modellers came when I crashed a few sessions of a conference held at ANU in the early 1990s and had coffee-break chats with groups of the participants. I didn't feel that I was being antagonistic, just curious, but some of my questions provoked hostility. They knew they had a difficult task ahead and didn't want any more complexity. They were mathematicians and acting like the proverbial physicist modelling a cow who starts with the assumption that it's spherical.

More broadly, they were working in a silo of group-think that was already well established. Entrenched views are the norm in well established disciplines but a new breed of climate scientists had scrapped the careful groundwork laid down by the discipline's founders such as Hubert Lamb who had looked carefully through historical records noting evidence of climate variability. They knew what outcome they wanted and have built their models to produce it. They had plenty of wriggle room. They had precious little data to constrain them and the path they took mathematically was naive and overly optimistic.

Mathematics has built up an amazingly diverse and powerful toolkit. For the applied mathematician there are two broad approaches that have been particularly successful in solving a wide range of problems: initial value and boundary value methods. With initial value problems you have an initial state: if, say, we're dropping a ball, we have its starting position and the strength of gravity which determines its acceleration. Easy stuff once Newton, Kepler, Galilei and others had figured it out. Got some air resistance? No problem – just another term to the equation and your cannon ball will land just where I say it will. In outer space, with no air resistance, the accuracy can be very high – hence the reputation of rocket science.

Simple boundary value problems apply to situations like water waves in a tub with an unconstrained boundary, or the head of a drum with a constrained boundary. These are solved with the wave equation developed in the eighteenth century by d'Alembert and others. If the geometry of the boundaries is simple – a rectangular tub or a circular drum – the solutions are relatively simple. As the boundaries become less regular the solutions rapidly become more difficult.

Weather forecasting is basically an initial value problem. The best estimate for tomorrow's weather is that it will be the same as today. We can look upwind and see what weather we might inherit – in a few hours in the case of the airport fog or days if satellite images show a storm front heading our way. Beyond that we can look at typical weather for the time of year or, eventually, start to include the results of more sophisticated climate analysis.

Climate models are primarily boundary value problems. The boundary conditions are dictated by geography, the Earth's orbit, the sun's heat, light, and UV emissions, solar flares, its magnetic field, and the impact these have on the oceans, atmosphere, and Life.

Climate isn't just a complicated problem it's a mathematically 'complex' problem. In real world 'complex systems' the elements are typically highly interconnected and there may be multiple interconnected sub-systems, but they don't have to be complicated. Mathematical complexity refers more to the complex dynamics of a system than the complexity of the system itself. Very simple systems can display complex behaviour with deterministic chaos in the extremes. Our ability to deal with such problems is limited.

A characteristic of complex dynamics is the attractor – a semi-stable state within chaos. The concept of an attractor is quite simple to understand. We deal with them daily. If you imagine a broad walkway with people walking in both directions a chaotic situation would be when everyone is constantly dodging people coming in the other direction. People would quickly end up walking behind someone going in the same direction and lines would be formed that could avoid all the dodging. An attractor is simply a state that's least likely to be disturbed and therefore stable.

We don't need our intelligence or even the instincts of ants to form attractors. Our solar system with its planets, moons, and rings and the galaxy beyond it evolved from chaotic clouds of matter. Under the influence of gravitational and electrical forces and after countless collisions, near-collisions, and slight deflections this matter has formed nested systems of semi-stable near-circular orbits in a plane because once in these orbits it tended to be undisturbed.

On the surface of our planet, with friction in its oceans and atmosphere and a disobligingly irregular geography, the ocean and air currents driven by energy from the sun, the gravitational attraction of the moon and other factors, attractors have formed as cyclic ocean and air currents. We can't predict their behaviour yet and they have a major influence on climate as thermal regulatory systems.

Climate models can use sophisticated initial and boundary value techniques but with complex dynamics they are merely simulating past behaviour – computer animations with little, if any, predictive value. Mathematical models can model any data set as accurately as you like but will usually fail dramatically as soon as you try to extrapolate beyond the original data. We're starting to come to grips with complex systems but we have a long way to go. Some researchers have recently claimed to be able to predict El Nino events ten years ahead but current trends seem to be proving them wrong.

Models using these techniques would need to be able to model all ocean currents many decades into the future with boundary conditions that are changing with changing temperatures, sea levels and solar radiation. Clearly they can't. They would also need to model the formation and impact of clouds, the onset and impact of precipitation in all its forms, thunderstorms, cyclones, a menagerie of whirlwinds, waterspouts, and Life – the biosphere. The IPCC models fail or don't even try.

By the standards of scientific evidence these models have failed to anticipate the current temperature plateau at the 95% confidence level. They may have pushed initial and boundary value mathematics to its limits they but have to assume everything else is random. It isn't. There is order within nature's chaos – method in Gaia's madness.

Water

Earth is the blue planet – the water planet. After the sun, the water cycle of vaporisation, condensation, cloud formation, and precipitation and its impact on the Earth's albedo – reflection of the sun's light and heat back into space – dominate the Earth's climate. As a further influence water vapour also absorbs and re-emits infrared or heat radiation and controls the radiative dynamics of the atmosphere. Other radiative gasses such as carbon dioxide (CO2) and ozone (O3) only play a significant role where the absolute humidity of the air is low – primarily in the cold upper atmosphere of the stratosphere where most of the water vapour has condensed out. Below in the troposphere convection currents, clouds, and storms dominate heat flow.

The water cycle provides a stable regulatory system for the planet's surface temperature. Any tendency for the temperature to rise is strongly counteracted by increasing evaporation, clouds, thunderstorms, and air circulation. These stabilising mechanisms all have plenty of scope for increase so there is no drastic '*tipping point*' looming. Water rules.

The oceans have been the target of two major scare campaigns. The idea of '*ocean acidification*' should never have gained public credence. Simplistically, it's true that adding CO2 to pure water does produce a mild acidity but the oceans are not pure water. Oceans are alkaline and the acid-alkali distinction is not just ranges on a pH scale, they are qualitatively different chemical regimes. Ocean chemistry buffers its pH against changes in dissolved CO2 levels. Also, the oceans are warming out of the Little Ice Age and warmer water out-gasses CO2 as can be simply, if messily, demonstrated by opening a can of carbonated drink that's been sitting in the sun.

Water expands as it warms, and sea levels – as far as we can measure them – have been rising steadily for the past couple of centuries and less steadily over longer periods with metre or more surges and drops superimposed on the rise since the last major ice age. We may get another 15 to 20cm rise over this century and there's no reason to think it will be more and it could start dropping.

A few years ago we were being assured by supposedly reputable scientists that arctic sea ice would be gone by now along with most of the worlds glaciers and that Greenland and Antarctica would be following close behind. Meanwhile, polar ice is surging and numerous ill conceived expeditions into assumed ice-free polar waters have had to be rescued after being trapped in ice – launched with a fanfare and their ignominious return ignored. Glaciers grow and shrink and European glaciers were as small, or smaller, during previous millennial warm periods.

Thunderstorms

The animation above could represent any hot object being cooled by simple convection currents – hot air expanding and becoming lighter, moving up and cooling as it expands, radiating heat and falling. If the hot object was a city the scale would be tens of kilometres at the centre and spreading heat over hundreds of kilometres while drawing cooler air from the surroundings. The cycle initiated by the heat of the tropics transfers air thousands of kilometres toward the poles.

A heat transfer system far more effective than simple convection is the phase change heat pump. For example, heat at the ocean surface evaporates water which absorbs heat in the process and cools the ocean surface just as evaporating perspiration cools our skin. The warm air rises and expands as pressure drops which cools it to the point where water vapour condenses forming clouds and releasing the heat of vaporisation to the air. Radiative gasses complete the cycle by radiating heat out into space. Cooling the air makes it denser so it starts to fall.

Thunderstorms are a high impact extreme of water's evaporation and precipitation cycle. They form a heat pipe that transports large quantities of energy rapidly from the Earth's surface to the upper atmosphere. A single thunderstorm transports atomic bomb scale energies. Multiply this by the seven million thunderstorms around the world each year and we get a quantity of heat – about $7x10_{21}$ Joules – that roughly equals the heat that was absorbed annually by the oceans over the steepest recent rise. A big problem for the climate modellers is that nobody can reliably model a single storm let alone their global frequency or their regular daily occurrence in tropical regions.

With global temperatures plateauing over the last decade or two climate alarmists talk of the '*missing heat*' and claim that it's lurking in the deep oceans ready to jump up and broil us – against the well established laws of thermodynamics. The reality is that modellers are underestimating the impact of clouds and the energy pumped up by storms and radiated out to space – among other things.

Clouds

The precise impact of clouds on global temperature is still debated and is not well modelled. They reflect heat from the sun back into space. They also reflect heat radiated from the earth's surface and lower atmosphere back down. Any observant person who has spent time outdoors will be aware that a cloud blocking the sun during the day drops the temperature far more than clouds increase temperatures at night.

Australians, or those that live on the land, have always taken a keen interest in clouds. When one appears on the horizon, where it's heading, its size, and whether it's bringing rain are often anxiously discussed. In the early 1960s, having spent some time in the bush, I heard about the Wilson cloud chamber. It had recently been replaced as the primary detector in particle physics experiments after nearly half a century of valuable service. Along with many amateur scientists I had a go at making one – dry ice from the ice-cream man and a radioactive source from an old luminescent watch. I can't remember that mine actually worked but I did see one working somewhere and remember the thin condensation trails it produced in the wake of a charged particle.

I remember hearing of discussions among the physicists at ANU, or the CSIRO rain-makers, who were wondering about cosmic rays – high energy particles from outside the solar system – and their probable role in nucleating cloud formation. It was a reasonable hypothesis for anyone who had seen a cloud chamber. Recent developments in the area have been interesting. The huge, and hugely expensive, CERN particle accelerator has been used to verify the process. The funny side was young climate scientists adamant that the whole idea was preposterous. Presumably they'd never heard about, let alone seen, a cloud chamber. This is a great illustration of the adage '*if you don't study history you are bound to repeat it*' – in this case at far greater expense. Surely some of the staff at CERN are old enough to have seen a cloud chamber? In any case, the clue is in the name.

The really interesting side comes when you look at the systematic variation in cosmic ray incidence over periods ranging from decades to millennia and trace back through a likely causal chain. We have: massively energetic particles producing huge showers of secondary particles that seed clouds; the earth's electromagnetic field deflecting some of the ionised particles to the poles creating the polar lights and reducing incidence elsewhere; the field strength influenced by solar flares; the flares associated with sunspots; sunspots produced at the chaotic limits of the circulatory dynamics within the sun; the internal solar dynamics influenced by the planets. This last link may seem improbable to the modern mind and smack of astrology but if you consider that the sun and planets have ***evolved*** together as a system of resonant cycles it would be strange if there was no link.

Carbon Dioxide

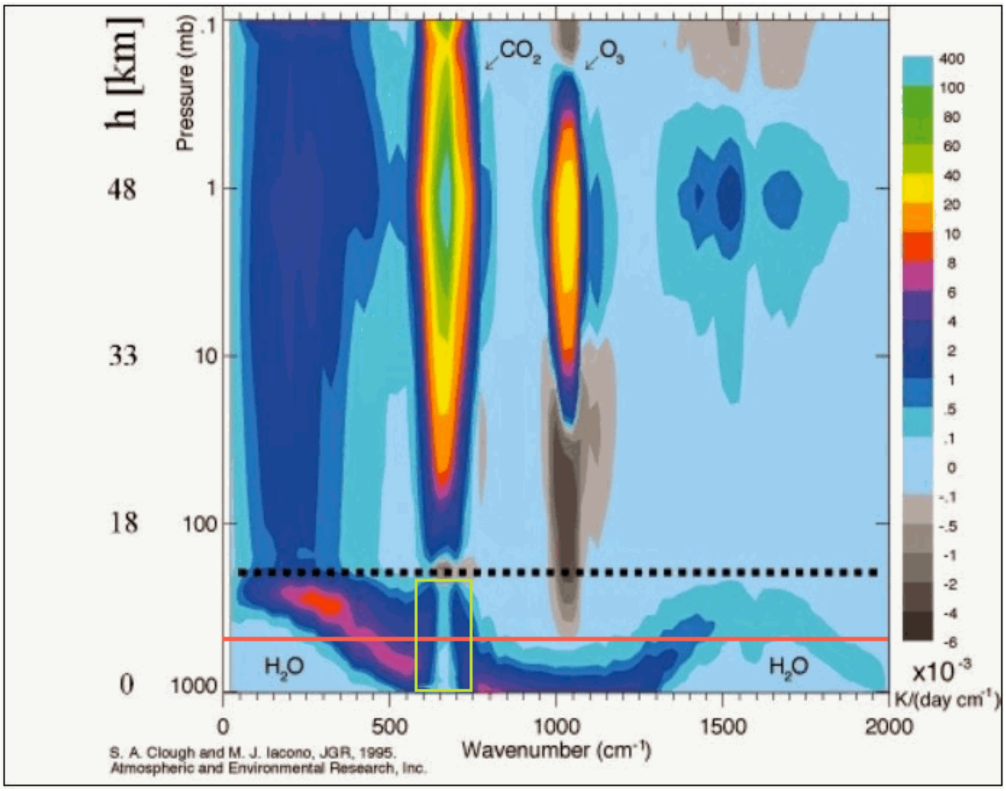
I soon left the Met Bureau when it became clear that my mediocre undergraduate results were going to be a handicap and enrolled in a masters degree in physics. I was given a choice of two projects. One was to build a physical model of the southern oceans, the other was to study the spectrum of the iodine molecule in vapour form using a laser. I chose the latter because it seemed clear to me that what meteorology needed was better data and that lasers and satellites were the way to go.

This was the era of DIY lasers. I built one that used an argon plasma as the active medium so I ended up with a practical understanding of the strange behaviours that plasmas could exhibit in magnetic fields – as we have in the sun. I also built a quantum mechanical model of a small part of the iodine molecular spectrum. The quantum mechanical equation was large. It would have filled many pages if typed out in full which is an almost impossible task to achieve without error so I used a computer to generate the equation from the basic QM before solving it. This sparked an interest in symbolic computing that eventually led to natural language processing, computational linguistics, and a very different career.

As an aside, and it may seem a stretch, I can see parallels between the oscillations of ocean currents and the irregular, or modulated, flapping of the vocal cords during speech. In studying the two problems the outstanding difference is the available data. A second of speech is roughly equivalent to a millennium of ocean oscillations. Analysing speech signals I had hours of high quality data but it's still an unsolved problem as most people who have tried to use automated speech recognition will be aware. Oceanographers have small amounts of incomplete and unreliable data and a global geography that's far more complicated than our vocal tract. I wish them luck. They're going to need it.

Molecular spectroscopy – how molecules absorb and radiate photons of light or heat – is central to the radiative physics side of climate dynamics. Atoms and molecules can absorb a photon, boosting an electron to a higher energy resonant state. In molecules a vibrational or rotational state can also be excited. In diatomic molecules such as nitrogen and oxygen the vibrations can be seen as stretching of the bond between the two atoms. Triatomic molecules such as H2O, CO2 and O3 have bending modes. These quantised rotational and bending modes have lower energy than stretching modes and are readily excited, or de-excited, by collisions between molecules.

Excited quantum resonances have a natural lifetime before they emit the extra energy as a photon, or they can be involved in a collision with another molecule in the surrounding gas with the energy lost to an emitted photon, another excited state, or the kinetic energy of movement of the colliding molecules which increases the local temperature of the gas. Conversely, collisions can result in the creation of an excited state that may then radiate the energy, resulting in a local cooling of the gas. The diagram below shows the radiative gasses in the atmosphere to have a predominantly cooling effect on the surrounding air.



Radiative cooling of the atmosphere (my added red line and green rectangle)

This is a model of the net radiative behaviour of the main active molecular species – water vapour, carbon dioxide, and ozone published by Clough and Iacono and based on the well-known infrared (IR) spectral properties of the molecules. The horizontal axis represents photon energy in the spectroscopist's energy measure of inverse centimetres, or inverse wavelength of the photon. The vertical axis is air pressure or, approximately, height. The colour scale represents net energy radiated (cooling) or absorbed (heating) where it goes negative. As a rough indication, photons emitted above the red horizontal line – halfway up the mass of the atmosphere – are more likely to reach space, or shift energy in that direction than toward the surface of the earth.

The diagram shows the ability of radiative gasses to cool the sparse upper atmosphere where collisions are relatively rare and where most of the energy is radiated to space. Overall, the general tendency of CO2 is to cool the planet because it doesn't condense in the cold upper atmosphere as water does.

From the spectroscopist's perspective the impact of CO2 in the green rectangle stands out as a major feature of the troposphere – the region below the dotted line. However, from the perspective of the Earth's surface any absorbed radiation is just heat – regardless of source or wavelength. If we add up all the energy across the spectrum in the troposphere and represent the average as an even shade then removing the impact of CO2 would be at the border of perception or beyond. The impact of doubling CO2 levels would be much smaller.

Radiative gasses have been likened to a blanket warming the earth, or the glass of a greenhouse. Both analogies are fundamentally flawed. If you raise a blanket up so that it doesn't trap hot air it forms an effective sun umbrella. Open the sides of a greenhouse to allow air circulation and it ceases to function.

In the dense troposphere, where emitted photons are soon reabsorbed and molecular collisions are frequent, radiation just tends to smooth out local temperature variations. Over the full height of the troposphere the evaporation and convection of water dominates energy transfer. Timescales are also important here. If talking about radiative gasses trapping heat in the atmosphere or the surface molecules of the ocean is at all relevant we are talking nanoseconds to milliseconds at most.

IPCC modellers start with the radiative behaviour of CO2 and have the evaporation of water as a secondary effect. The impact of CO2 becomes a small tail trying to wag the water cycle dog. Mathematically it's a small perturbation and perturbation theory requires an accurate model of the central dynamics before the impact of such a small perturbation can be meaningfully analysed. We don't have a detailed model of the full water cycle that accounts for cloud formation, storms, etc. and the creation of a global model with this degree of detail is currently inconceivable. Amongst the many flaws of the IPCC modellers' approach this inversion of the analysis is probably the most fundamental.

Data analysis and theory published by Ferenc Miskolczi over 2006 to 2014 shows the impact of radiative molecules to be tightly controlled by the water cycle that acts, on average, to maximise or saturate the radiative dynamics. Changes in levels of CO2 are thus counteracted by opposing changes in the level of water vapour and have no significant impact on surface temperature. It implies that a doubling of the present levels of CO2 would decrease water vapour levels by about 3%.

If this work survives critical review, which it has done so far, it provides theoretical confirmation that evaporative cooling is providing a stable thermostat for the earth – something I see as intuitively obvious. I haven't analysed the mathematics of Miskolsci's work in detail – too many parameters I'm not familiar with – but I dug back a little to see how he came to diverge from the generally accepted approach to the problem of energy balance in planetary atmospheres.

Theoretical physics usually has to make simplifying assumptions to make a problem solvable. The reason I digressed from experimental work in my masters degree into calculating the iodine spectrum was that previous calculations, made in pre-computer days, had necessarily made simplifying assumptions and were unreliable. With the help of computing power I was in a position to include more detail in the equations. It was a common scenario and still is. Unlike my work, which was just applying new technology to gain accuracy for well established theory, Miskolsci was being more rigorous in developing the basic theory.

He went back to early foundation work and looked at assumptions made by Eddington and Milne in 1916 and 1922. He dropped their assumptions and produced a theory that was not only more realistic and productive but has the kind of elegance that mathematicians love. Miklós Zágoni has said '*I regard this deduction of F. Miskolczi one of the most beautiful results in the history of theoretical physics*'. Perhaps it's not really up there with Newton's $F = MA$ or Einstein's $E = MC^2$ but for the messy world of Earth systems it's a real contender.

As happens when new findings contradict the orthodox view his work is being ignored. In part, at least, this is probably because his writings are dense, cryptic, and almost unreadable – a standard characteristic of people deeply involved in their work and isolated from peers. Zágoni has attempted to overcome this but I suspect there is a long road ahead.

Even if Miskolsci's theory is found to be flawed his data analysis supports the hypothesis of a regulatory process of some kind controlling the combined impact of radiative gasses. A key to developing an intuitive view of this may be Miskolsci's cryptic reference to the atmosphere being locked to the triple point of water – the temperature and pressure where liquid, solid and vapour phases of water can coexist as they do across the atmosphere. In simplified terms the process might be likened to the temperature of water boiling in a pot at sea level being locked to 100C when the heat of the stove is varied. We have the polar regions clamped to the melting point of ice and the tropical regions regulated by the evaporation rate of warm waters fixed, on average, by the boiling point of water and the weight of the atmosphere.

The water thermostat is stable in the sense that it can't catastrophically fail as long as we have oceans but various factors can shift the equilibrium point and hence surface temperatures. Increased heat from the sun is extra heat that has to be radiated out from the upper troposphere and stratosphere and stretches their cooling capacity. *Radiative gasses in the lower atmosphere shuttling photons about and momentarily slowing their transmission does not add extra heat to the system and has a negligible impact on the cooling cycle*. Only a change in their ability to cool the upper atmosphere makes a difference. Without radiative emission in the atmosphere it would be warmer.

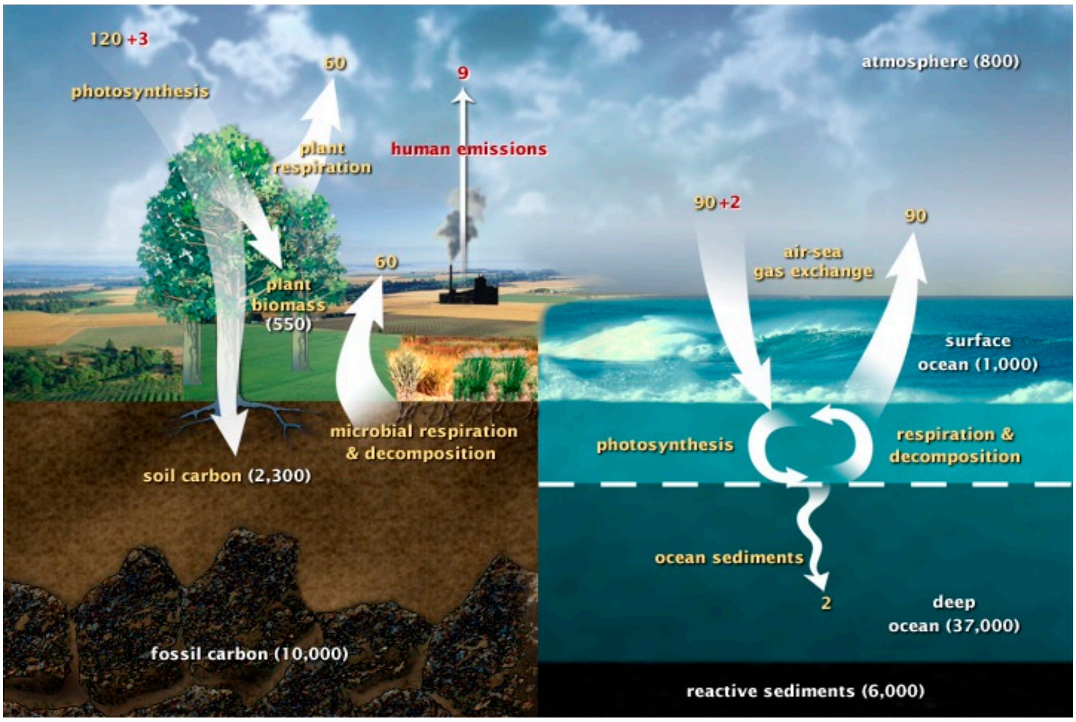
The dominant variable factor is the ease of formation of clouds which increases the efficiency of the cooling cycle. Aerosols from surface volcanos, human industrial activity, or plant and algal sources can seed clouds as can cosmic rays that are modulated by changing activity of the sun associated with the sunspot cycle. Another factor is variation in the sun's UV radiation – the high energy photons that penetrate most deeply into the ocean surface. In addition to directly heating the oceans they have an impact on algal life and death and hence aerosol formation, and on ozone production which impacts atmospheric radiative processes. UV fluctuations also follow the sunspot cycles.

Over scales of millions of years ice core data has shown a correlation between temperature and levels of CO2 with CO2 lagging temperature by about 800 years pointing to ocean outgassing producing the CO2 rise – an effect of temperature change rather than a cause. Over short timescales Murry Salby has shown that the relationship is qualitatively different but with CO2 levels still lagging changes in temperature – still an effect rather than a cause. In the past, on evolutionary time-scales, atmospheric CO2 levels have been four times present levels and often well above that. Our current levels are barely above the minimum required by most plant species. Some species of plants, particularly grasses, have evolved to compete at these low levels.

Climate scientists and activists talk about CO2 as the being the '*control knob*' of climate. It's an interesting choice of words and suggests that they've spent most of their lives in 'climate controlled' buildings and cars. Another frequently repeated comment is '*Climate change is real! Just look out the window.*' which, again, is an indoor perspective – and a truism since nobody seriously argues otherwise.

Perhaps they should go outside and breathe – breathe in the air. A long slow deep breath is an age-old remedy for anxiety. They should sit on the grass and contemplate the fact that it is taking a long deep breath too. In the race to grab CO2 from the air grasses are the flashy new thoroughbreds. On a still day in a field of corn their cousins can exhaust their supply of CO2 in a few hours.

The Carbon Cycle



A simple view of the Carbon Cycle (gigatons of carbon, per year for fluxes, ex NASA)

Regardless of CO2's precise role, the central question is whether human industrial activity contributes significantly. When considering our impact it's not the amount of CO2 in the atmosphere at any instant that's important but the throughput or fluxes.

Some climate activists, including IPCC politicians, use the analogy of water in a bucket with a small hole in it and they have us adding so much extra water that it will overflow disastrously. A more appropriate analogy would be using a syringe to inject water into a running hose. To be a little more precise, the diagram shows industrial emissions to be less than 5% of the annual flux of at least 210 Gt/y – scientifically insignificant since the figures in the diagram have no better than 20% accuracy. Most of the values in the diagram, particularly soil content, are educated guesses and are subject to natural fluctuations with changing temperature, rainfall, and biosphere dynamics.

Surface-based and satellite data shows the main concentrated sources of CO2 as being tropical or sub-tropical rather than our major industrial areas – so natural rather than anthropogenic – coming from the biosphere or outgassing of warm tropical oceans to be swept south in the circulating air and re-absorbed in cold arctic waters.

The influence of the biosphere on climate has been downgraded in significance by the IPCC. Its first steps were to totally ignore the ocean biosphere and the four fifths of the land biota that exists in the planet's soils. The next step was to downgrade the above surface biosphere to land use change. From a political perspective this was a reasonable, if disingenuous, response given the IPCC's brief to limit their study to human impacts – but they didn't stop there. The next step was to narrow it down to trees, then just the amazon basin.

The ocean biosphere is assessed as 90% of the total biosphere by the Census of Marine Life which would amount to about 50,000Gt of carbon, or 10,000Gt if soils were not included in coming to their figure. Either way, it's ignored though it will be subject to fluctuations which will increase the atmospheric fluxes. A further example of science ignoring factors that it can't quantify or that complicate things too much – often necessary but too often not acknowledged. This treatment of the biosphere is absurd. It's a major component of the planet's carbon cycle and it's always changing.

The amount of CO2 in the atmosphere at any one time is a small component of the whole cycle but an important one in that the atmosphere transports CO2 between the oceans and the terrestrial biosphere and between a multitude of subsystems within these that vary at daily and monthly rates on local and global geographical scales – all obscured by global annual averages. It's a busy transit lane that transfers at least a quarter of its contents each year – possibly far more. Basic biology and chemistry tell us that any increase in atmospheric CO2 levels will increase transfer rates to and from the biosphere and oceans. Conversely, any change in ocean temperatures or biological activity will change the levels of atmospheric CO2. In the case of the seas changes are unmeasured or may be unmeasurable – lost in measurement uncertainty. With the above ground terrestrial biosphere the increase is visible and has been roughly estimated using satellite data.

Satellite imaging of the Earth over recent decades has shown an increase in land vegetation of over 10%. Since global rainfall hasn't risen significantly in this period any change is likely to be caused by increased temperatures, CO2 fertilisation, or human cultivation. On-ground information from effected zones such as the Sahel desert fringes tend to discount human activity as a major contributor despite claims to the contrary. Temperatures have risen, but very little in absolute terms over this period – perhaps enough to increase growing seasons in some areas.

However, the CO2 increase has been of major significance to the biosphere. Given that we are just above a critical minimum for most plants the impact would be rising faster than the atmospheric CO2 levels. Commercial greenhouses, after many decades of careful commercial evaluation, use CO2 levels of 1500ppm or more to boost production – well above the 400ppm currently in the atmosphere so we have a long way to go before the effect declines. As a rough order-of-magnitude estimate a 0.3%/y increase in above ground biomass carbon gives around 1.6Gt/y drawdown of CO2. Assuming a similar increase in soil biomass would give a total land drawdown of 8Gt/y – roughly our industrial output. Changes in the ocean biosphere could be many times that figure.

From a different perspective, and data source, the regular annual fluctuations in total airborne CO2, usually assumed to be due to seasonal vegetal fluctuations in the Northern Hemisphere, have been increasing over the years by a rate that suggests an increase in biomass carbon of at least 8Gt/y. An alternate, or additional, explanation is an increase in ocean outgassing as temperatures rise. I don't suggest any great significance in the closeness of these figures. They are all rough calculations from poorly known data but they do put our CO2 contribution into perspective – in the context of our 9Gt/y being less than 5% of the total CO2 sea-air-land fluxes, and being only 0.03% to 0.3% of total dynamically active surface CO2.

There are many unquantified contributions to changes in CO2 dynamics. In addition to changes in ocean biomass we have volcanic activity – most of which is under the sea and unmeasured. Recent reports suggest that the impact of volcanos has been underestimated and that they release CO2 constantly via seepage through soil and the ocean floor – not just when they are visibly active. Then we have the real Green Revolution that had a major impact on global food production but also some negative consequences.

Replacing traditional farming practices based on careful maintenance of soil with a system based on the internal combustion engine and manufactured fertilisers led to a neglect of soils and over-ploughing which destroys soil ecosystems. This alone could have decrease overall soil carbon by an amount needed to match the figures above though there is a recent trend to low-till cultivation, driven by increasing fuel prices and the availability of herbicides to control weeds, that's counteracting the trend.

Plants are not always able to benefit from increased atmospheric CO_2. In their competition for CO_2 plants can be restrained by the availability of nitrogen, minerals, and other nutrients from soil. In a stable soil ecology they can form cooperative systems with soil bacteria and fungi and provide solar energy packaged as sugars in return for nutrients. Soils are a key element of the carbon cycle and our neglect and lack of knowledge of soil ecosystems may constitute our main impact on it.

As with all natural systems the full complexity is beyond our current understanding but the deeper we look the more we find that undermines the view of humans being at the centre of the universe. To claim as irrefutable that our contribution from burning coal is *the* primary factor in CO_2 dynamics, or even significant, is unscientific or just plain irrational. Our small contributions to the CO_2 cycle are lost in the fluctuations and measurement noise. We can't possibly measure their impact but we can set an upper limit and it's negligibly small.

If CO_2 does not significantly effect climate OR our contribution is not significant then the massive disruption to western economies that's being forced on us is unnecessary.

The Sun

We still have a lot to learn about stars and solar system dynamics but space-era exploration has pushed the knowledge of our system ahead at a rapid pace – particularly the understanding of our sun's internal dynamics that produces the cycles of sunspots, flares, and fluctuations in its UV output. There is a growing body of knowledge about their impact on climate. The sun influences cloud formation via the impact of solar flares on the earth's magnetic field and ionosphere, and changes in its UV output vary the degree to which its energy penetrates the oceans. An understanding of its internal dynamics and external solar wind and magnetic field are essential for understanding its influence on our climate.

There is clear evidence of the influence of planetary motion on the sun's internal dynamics along with plausible theoretical support. The planets shake the sun about their common centre of mass through a distance roughly equal to the radius of the sun. Their gravitational tidal interaction is substantial and must influence the circulatory patterns within the sun's plasma. In addition to gravity there are magnetic forces which, though small, are likely to have influence over a long timeframe. My experience with plasmas and magnetic fields suggests that this factor may be undervalued.

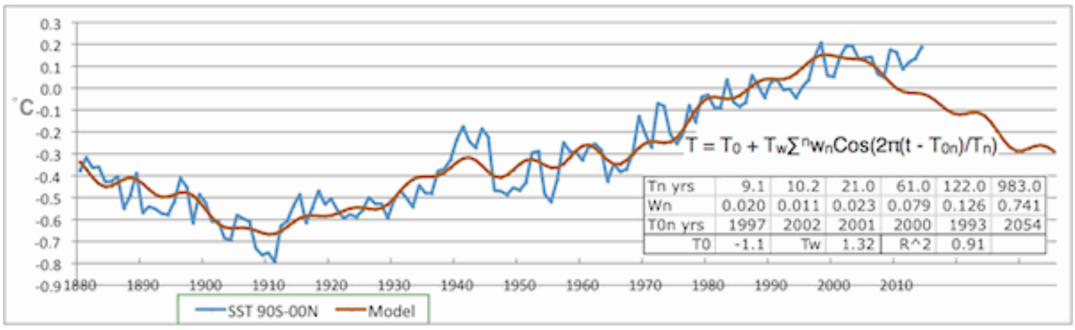
A point that I see as central to this is that we are considering cyclic resonance. Here the usual mental model is a child on a swing. A succession of small pushes gradually builds up the momentum of the swing if the pushes synchronise with the natural frequency of the swing. The planetary influences don't have to be strong, just resonant and consistent – particularly as they've been part of the system from scratch. The inner solar dynamics that produce the sunspots have evolved in harmony with the formation of the planets over the billions of years since it started as a condensing cloud of matter. In any evolutionary process the most common states are, naturally, those that last longest without being radically disturbed. In a complex orbital system, this both requires and produces harmony.

The IPCC's climate modelling is an example of the reductionism that has come to dominate science. It can be likened to trying to understand an orchestra by modelling the finger movements of a few musicians while ignoring the score and conductor – the sun. Viewing climate as having an underlying cyclic nature overlain by progressively chaotic features may provide the best approach we have of modelling long term climate variability.

A cyclic view shows us to be near a peak in a quasi-millennial cycle that is seen historically in the spacing of the Minoan, Roman, Mongol, and Modern warm periods. A sixty year cycle is seen in the stepwise rise in mean surface temperature over the last two centuries. The shorter 9-14 year cycle that dominates sunspot activity is counteracted by ocean cycles but can still be detected in some climate related data. These cycles can be directly related to planetary motion.

If the millennial cycle is peaking then over the next few centuries we are heading into the downward slope that caused so much suffering through famine and plague during the slide into the Little Ice Age. With reliable energy supplies we can cope, but it would help to be prepared. Putting aside the CO_2 scare, temperature changes over this century can be expected to be comparable to those of the last but, unfortunately, down rather than up.

The impact of twentieth century temperature changes has been quite minor. The graph below shows a temperature rise in the southern oceans since 1910 of less than 1C. Regional climates dominate. In 1909 Bourke in central NSW recorded what was probably our highest ever temperature of 125F or 51.7C and other stations recorded similar extremes between 1880 and 1910. Now, at an ocean temperature peak, the northern hemisphere is experiencing brutally cold winters and the Canberra summer is the coolest I can remember – balmy. Whether our national maximum was in 1909 or 2009 makes little difference. I see no changes in Australia's agricultural practices over the past century that can be attributed to changing temperatures. Water rules. Australia has long been, as Dorothea Mackellar wrote in 1907, a land '*of droughts and flooding rains*'.



Planetary cycles model of southern hemisphere sea surface temperature

SST data from NOAA. Model and parameters are shown in inset.

The model plot presents the results of a few hours I spent with a spreadsheet and a model of solar irradiance published by Nicola Scafetta – adapting it to fit southern sea surface temperature data. The SST data set was chosen because of the relative simplicity and regularity of southern climate zones, the predominance of oceans in the south, and because oceans are the primary driver of the Earth's water thermostat. If the Earth's climates have a heartbeat it's to be found in the oceans. Also, as discussed earlier, I can't see the continental meteorological data as reliable.

This model is based on planetary cycles but not all cycle based models are. An Australian scientist, David Evans, has drawn on and extended the sophisticated mathematical toolkit developed by electrical engineers over the last century for signal processing. From this generalised perspective he has come up with similar results.

I've not presented my effort as an optimal fit, or an endpoint in my dabbling, but to illustrate the downward future extrapolation shown by all such models that I've seen. The trend seems robust and recent cold winters in the north, and expanding sea ice at the poles, may herald its start. Projecting this model backward and forward in time shows the peak of the current millennial maximum to be around the year 2000 with 3.5C between millennial extremes. The model is clearly not the full picture. For a start, historically, the millennial peaks seem to be decreasing. Greenland is not as warm as it was when the Vikings settled and, as far as I know, nobody has emulated the achievement of the Romans in growing vineyards near Hadrian's Wall. The decadal cycle varies in length and amplitude so it is likely that the longer cycles do too.

In as far as this model still has parameters not yet tied to detailed physical explanation it is still, to some degree, a curve fitting exercise and, as noted above for the IPCC models, extrapolation should be treated with caution. Since the cycle frequencies and phases can be related to solar irradiance measurements and known planetary cycles this small parameter set is not as arbitrary as hundreds of parameters used in the IPCC models. The principle of parsimony puts cyclic models well ahead. Even when reduced to three cycle periods they are better at matching the details of past data where the IPCC models fail – as their failure to predict the present temperature plateau demonstrates.

Update, March 2015: I've created a more sophisticated model using the software I wrote to analyse speech for my PhD project. It is now self-optimising. It systematically varies all parameters to achieve a best fit to the data. I've introduced a component that represents atmospheric CO2 levels and the optimisation process reduces this component down almost to the level of the residual noise. Currently the model rejects it above a level of 0.06˚C/century. I'm continuing to try and accommodate this component but anything larger than a negligible 0.2˚C/century seems unlikely. I don't see it as necessarily representing any 'CO2 signal'. It more likely represents the difficulty of estimating multi-century cycles with 135 years of data.

The model illustrated above shows that the inclusion of a CO2 influence is not necessary. The latest model goes further in suggesting that including such a component at a significant level is not possible without compromising the fit to data.

An interesting corollary is that although the SST data has been modified by others in an attempt to allow for varying measurement techniques over the 135 year time period, these modifications have not introduced a significant CO2-like component. For now I'm happy to conclude that the adjustments have been made on a serious, and presumably sound, scientific basis and are not the politically motivated data tampering that the terrestrial temperature records have been subjected to by rogue meteorologists.

When a simple spreadsheet model with as few as three free parameters can outperform supercomputer calculations that can take months to run something is fundamentally wrong. The IPCC is lost in a complexity jungle of its own creation.

The simplicity and success of cyclic models shows beyond reasonable doubt that what the IPCC modellers refer to as '*random natural fluctuations*' are not random, not just fluctuations, but a relatively complete picture in their own right. The current temperature plateau was initially put down to natural fluctuations. The plateau has now extended to the point where ocean cycles must be considered as the primary driver of the small background temperature changes of the last century.

The southern oceans provide the most fundamental measure of global temperatures. They dictate the southern hemisphere climates and have a major impact on the northern hemisphere. If they aren't significantly influenced by atmospheric CO2 levels then it is reasonable to conclude that any apparent influence seen in terrestrial temperatures is due to poor data.

The precise harmonic relationships between the orbital motions of the planets, and the close parallel these have with musical scales, has been known for centuries. I'm not sure how far the cycle models are tapping fundamental solar system dynamics but I like to think that here we are seeing the southern oceans dancing to the music of the spheres.

Scientific Debate

There has been nothing that I can accept as serious public debate on climate in Australia and, as far as I've seen, nowhere else either. All I see is a combination of bullying and sensationalism.

The media, who have a financial interest in presenting scary news, grab the results of a scientific paper and start with the words '*a study has shown*'. That a paper has been published in a journal, however reputable, doesn't make it scientific fact. The very concept of a scientific fact is debatable but we can distinguish degrees of reliability and stages in the assessment process. Peer review and publication mean that an article is not obviously wrong, readable, and of interest to the journal's readers. The scientific method requires replication of results by independent researchers at the very least though it's rarely done. To gain real credibility the results should be subjected to vigorous debate and serious attempts to refute them. There is no such subtlety in press reporting of science.

The legal profession has managed to come to a deal with the press to stop sensational reporting undermining due process. Science should be able to do the same. We don't have to gag the press, just insist that the status of a result is clearly acknowledged and when a previously reported result has been shown to be unreliable a prominent retraction is issued. The knowledge that such a process exists would would dampen sensationalism among both journalists and publicity seeking scientists.

When policy-makers ask scientists for advice the best they can expect is an answer prefaced by 'to the best of our current knowledge' and accompanied by an error analysis based on real data and valid statistical techniques. It should also contain a balanced presentation of weaknesses and conflicting views. What the public are rarely, if ever, told is that the best current knowledge may be based on a handful of speculative papers or a naive theory dressed up as a mathematical model and given an undue aura of credence because it uses supercomputers.

With the IPCC we had massive funding allocated for a particular result with opposing views actively suppressed. What passed for error analysis was a group of self selected experts giving opinions. As the scientific evidence for extreme consequences of warming weakened in successive reports the certainty expressed in the reports for policy-makers strangely rose from 90% to 95%. Presumably someone pointed out that 95% was the minimum acceptable for science – and then only with caveats about the availability of data and completeness of the analysis.

Scientific bodies such as the Australian Academy of Science jumped into the fray or were pushed by threats and promises regarding funding. Having made naive pronouncements they, or the current incumbents, were committed and now resort to political activism and pamphleteering to support their stand. It is said that science progresses from funeral to funeral. When drastic policy initiatives are involved we can't afford to work on that time-scale.

If we are to get serious about the use of science in public policy we need an open adversarial court system with specialist advocates putting all sides of the case. It would help if we encouraged the development of a branch of science that specialised in refutation. We need people who built their reputation on their ability to analyse the work of others and expose shoddy work – particularly in medicine where recent systematic attempts to replicate published work have shown that much of it can't be reproduced. Above all, we need transparency in the review processes and an acceptance of the principle that any scientific results that are put forward as relevant to public policy-making should be publicly available and not hidden behind the pay-walls of journals.

Symbolic of a retreat from rationalism in public debate is the recent rise of the phrase '*the precautionary principle*'. Superficially it sounds sensible but roughly translated it seems to mean 'if it sounds scary we should panic'. It attempts to replace the process of rational risk assessment where: Risk = Likelihood X Impact, summed over all risks. Sure, we can rarely quantify the values precisely but that doesn't mean we should abandon it. It provides a framework for rational analysis and discussion that can start to put things in perspective.

When have bullying and panic ever produced a good result? When have they ever been more than a push for power?

Politics, Science and Religion

'*The supra-national sovereignty of an intellectual elite and world bankers is surely preferable to the national auto-determination practiced in past centuries*.', David Rockefeller, Club of Rome, Bilderberg Conference, 1991

My interest in politics stems from the age of nine when I got to know an uncle who had grown up in Nazi Germany. This led me to wonder about what he had been through as a child which, in turn, led to an interest in the history of modern social upheavals and the bloody chaos that inevitably followed. In the modern era we've had Genghis Khan, Napoleon, Stalin, Hitler, and Pol Pot. Now we have Al Gore with a campaign based on fear, the creation of fanatical youth groups, and indoctrination of young children in schools to fear the future. The others in the list at least had a positive message – however fanciful.

Through this sequence of men I can only see Genghis Kahn as having made any positive contribution to the modern world. He was a modernist, though appointed as Kahn in feudal tradition by the Mongol's senior matriarch. He advocated promotion on merit, religious tolerance, and a social welfare system to assist the needy. He knew what it was to be needy having been brought up by his mother in the harshest of conditions as outcasts on the fringes of Mongol land and society.

Most significantly, in his efforts to unite the Mongols the young Temujin rejected fear as a means of uniting them and even went to war against his childhood friend and sworn blood brother Jamuqa over the principle. His success in leading a bunch of nomadic herders fleeing from the encroaching cold of the north to create the largest empire the world has known must be attributed, at least in part, to these principles providing a relief from the rigidity of old hierarchies and hope for a better future.

It was a time of change and the beginning of the rise of modernism with the creation of the first European universities. I see modernism, through its inevitable undermining of traditional religions and the massive shift from rural to urban life, as leaving a spiritual vacuum. Humans, faced with the reality of inevitable death after a brief existence, need to feel part of something enduring – or at least momentous. Some try to use science to fill this vacuum but science is a method for the evolving exploration of nature not a salve for the human spirit.

In deifying it they have corrupted it by trying to establish fixed and unchallengeable truths, a hall of saints, and a hierarchical priesthood – even a creation myth with the Big Bang. Academic scientists have become the clergy of the Church of Scientism with the professional societies the high priests – evidenced by their failure to consult members before pontificating on climate. It is a feeble and shallow religion and leads to bad science.

The '*we are close to a Theory Of Everything*' message that permeates contemporary scientific hubris robs young scientists of the hope of dedicating their lives to coming up with major breakthroughs and fundamental principles and condemns them to the treadmill of incrementalism. It has also created a faith in the pronouncements of scientists that has fuelled the climate scare. We are still just scratching the surface in our understanding of the natural world and climate is no exception.

I don't want to sound negative about the whole scientific community. Very few scientists are directly involved in climate modelling. The vast majority of climate related research involves scientists who have been funded to explore possible impacts on their area of expertise – butterflies, snails, etc. – or gather other climate relevant data. They take the modellers results on face value. I expect that most presume that the modellers adhere to the standards that they themselves hold to. Many scientists have also publicly expressed doubts or strong dissent.

Historical data – reality as far as we know it – fails to show any causal link from CO2 to temperature. It clearly shows the reverse. The assumed causal link has been built into models that I have no faith in. When the IPCC models and rhetoric are pushed aside, ideology and faith are all that remains of the climate issue. The Green movement has become a religious cult in its own right. I can't help smiling when I see the local Uniting Church with a large cross made from solar panels on its A-frame roof.

German social historians have mapped close parallels between Nazi ideology and that of the Green movement. They share a superficial and idealised view of nature and pre-industrial life – from Nietzsche's '*Remain faithful to the earth*.' to the Nazi slogan '*Ask the trees, they will tell you how to become a National Socialists!*'. The Green movement also reflects the Judaic myth of a perfect Eden and a human fall from grace after eating the fruit of the tree of knowledge. It is not an environmental movement but a political movement that uses simplistic notions of our upsetting some delicate natural balance to create public fear. Nature and Life are neither perfect nor fixed but constantly evolving and learning from fluctuations and flaws.

My alienation from the Green movement was helped along by two particular events. In the late 1970s and early 1980s I researched the issue of lead in petrol and came to the conclusion that it didn't make either engineering or economic sense. I went on a brief tour of a few Australian environment groups to discuss my results and found that, with one exception, they weren't the organisations I had known in the early 1970s but had been taken over by the Authoritarian Left who just saw the issue as a vehicle for anti-capitalist protest and were angry about it being resolved. The second event was a letter from Greenpeace saying that they no longer wanted members, just our money, and were dismissing us in a management takeover. I stopped contributing. I'd already noticed that they were just a self-promoting media grabbing organisation and regretted not having left earlier.

A recent TV advertisement produced by the Australian Greens had bushwalkers stumbling about, fearful and angry that they couldn't find any walking track created and maintained by government rangers. All they needed was a map, a compass, and the skill to use them. The knowledge, or simple observation, that the type of bush they were in usually has networks of tracks created by wallabies and wombats could have helped them too. Following these they might have learned a little about the animals' movement patterns and run into a few along the way – perhaps spending a few relaxing hours watching their behaviour from a suitable vantage point. Viewing the advertisement more generally, they needed a better understanding of the world to allay fear, a moral compass to guide them on their chosen path, and a sense of adventure to replace the need for government assistance with every step on their journey through life.

Major players on the political stage are now saying that the science doesn't matter and that the real goal is centralised and coerced global wealth redistribution. They're ignoring the fact that trade liberalisation is already achieving that. Talking about evil forces plotting world domination commonly prompts knee-jerk reactions of '*conspiracy theory*' from some but in this case we don't have to theorise we can look at their proud boasts.

Near the front of the conga-line there is the UN and EU promoted Agenda 21 openly pushing for a totalitarian world government, or '*Global Governance*', with democracy and the nation state being replaced by a giant bureaucracy. Then there are the inevitable International Socialists who follow Trotsky in realising that socialism will never work until all alternatives are eliminated from the face of the earth. In the shadows lurks the Club of Rome who published *The Limits to Growth* back in the 1970s. The naive simplicity, and inevitable failure, of their mathematical models were an embarrassment and setback for the pre-Green environmental movement. There are also many people in the global corporate world who find national boundaries and democracy a nuisance. Then, for comic relief, we have the ultra-loons such as Australia's own Tim Flannery who talks with wide eyed enthusiasm of a future where humans emulate ants, abandoning individual freedom and reproduction – except, of course, for a small feudal elite.

As far as I can see, at a national level it's mainly Germany, Britain and Spain, following EU mandates that have seriously trashed their electricity supply systems, undermined their reliability, and put their whole economies at risk. Outside the EU the rest of the world has done little more than pay lip service and try to cash in on new industries totally dependent on massive government subsidies.

The public, jaded by decades of Green scare campaigns and angered by escalating energy costs and impending unreliability, are starting to look beyond the scary rhetoric – informed instead by pragmatic engineers and geologists in the sceptical blogsphere and a few independently minded academic scientists that haven't succumbed to the lure of massive research grant gravy trains. In the US climate recently came sixteenth – last – in a ranked list of public concerns. Where would it have come on a list of fifty? Even Greens are recognising their recent election results as a vote against climate alarmism – or at least disinterest. The people of Australia, traditionally sceptical of governments and ideology and not prone to pessimism, are shrugging off the scary rhetoric though it's well entrenched in the government funded schools, universities, bureaucracies and most of the media.

Here, as elsewhere, the Authoritarian Left of the Green movement have allied themselves with businesses that globally are plundering hundreds of billions of dollars of government renewable energy subsidies, and players in the money market salivating at the prospect of the new trillion dollar casinos that carbon markets would provide – markets that are quite arbitrary and meaningless because we can't quantify the detailed dynamics of the carbon cycle let alone our various tiny impacts. These are prime examples of Capitalism at its worst.

With a topic as politically inflamed and deliberately divisive as climate, where dissidence can lead to social ostracism or loss of employment, having a contrary view can be difficult. Friendships and even family ties are being strained or torn apart. I started out prepared to accept that there might be a serious problem. As my views on the topic changed over the years I retreated from discussion but maintained my general behaviour – minimising energy use and material waste. These had been instilled in me as a child by parents who had experienced the depression and a war. As I became more aware of the damage that was being done – social, economic, and environmental – I felt I should speak out. The turning point came as I left the theatre after watching Al Gore's B-grade horror movie about truth and lies. I felt a surge of anger rising which led to an urge to act.

I've had a long standing aversion to evangelism. I'm wary of appeals to authority whether the authority is an individual or a consensus of experts that leads to what Feynman called '*Cargo Cult Science*'. In my current writing I'm trying to dissect my ideas on different topics and understand how I came to them. I don't expect, or want, anyone to just accept my views. I hope to encourage others to review their own ideas and how they came to be. We all experience life differently and develop different perspectives. The best chance we have of making real progress in coming to an understanding of the complex world we live in is crowdsourcing knowledge from a diverse range of perspectives – for as many people as possible to observe their own world and see how their views, and the views of others, align with that experience. The alternative is the hive-mind of the mob.

Humans seem prone to accept apocalyptic visions of the near future. I believe we have a hard-wired instinctive response when confronted with a real or perceived threat to look to a leader and form '*one people, one mind*' – instincts that reach back beyond our human form – but we humans have the ability to override instinct with reason.

We have schools and the media inculcating millions of young children with a fear of the future and denying them a chance to see a happy and prosperous life ahead. Adults can deal with problems, put them behind when they are resolved, or adapt. Children are likely to be scarred for life and fear dulls the mind which only benefits those who seek power. I see this as systematic child abuse on a massive scale. In various recent verbal ramblings and the novel *Brindabella 2200* I sketch possible futures that don't have to be bleak. Free humans – free from fear and coercion – are adaptive, creative, and resourceful.

The political scene is changing rapidly. IPCC models are at last coming under closer scrutiny in academia and publishing criticism of their over-simplicity and errors is not the career killing move that it was just a few years ago. I'm confident that eventually they'll be publicly recognised as Science Fair level science on mega-grant steroids. Closing down debate by claiming that '*the science is in*' was a successful tactic but in the longer run the truth is coming out. While the politicians of the IPCC still stick to their agenda with increasing stridency, scientists writing the technical reports have backed away from the scary bits – perhaps with the words 'professional negligence' in mind. Elements of the media are finally recognising the huge logical gaps between the IPCC scientific reports and the alarmist statements of its politicians.

There has never been a simple conflict between coherent 'alarmist' and 'sceptic' camps but a broad spectrum of views. Currently, there is a cautious rapprochement between some people on both sides of the apparent divide that support the view that CO2 is still a problem and '*decarbonisation*' still necessary but the impacts will not be as great as extreme alarmists have claimed – the '*luke-warmist*' view. It's an unhelpful compromise that doesn't address fundamental issues and will extend the economic damage and consequent suffering unnecessarily. It's not a compromise that creates a balanced solution to the problem. Half a wrong is still a wrong.

Rather than this development being, as some would have it, a capitulation of sceptics to a consensus view, there are many of us still pointing out that the central tenets of the scare have not been publicly scrutinised and are not scientifically established – quite the contrary. Over the last decade or so there has been an increasing recognition that evidence and theory show atmospheric CO2 as having little, if any, impact on global climates and even if it did our contribution is insignificant. I think the general public have a right to know that these views exist and to see them seriously debated before any further economic and political steps are taken.

All that's keeping the climate band-wagon on the road now is social and political momentum and the massive investment involved in the industries that have built up around it. In a free-market system the players would recognise risks and accept failure when it comes but this has never been a free market, it's been taxpayer funded from the start and many have already made huge profits. Before it's too late we need to send a message to governments that at the December 2015 meeting in Paris our representatives should declare that the gig is up – or at least postponed to allow for some genuine public debate.

The brief of the IPCC was to develop a case against fossil fuels. The case for the prosecution has been put. Now it's time for the case for the defence to be publicly presented on behalf of the powerless of the world who have a desperate need for cheap and reliable energy along with the health, comforts, and economic opportunities that it brings.

Personally

I expect to escape the worst consequences that the climate scare campaign is having on western economies. I'm paying more for electricity that I should be and I resent paying subsidies to my wealthier neighbours sporting inefficient, intermittent and environmentally dubious solar panels on their roofs. I'm more concerned, but not surprised, that the Authoritarian Left have spurned those people who are deliberately being denied access to any electricity at all. I'm also concerned about the damage that's being done to the practice and reputation of science and its role in public policy and look on with despair at the train wreck that the environment movement has become.

I look at the carbon cycle diagram and wonder whether I have a duty to Gaia to help liberate some of her trapped carbon and get it back into circulation.