

# **CREATION, CRISIS AND CONSERVATION CONFERENCE AUCKLAND – FEBRUARY 2005**

## **From foundations to action – the challenge of changing the world**

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Oceanic islands have always fascinated biologists. This summer I had the experience of being one of the first botanists to spend a day on the Forty Fours. These remote rock stacks are the easternmost New Zealand - flat topped but sheer-sided and seemingly inaccessible. A three metre swell and 30 metre cliff to the island top was an occupational safety nightmare. But once there we were in a strange world of nesting mollymawks and albatrosses nestled among giant trifold-like button daisies. Blasts of air rushed from fissures, driven up by the relentless surf. Sheer cliffs plunged from the island summit.

But deserts also fascinate, especially the Rub al Khali of the Arabian Peninsula, where shade temperatures in excess of 50°C in summer months make it impossible for humans to survive for more than brief periods. Paradoxically, rain may fall as hail, and there are vast reserves of underground water. The ascent to the edge of the Rub Al Khali takes you onto a blinding polished white limestone plateau of etched ancient fossils. On top of the limestone lie gigantic dunes of orange sand like vast mountain ranges. Oryx and gazelles follow the rain patches, grazing on the herbage that the rain brings. The flora we see today is but a remnant of the past, many plant groups as legumes being largely eliminated since camels were introduced in historic times.

A third vignette takes us to another extreme environment and one that is influential on the world's climate systems. New Zealand is a launch pad for the Antarctic – the world's driest continent yet ironically the greatest storehouse of water. The first human footprints on Antarctica were a little over 100 years ago. Even within our lifetime, parts of the Antarctic have been mapped, explored and traversed for the first time. Its animals and plants include some of the most remarkable species on Earth: the emperor penguin, mosses only found on high volcanoes, the pure white snow petrel and magnificent whales.

My father was a scientist, my grandfather was trained as a scientist and teacher – it was probable inevitable that I would follow this path. As a child I was brought up in a world of outback Australia. At school and university I built on that start. Nature continued to be a fascination. And when I moved into a scientific career I did not give up such childish things but research reinforced for me that I was privileged to be able to work close to nature. I have never lost this fascination, or the sense of mystery, or

the sense of awe at the creator of this world. I am a rational scientist - but also a fascinated child.

### The challenge to biological diversity:

Nature faces many challenges. Take extinction as an example. The mean background rate of extinction in the geological record is estimated at about one species per year. British researchers using three analyses based on independent scientific approaches have concluded that, impending extinction rates are at least 4 orders-of-magnitude faster than the background rates seen in the fossil record. Add to this the observation by the director of the International Mycological Institute, David Hawkesworth, that the extinction of an obvious, large organism such as a forest tree probably results in the loss of at least fifteen organisms dependent on or confined to that single species and we start to see the magnitude of the problem.

University of Tennessee's Professor Stuart Pimm and Professor Peter Raven, Director of the Missouri Botanical Garden, also paint a bleak scenario for the future of biodiversity unless markedly increased steps are taken to protect remaining species-rich regions and habitats. Their modeling forecasts an accelerating rate of extinction peaking about half way through the twenty-first century at nearly 50,000 species per million species of animals and plants.

The most critical parts of the world may be the biological 'hot spots'. These areas are rich in species found nowhere else. 30-50% of plants, amphibians, reptiles, mammals and birds occur in 25 hotspots that individually occupy no more than 2% of available land area. In the tropical regions designated as biodiversity hot spots, only 12% of the original primary vegetation remains. Applying the Pimm and Raven model, even if all remaining habitat in these regions is protected immediately there may still be an 18% loss of all species, and if habitat depletion continues at the present rate for a further decade the loss rises to 40%. These are alarming figures.

Several years ago a Canary Islands botanist documented the extinction through animal grazing of the last wild population of a plant species. Fortunately, he was able to salvage ripe seeds and introduce the species into a botanic garden. Some of New Zealand's birds have not been so fortunate. There are people alive today who have encountered living specimens of the now extinct bush wren and the laughing owl, neither of which are alive in captivity or the wild.

Extinctions do not usually happen in one giant step, but a little at a time. Once populations have become extremely fragmented and small, they become increasingly prone to events that are akin to the "throw of the dice". Thus the last few individuals of a species may disappear because of unpredictable accidents such as a misplaced bulldozer blade, a freak storm or elimination of one or other sex.. Therefore, it is important that species not be reduced to such small numbers that the risk of being eliminated by such accidents becomes unacceptably high.

Species do not have to be rare to be under threat. One of the most shameful acts of terrorism against the world of nature concerned a bird that was once perhaps the most abundant bird ever occurring in North America – the passenger pigeon. In 1810 it was estimated that a single flock in Indiana consisted of at least 2.2 billion individuals and

diarists noted that flocks of the bird turned the daytime sky dark. Being a pigeon and in such large numbers it represented the ultimate pigeon pie for settlers of the American mid-West.

An 1850s comment by an Ohio county commissioner was that:

*The passenger pigeon needs no protection. Wonderfully prolific, having the vast forests of the North as its breeding grounds, traveling hundreds of miles in search of food, it is here today and elsewhere tomorrow, and no ordinary destruction can lessen them or be missed from the myriads that are yearly produced.*

Yet, by the 1870s the bird had disappeared from Ohio, and although over 130 million birds still existed in the state of Michigan, this was the last of the big flocks. Within 25 years the bird had disappeared from the wild, and in 1914 the last individual of the species, a captive female named 'Martha' died in Cincinnati Zoo.

The unbelievable had happened, and the story provides a sober warning: if one of the most prolific birds can become extinct through human actions then what security does any species of animal or plant on earth have? We still have specimens, preserved in museums, but the pioneer ecologist Aldo Leopold pointedly comments that:

*We grieve because no living man will see again the onrushing phalanx of victorious birds, sweeping a path for spring across the March skies, chasing the defeated winter from the woods and prairies ... There will always be pigeons in books and museums, but these are effigies and images, dead to all hardships and to all delights. Book-pigeons cannot dive out of a cloud to make the deer run for cover, or clap their wings in thunderous applause of mast-laden woods. Book-pigeons cannot breakfast on new-mown wheat in Minnesota and dine on blueberries in Canada. They know no urge of seasons; they feel no kiss of sun, no lash of wind and weather ... The gadgets of industry bring us more comforts than the pigeons did, but do they add as much to the glory of the spring?*

As a final comment, animals and plants do not have to entirely disappear to become extinct as far as the functioning of nature is concerned. An increasingly common phenomenon is what is called the 'living dead' - species that are still present as adults but where reproduction has virtually ceased. They are spatially living but functionally dead. New Zealand's shrubby pohuehue or *Muehlenbeckia astonii*, is an example. Over 2000 plants known, but these are old and only a handful of seedlings and juveniles have been seen in recent years. Few individuals of the species play an effective ecosystem role.

We do not know how many of the world's populations of animals and plants may be in such a 'living dead' category. What we do know is that once this stage of depletion is reached, we are in big trouble - where one stochastic push can hurtle not only a species but a whole ecosystem into oblivion.

A useful indicator of the overall effect of humans on our environment is the 'ecological footprint'. This is the area of land and associated resources needed to sustain a particular number or group of humans. Consider New Zealand, with a population base of only about four million people and a country noted for its green

approach to the environment. Dr Denise Church, former Secretary of New Zealand's Ministry for the Environment, noted that, "If everyone presently alive aspired to our New Zealand level of 'land affluence' the world would need 28 billion hectares of production land. That is twice the earth's land area and about five times the area currently used for production".

### Changed people:

Technology rules our lives. For many people it is the key to conquering problems. So do solutions lie in technology and smart thinking? Certainly we need to be much smarter about how we sustain populations of endangered species using good science. Today, we have an array of technology including satellite imagery, computers, and genetic engineering that were not even dreamed about when I was a student. The last three decades has seen the birth and development of conservation biology as a discipline. It is a changed world and in many respects that is good.

But technology is not everything. For one thing, we can greatly underestimate the role of nature in human society. Life starts at the supermarket and stops with the garbage collector. Business is about share prices and profit margins. City dwellers are increasingly isolated and insulated from the world of nature except through human constructs – whether Discovery Channel on TV or a local city park. But the recent tsunami disaster reminds us that there are forces of nature that defy human constraint and which we cannot walk away from.

All people depend on plants and animals for food, clothing, shelter, and fuel. But when asked in the United Kingdom where vegetables come from, a survey showed that one student in five answered, "The supermarket". Our essential fuel oil, natural gas and coal are derived from fossil biodiversity. Eighteen crops supply eighty percent of the world's nutritional needs. Up to 80 per cent of the world's people rely primarily on raw nature for their health.

Flags of nations, airline logos, clothing designers, artists and poets draw inspiration from nature. Ask any corporate office designer what he will use to create an entry into the most contemporary of establishments and it will include plants. Lovers "Say it with flowers". Ask many people what they most miss at daybreak and after hot coffee or tea it may well be a dawn chorus of birds.

But as largely urban people we are isolated from the context of nature within which we have evolved as a species and as society. We are orphans, as suggested in the ancient biblical story of Cain and Abel. After Cain murders Abel, we are told that Cain went away from the presence of God to live in the land of Nod, east of Eden. The theologian Jacques Ellul graphically describes his situation:

*The seed of all man's questings is to be found in Cain's life in the land of wandering, always searching for a place where his need of security might be satisfied. But the only place he finds is that very country characterized by being uninhabitable. And the ancient story means the very same thing when it speaks of the east of Eden. The East - the country where the sun rises, the point of departure. But one does not stay in a starting position, one leaves it. And now Cain is forever fixed at this starting point. His eye and its desire must always*

*wander after the land where he will direct his steps, but he can never finish his journey, for he lives at the point of departure.*

Contemporary humanity is in that place of wandering. We need to rediscover our essential relationship to a world in which our species evolved and our forefathers were nurtured. But we cannot do so while we remain alienated from the rest of biological diversity.

#### Biblical foundations:

Many biblical foundations have been explored at this conference. Among these is the book of Job. It never fails to excite me, especially as I read the magnificent closing chapters where God challenges Job and his view of the world, himself and his relationship to God. Five primary questions here challenge us as we search for fundamentals to bring together faith and science and find our place in relation to the environment of our homeland planet.

- (1) Where were you when I laid the foundations? This speaks of God creating and not us. Despite our technology we are far from creating the complex world of which we are part. Although made in the image of God we have been given that attribute and not made it for ourselves.
- (2) Have you commanded? One of the remarkable things about running a botanic garden is that as season succeeds season everything happens. Plant germinate and grow, flower and seed. It does not need my instruction or that of anyone else. To command implies power, something for which the human nature within us craves.
- (3) Have you comprehended? One of the frustrations of being a scientist is that just when you think you have answered one question another half dozen pop out of the woodwork. We still do not even know how the simplest ecosystem really works. Dreams among generations of past biologists, chemists and physicists that we might know it all have been shattered.
- (4) Can you bind? Perhaps one of the disturbing things that scientists learn is that nature moves and works regardless of our presence. Perhaps worse, in the event of a nuclear holocaust it would be cockroaches and not humans that would probably survive. We are like King Canute standing at the sea shore commanding the sea to retreat, and getting soaked for our troubles.
- (5) Is it by your wisdom? Technological humanity has been labeled by one well-known philosopher as “The arrogance of man”. As a scientist the aspects of nature that I am observing and experimenting with have a terrible habit of “telling me” that every time I think I have it all explained something pops up that confounds me. After 40 years of research I still feel that I am in God’s kindergarten.

These are the questions that we need to constantly have in front of us as we explore, use, admire or simply cope with nature.

### The essential endpoint - action:

As the curator of a major botanic garden administered by a local body, I have to be mindful of the Local Government Act and the need to consult with the public – the community who are paying my wages. It is an interesting process but at the end of the day, I cannot sweep the submissions aside. I have to act on them – maybe not as if my life depended on it but certainly knowing that my job might. How easy it is to say but not do; to ask but not act. But as faith without resultant works is dead, so environmental planning, policy and wish-lists are dead unless followed by actions that make a difference.

Environmental issues seem so big and it is little wonder that we ask, “what can I do that will make a difference”. The answer is, “Anything”. In the recent tsunami we saw a death toll the equivalent of the whole of Christchurch. We are seeing destruction on a scale that exceeds many wars. The big agencies and countries have given well, but it has also been the generosity of myriads of people – the principle of the widow’s mite - that has started the road to recovery. As in every endeavour the first step is the most important.

### The essential perspective - globalization:

Today we are part of a world that seems very small in time and space. Communication systems allow us to speak to people on the other side of the world as though it is next door and to see things happening in another continent at the same instant. We read e-mails or text messages by the hundreds. Such a world can frustrate, but we can take advantage of this new global commons in developing the kind of world we want to bequeath to future generations.

A negative of globalisation is the homogenisation of society initially through symbols and habits such as the appearance of the hamburger bar on every street corner. But more pervasive is the loss of those things that make the human race the exciting mix of diversity that it has been through history. Globalization is the context of our times and although many see it as a threat it also has positive spin-offs for biological conservation.

My wife is Dutch and we still celebrate special occasions with *ollebolle*, a delicious Dutch treat. I have a son-in-law who is Portuguese and knows how to barbecue fish on rock salt in a way that is traditional to the Algarve of southern Portugal. But both people are kiwis and they bring those special customs that enrich our culture.

But what about nature? The danger is that homogenisation can extend to our environment. We start moulding cities, resorts, hotels, rivers, and gardens to boringly replicate what is found in a thousand other places. In doing this we shape our preferences for the behaviour and place of biodiversity. Loss of the diversity of life resulting from tens of millions of years of evolution is inevitable. We see this already in the replication of a small number of crops worldwide. Wake up in New Zealand, Chile or parts of Africa and you will see Californian Monterey pine; wake up in upland Colombia or southern Portugal and it may be Australian *Eucalyptus* trees. In much of lowland Asia the theme plant-scape is plantations of oil palm.

We need to develop farmlands and forests so that we do not deplete local biodiversity. We need to encourage landscapers and horticultural outlets to use a greater variety of local species. We need to prevent the spread of weed and pest species around the world as a suffocating blanket that swamps diversity – especially in biological hot spots such as New Zealand. At the same time we should be using exciting new combinations of plants and animals – exotic and native. But the essential we need to consider is the total environment and interacting system in which we live. It was Nelson Mandela who said, “a nation should be judged not by how it treats its highest citizens but its lowest”, to which I would add, “... and its environment”.

There is also a temporal aspect of globalisation. With global, fast and comprehensive information systems we have no excuse not to learn from both the failures and triumphs of others. Civilization is replete with examples of the rise and fall of civilizations on the basis of their use and misuse of the environment. Agriculture in Mexico probably arose when a chance mutation in teosinte produced the corn-cob that characterizes maize. But recent evidence suggests that the Mayan civilization of the same region collapsed as a result of agricultural failure.

Similar lessons come from tracking other great cultures of the past – Assyria, Nineveh, the Romans, North Africa. Reading of the dust-bowl of the 1930s in North America, the landslips of New Zealand in the same period and the more recent degradation of the Aral Sea in Asia and the Darling basin in Australia suggests that we are sometimes obtuse people.

A recurrent biblical theme for Israel was the call to look back, to see what lessons there were in the past and to use this to move wisely into the future. We all need to look back – there is nothing new under the face of the sun. Being made in the image of God gives us this unique ability to learn from the past.

#### The essential dialogue - science and faith:

A fundamental of science is that it asks us to experience, observe, correlate, and provide causality. It is based on, but moves beyond, hypothesis. Life lived by such precepts becomes a process of both separation and engagement, of hypothesis and experimental validation. But do we too often lose this experiential attitude to life, in matters of faith, relying on dogma rather than experiment? Do we fail to move beyond hypothesis to test what really works in life? We can unthinkingly accept the latest “rules for the Christian life” and then wonder why they do not seem to work, rather than living life and testing what works for us and our community.

There is a reverse side to the coin. Science has brought us enormous benefits. Science is the underpinning of most of our activities. Yet science has proved an inadequate substitute for faith in setting fundamentals for life and even within science there is a need to rediscover faith as a concept, being in the words of Hebrews, “the assurance of things hoped for, the conviction of things not seen”.

In recent years I have been fascinated by the thought that in making our world safe and predictable we are increasingly separated from disturbing things that ecologists tell us are basic in this world - uncertainty, perturbation and chaos. In society these are often perceived as negatives to strive against and overcome. Yet ecological

scientists tell us that such things constitute normality rather than being the exception. New Zealand, lying as it does in the intersection of two continental plates, has been shaped by floods, earthquakes, storms and mountain building.

There are fascinating avenues for greater interaction between faith and science in such matters. The world of faith is a search for certainty in a world that carries many uncertainties, and in this country Christianity especially has a very significant contribution to the debate. There is in fact only one great certainty in life on earth and that is that from the moment of conception we know that one day we will die, although science – or more correctly medical technology - seems determined to postpone that event as long as possible.

We need to be reminded, in the words the American historian Wilma Dykemen that, *“things born are not the same as things made ... that we are not to denigrate but to celebrate, not to exploit but to explore ... that we walk with the observation of a scientist but the vision of a poet”*.

#### The essential simplicity - understanding:

Although we make both the science and faith involved seem complex, the fundamentals are deceptively simple. Genesis 3 describes sin and a turning away from God. When we sin the land suffers and when people forget God’s principles for right living the land fails to yield in full. This is stressed by the prophets, for instance, Jeremiah:

*How long will the land mourn and the grass of every field wither? For the wickedness of those who dwell in it, the beasts and the birds are swept away.*

A vital matter is that God values relationships. We struggle in our relationship one with another (hence high fences in cities), go hot and cold in our relationship with God, and in many instances have lost the value of ecological relationships that God established. A primary mission for modern biology has been to discern the intricate relationships that are part of, and essential to, natural systems.

In Genesis God affirmed seven times that what He created is good. The creation as originally planned and executed reflects God’s character in its orderliness, stability and beauty. Biological life as we know it depends on such extraordinary things as the properties of water, along with complex but orderly inter-relationships between living organisms and inanimate resources, and between different organisms. In the midst of this, God commanded Adam to name the animals, a symbolic action that established a caring relationship.

Relationships deserve respect. A fundamental principle is well expressed by ecologist and moralist Aldo Leopold in his essay, *The Round River*:

*If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.*

Facts are not enough – we need wisdom. Wisdom requires the exercise of humility, right judgment, boldness but also caution where there is uncertainty. Wisdom must result in action and not just words. The exercise of wisdom with respect to environmental ethics requires that we are not just spectators but players.

A realistic perspective also involves assigning value to nature. Several years ago, US\$20 million was paid for a Van Gogh painting. I asked a colleague if someone would pay the same amount for a wetland rich in indigenous plants including several rare species. The answer was, “Probably not!” This response suggested that while appreciation of aesthetic value has matured in the fine arts, it may not have done so with respect to nature. It seemed to me that if the wetland represented 20 million years of evolution it might not be a bad bargain at a valuation of one dollar per year of creation. I side with those who argue that values are not just for humans but also other life forms and that there is moral value of the inanimate parts of nature. This, for me is part of the ‘goodness’ of the creative work of God.

It is easy to base our values for biodiversity (and consequent equity or lack of it) on a narrow set of criteria and especially only those criteria that relate to the utility of human use with a dollar-value bottom-line. But the fair valuation of biodiversity must be based on a wide array of parameters.

One of the most fascinating areas of research at the present time involves the value of biological diversity and ecosystems in their delivery of ecosystem services. This is the array of functional services that maintain soil and water quality, sequester carbon in living matter, ameliorate climatic extremes, and so on. As an example, calculations based on many years of fieldwork by the Polish Academy of Sciences suggests that the predicted effects of climate change can be largely mitigated by appropriate patterns and composition of landscape vegetation, with major economic consequences.

But even this is not enough. We need to re-learn how to love and cherish. Many of our most important decisions in life are made on the basis that we ‘feel’ they are right. We apply intense scrutiny to financial investments and business decisions. But some of us also initiate life-long alliances with a partner on the basis of a glance across a room or a chance conversation. What does this have to do with biological diversity? Simply, this – that many scientists in the past were driven by a passionate and transforming relationship with the world they were studying.

Alfred Russell Wallace wrote in the 1850s from Kuching of his first sight of the birdwing butterfly, *Ornithoptera croesus*, saying, “The blood rushed to his head” and that:

*... it is one thing to see such beauty in a cabinet and quite another to feel it struggling between one’s fingers, and to gaze upon its fresh and living beauty, a bright green gem shining out amid the silent gloom of a dark and tangled forest.*

And why is enthusiasm important even in science? Why did I express enthusiasm in introducing this session? It is because people will be moved to value nature through words that speak of enthusiasm and caring rather than pages of statistics. Can we relearn a love for nature which will move others to cherish, value, care for and

exercise stewardship for biodiversity, not just because it is seen as useful but simply because it exists.