

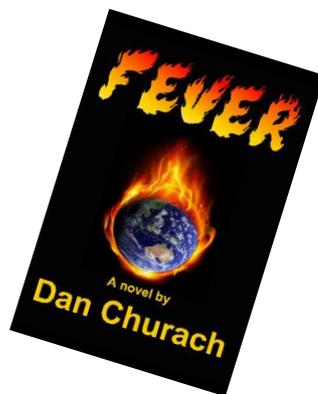
FEVER

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Monday, 22 April; Earth Day at Murdoch University, Perth,
Western Australia

“Good morning. My name is Tom Greenough. I am both a *Nyungar* elder and a member of the staff here at Murdoch. I want to welcome you and to acknowledge that Murdoch University is situated on the lands of the *Whadjuk Nyungar* people. I pay respect to their enduring and dynamic cultures and the leadership of *Nyungar* elders both past and present. The *boodjar* or country on which Murdoch University is located has, for thousands of years, been a place of learning. We at Murdoch University are proud to continue this long tradition and, especially today, to join in the global celebration of International Earth Day.”



Professor Greenough turned and quickly walked off the stage as Sacha walked to the podium. He unconsciously tapped his lapel microphone and looked over the 600-odd people in the lecture theatre. The large screen behind him lit up with a slide showing the planet Earth floating in space and the words “Welcome to Murdoch University and International Earth Day 2024. Dr Sacha Sharma, Emeritus Professor.”

“Thanks, Tom... Professor Greenough is not only my colleague and friend but more importantly, a *Nyungar* elder who we are so fortunate to have here on staff at Murdoch. This being International Earth Day, I can’t help but add the words of another

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colleague from the University of Canberra, Dennis Foley. I want to quote him here.

“The land is the mother, and we are of the land; we do not own the land; rather, the land owns us. The land is our food, our culture, our spirit and our identity.” The quote was projected behind him over an image of a native Western Australia forest with a mix of jarrah and marri trees.



“Professor Foley’s quote is an insightful way to begin this Earth Day 2024 talk by reminding us all that we are not the first – or the last – peoples to occupy this land we call Australia or this planet we call the Earth. It also reminds us that even though many of us who practise western ways may

have a unique view on our relationship with Mother Earth, it certainly is not the only view or even the best view. Professor Foley tells us that ‘we do not own the land rather the land owns us...’ In the truest sense, that reflection is probably much closer to reality than much of our western philosophy has professed.

“We can go all the way back to the Bible, where Genesis 1 proclaims time and again the ‘goodness of everything the creator made before he created humans’... though any praise of nature itself seemed to fall by the wayside.

“Both Greek philosopher Aristotle and Roman philosopher Lucretius may have appreciated wild nature for her beauty, but again echoed the thinking of their time that nature existed to be conquered by mankind. Much later Saint Thomas Aquinas argued that only rational creatures – humanity that is – could know and love that creator and therefore fulfil the true purpose of his creation. Descartes argued the soulless nature of any life aside from

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humans, and John Locke believed that nature had little or no value until the labour of humans gave it value. In case you're counting, that's several thousand years of learned thought proclaiming humankind's superiority over nature." A series of colourful slides projected on the big screen behind Sacha showing the likeness of each scholar he mentioned.

"In the United States, the early history is filled with two centuries or more of a western movement that called on spirited Americans to 'tame the wild frontier' by any means necessary. Of course, part of



that movement meant 'taming the indigenous people' already living on the land. In the early part of the 1800s, the so-called 'Trail of Tears' saw more than one hundred thousand Native Americans marched westward away from their native country in the southeast of America. Exact numbers could never be known, but probably several tens-of-thousands of those indigenous Americans died in the relocation.

"But please my fellow Australians, don't feel too smug about our own past until you consider the checkered history of European settlement. A permanent colony was established in Sydney when the First Fleet of British ships landed there in January of 1788. The then Governor representing the Crown, Arthur Phillip, claimed sovereignty over all Captain Cook's recently discovered New South Wales and instituted the concept of *terra nullius* which basically claimed that no people at all lived here. In the British case... our case... the Aboriginal people were more likely to be shot and killed rather than moved away from their homelands.

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“Through this rather one-sided history of man-conquering-the-environment, there have been critical voices expressing a more harmonious perspective that offer us hope. Henry David Thoreau’s *Walden* and Rachel Carson’s *Silent Spring* are great examples of recognising that *Homo sapiens* might just occupy a different rung in Mother Nature’s ladder.” Images showing the covers of each of these literary works appeared on the screen. “Likewise, Australian works including Paul Gilding’s *The Great Disruption* and Clive Hamilton’s *Defiant Earth* have expressed the belief that we are only one of the uncountable species occupying Planet Earth and that our respect of the intricacies of nature is paramount. And of course, one notable bright light during the last fifty years of the environmental movement is represented by the celebration we honour today. I wish to pay tribute to farsighted minds who first proclaimed an annual day on which we can pause to recognise Mother Earth. Today is the 54th anniversary of that first Earth Day in 1970, and there are now more than 190 countries so honouring *Gaia*.

“When I thought about this address, I considered the many, many speakers over the past half-century who have taken on this task to call the attention of their fellow travellers on this spaceship Earth. Many of these speakers traditionally have pointed to the fact that *Homo sapiens* have had such an immense impact on the planet. Many have used this day to point to statistics confirming this impact. Numbers... numbers that often seem to make it all too easy. But being an academic, I would be remiss without employing any statistics so I will give you a flavour of numbers with a 60-second blur of facts and figures...

“Consider, 24 of the hottest 25 years ever measured – EVER MEASURED – are in the 21st century. That, of course, includes the hottest ever measured just last year, 2023. The most recent carbon dioxide readings from Mauna Loa in Hawaii are now over 420 parts per million this morning, 150% higher than 75 years ago and the highest level in a million years or more. The Paris Agreement that 195 countries signed less than ten years ago targeted holding temperature increases to 1.5°C. We have just about surpassed that

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global target last year and have close to zero chance of meeting that goal in 2030. The ice caps are melting, the glaciers are disappearing, the Arctic permafrost is less and less permanent, and the sea levels are rising. And making these numbers even worse is that fact that nearly all of them are accelerating. ACCELERATING! Many have argued that our scientific models are faulty. They are correct – our models ARE faulty – nearly every prediction our models have made UNDERSTATE the scope of our planetwide problem. I can sum up the reams of data supporting all of this by saying that we no longer need to speak of climate change, rather assert that climate CHANGED... and I emphasise the past tense.”

“But I promised that I was not here to talk to you about numbers.” Sacha put both hands over his head with his fingers extended in an ‘I-give-up gesture’. “I’m here to talk to you about Mother Earth... about *Gaia*, for today is Earth Day... *Gaia’s Day*. Now the name and the concept of *Gaia* has been around for thousands of years for she was the primal Greek Mother Earth, the ancestral goddess of all life. A more scientific concept we call the *Gaia* Principle has been around for over fifty years at this point... actually pretty much established about the same time as the Earth Day celebration we commemorate today. We have English chemist James Lovelock and American microbiologist Lynn Margulis to thank for the initial formulation of the *Gaia* Hypothesis.

“I have been trying to understand more and more about *Gaia* over my fifty-year career, so I am not silly enough to pretend to be able to explain *Gaia* in any great detail in a fifty-minute talk. I will say this, however: the *Gaia* Hypothesis has been tested, argued against and ridiculed for half a century, and yet the concept is stronger than ever. It is so strong today that the China National Space Administration, the European Space Agency and America’s NASA all agree that any search for life on extraterrestrial planets must look for planets either teeming with life or totally dead. In other words, we no longer think a planet can have ‘a little bit’ of life. The point? A planet is either alive, or it isn’t... no halfway levels of life seem possible.

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“Why does this seem to be the case? Simply because based on our total sample of one planet – Planet Earth – we learn that organisms co-evolve with the planet. Obviously, the planet affects organisms in terms of atmosphere, water, temperatures, etc. I hear you thinking out loud, ‘organisms change the planet?’. Yes indeed... of course, they do. Consider that plants exhale oxygen and over millions of years totally changed Earth’s atmosphere. Microorganisms fix carbon in carbonaceous rock, building kilometre-deep layers of limestone and calcite. Organisms fixed carbon within the Earth... in the soil, in coal, gas, oil, peat...

“And the Earth’s geology greatly affects the biosphere. Palaeontologists read the fossil records and agree that five Mass Extinction events have happened to our Earth over the past 500 million years. The causes of these events were both homemade and extraterrestrial. Of the homemade events, the causes range from global cooling and sea-level changes to planetwide disruptions of chemical equilibriums to massive volcanic events. Of the extraterrestrial caused events, triggers include things such as meteor impacts, the variability of our sun, nearby supernova explosions and cosmic ray events. The most recent great dying, the so-called K–T Extinction that occurred some 66 million years ago, was primarily caused by a massive 10 to 15 kilometres in diameter asteroid slamming into the Earth off the Yucatán Peninsula in the Gulf of Mexico. About 75% of all the species on Earth disappeared within a ‘short’ few thousands of years including what we refer to as the great dinosaurs.

“There is evidence of an even earlier great dying not included in the five mentioned here. That was a VERY long time back, about 2.5 billion years ago just after green, chlorophyll-laden plants evolved. This one is of particular interest since we are talking this morning about organic and inorganic co-evolution. This great dying period has been named the Great Oxygenation Catastrophe, which occurred soon after green, photosynthesising plants evolved on the planet.” A grin crossed Sacha’s face. “I have to smile since we often hear how good or bad carbon dioxide might be without

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recognising the fact that chemically, no substance is ‘good or bad’ in and of itself. The reality is that in too small or too large a quantity, ANY chemical can be either good or bad or at least unharmed to we *Homo sapiens*. I mention this because palaeontologists often refer to this sudden surge of oxygen in Earth’s atmosphere as the Great Oxygen Catastrophe or the Oxygen Holocaust. The first time many of my students hear that they scratch their heads and say, how can that be? Oxygen is a good thing... we all die without oxygen... Let’s take a look at that from another point of view.

“In the carbon dioxide-rich atmosphere that covered our planet two-and-a-half billion years ago, the green plants found themselves in a photosynthesis nirvana. The things these cyanobacteria needed most – water, CO₂ and sunlight – were all found in excess quantities. Over hundreds...thousands... millions... of years, these green plants exhaled incredibly great volumes of oxygen. Initially, *Gaia* was able to offset this chemically active element through geophysical means... Mother Earth sequestered much of that evil oxygen gas all around the world. We here in Western Australia have for sure been very thankful for that since so much of our economic wealth is a direct result of it.” Sacha reached behind the podium and pulled out a large piece of reddish rock. “Of course, I refer to the miles-thick layers of this stuff...” He held the rock over his head. “This is a piece of iron ore which was deposited here and globally those billions of years ago when the nearly unlimited supply of oxygen combined with dissolved iron and the iron oxide rained to the seabeds. Yes, that’s right – simple geology and chemistry saw the ionic form of iron ions literally ‘fall’ out of seawater in the form of what you and I might call rust.

“There is more to the story, though... After 500, 600, 700 million years, even Earth’s geology couldn’t compensate for so much oxygen, and the atmosphere became toxic and flammable. Remember, at that time there just weren’t the multitudes of oxygen-breathing animal species to stabilise this system. Eventually, though, Earth’s biosphere helped out when these

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animals showed up in mass with their ability to breath in the oxygen and balancing that with exhaling carbon dioxide.

“When James Lovelock and Lynn Margulis originally proposed the *Gaia* theory in the early 1970s, many scientists felt abhorrence for the idea that a planet could be alive.” Sacha used both hands raised up with his fingers indicating quotation marks around the word alive.

“In the first instance, this was due to Lovelock and Margulis’s inability to explain the detail of how it all worked. Naturally, no scientist can explain it all... in the 1970s... in the 2020s... ever... I believe it is fair to argue that fully understanding how nature works is beyond human capabilities.

“The second problem many in the scientific community had was that somehow the *Gaia* Hypothesis was a theory built on mysticism or religion. Again, Lovelock may have inadvertently caused this misunderstanding simply because he chose to name his idea after a Greek goddess, *Gaia*. But let’s put this into historical context. Remember, this was a time that the western world was coming out of the 1960s when culturally, the hippy-movement was all about beautiful people consuming large quantities of cannabis, LSD and god-knows-what, the birth control pill led to an era of free sex and the American’s Watergate scandal seemed to put an end to community faith in much of anything. This was the ‘Age of Aquarius’. This was the ‘*Lucy in the Sky with Diamonds*’ era... The moniker *Gaia* certainly fit the cultural times.

“But Lovelock and Margulis NEVER suggested that Mother Earth was alive in the living, breathing sense that we are. They simply pointed out that Earth displayed many properties that living systems have. The most important parallel is that *Gaia* displays homeostasis. I realise most of you are not science students, so let me simply say that homeostasis is a term often used in biological that refers to self-regulation. You get hungry, your brain tells you to eat. You run in a footy game, your body needs more oxygen, and your body tells your lungs breath faster. It’s a hot summer day in

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Perth, and your body makes you perspire freely so that the evaporating perspiration removes heat from your body. You needn't know ANYTHING about these events, and your miraculous body just does them. There's nothing mystical here, just the laws of physics, chemistry and biology.

"Homeostasis is used in chemistry, too, in relationship to *Le Châtelier's* Principle that refers to equilibria. This one, simple chemical law governs so much biochemistry from our blood supply to neurotransmitters. And chemical principles don't stop there... Think of a pile of firewood and a campfire. At the beginning of the night, you start the fire, and the fuel uses oxygen to produce heat, light, carbon dioxide and water vapour. When the fuel runs out, the fire goes out. If you never studied fire chemistry in your life, the fires will still go out when you use up the fuel.

"In economics, homeostasis applies too. The whole notion of supply and demand keeps things in equilibrium. If it's a bad year and farmers don't harvest many apples, the price has to go up, so people buy fewer apples. In years the apple harvest is plentiful, there are so many apples that the grocers can't sell them unless they lower the price. There's no mystery here... just supply and demand.

"Systems of any kind can stay in balance because of the laws of nature. We can capitalise that and call it the Laws of Nature, but that doesn't change the meaning." The slide projected at the front of the theatre now showed the capitalised words. "They are NOT magical, NOT religious, NOT spiritual... They are merely statements that we humans make based on our collected observations of the regularity, the uniformity we see in the world. In short, the Laws of Nature simply describe the way the world is and the way the world works.

"If there is nothing else you take away from this talk today, I cannot emphasise enough that *Gaia* is NOT mysticism... *Gaia* is NOT spiritual... *Gaia* is NOT religious..." The big screen behind him had a slide up with two-metre-high letters spelling NOT for each comment he made. "This, my friends, is science! This is all based

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on the Laws of Nature! It is the absolute best science we can relate to you today... and just like Lovelock and Margulis, we don't understand it fully. But just because we don't understand it fully, we still see it happen.

“Doubting any newly discovered science is not new. We humans make a habit of mistrusting new discoveries. Sometime before 1514 Copernicus proposed his heliocentric or sun-centred solar system. A hundred years later, Galileo got in big trouble with the Catholic Church because he supported Copernicus's ideas about a heliocentric, sun-centred solar system. It wasn't until Isaac Newton published his *Principia* 150 years later that the idea became widely accepted. Einstein prosed his Special Theory of Relativity in 1905 and his General Theory of Relativity in 1915, but it took decades for this to be accepted. Charles Darwin presented his theory of evolution or natural selection in 1838, and I'm sure most of you know what a controversial issue that caused... evolution rather than creationism... I say 'caused' in the past tense, but in the most recent polling I can find today – TODAY – some 9 or 10 per cent of Australians, some 20 per cent of Canadians and a whopping 30-something per cent of Americans still believe we are all here through creationism, not evolution.

“So, whether we call her Mother Nature or *Gaia* or just plain old Mother Earth, we all live on this planet together... together with the other animals, with the plants, all the microbes big and small, the mountains and bush, the atmosphere and oceans... We do not need to fully understand the trillions and trillions of working systems, of equilibriums, of shared relationships that allow for *Gaia* to have gone on now continuously for billions of years. It just happens without us fully understanding it. On this Earth Day, we only need to have enough awareness not to disrupt *Gaia* from doing what she does best... keeping our Earth as the best place in the whole universe for us to live and thrive.”