
# William Rees

Recorded August, 2010

SILVER DONALD CAMERON:
Doctor William Rees is world famous as the originator of ecological footprint analysis—a remarkable instrument designed to actually measure the demands that each of us, and each of our societies, is placing on the productive capacity of our planet. The Earth, after all, can only provide so much food and water, and can only absorb a finite amount of waste. If you divide the productive capacity of the Earth by the number of people on the planet, you can estimate the share of the planet's capacity that each human being is entitled to.

By extension, footprint analysis can also show how much of the Earth's carrying capacity is actually being taken up by any particular human population. It shows that the consumer societies of the west are taking up far more than their share of the Earth's resources, while the Third World is taking up far less.

And it also shows that the idea of endless economic growth is a destructive pipe dream. The Earth has limits, so the economy must have limits, too. Bill Rees's book, *Our Ecological Footprint*, written with his

colleague Mathis Wackernagel, has been published in numerous languages around the world. Since 1969, he has been a professor at the University of British Columbia. I spoke with him at his home in Vancouver.

CAMERON:
A lot of what you've been doing comes under the general heading of human ecology. And it's my understanding that when you started out as a student, there was no such thing.

WILLIAM REES (1:49):
Well, there were versions of human ecology, but they were mostly in geography and sociology. What there wasn't was a well-developed branch of science in which human beings were considered as a species within ecosystems. So traditionally, academic ecologists study pristine nature—non-human species—and left humans out. So when I actually asked if I could study humans as a graduate student, I was told that yes, I could, but it would be in anthropology, sociology, or perhaps economics, certainly not in ecology.

CAMERON:
And that's completely changed?

REES (2:26):
I wouldn't say so. It's not completely changed. There's now a branch of scientific ecology, or academic ecology called systems ecology, which certainly does take human beings as part of the ecosystem and at the centre of things. But most academic ecology is still almost entirely focused on non-human nature. Just, by the way, as economics, which is human ecology, is focused exclusively on humans, with almost no reference to nature.

So we have a real paradox here, in that the two disciplines which purport to be "ecology" really, in many respects, have taken a long time to gather their legs under them in dealing with the question of sustainability, for example. Because academic ecology focused on nature but not humans; economics focused exclusively on humans but had nothing to say about the relationship between humans and nature. And frankly, we're pretty much stuck in that position still, in the mainstream, even though some of us have moved way beyond it in our own work.

CAMERON:
You were concerned very early on about carrying capacity. Tell me about that and about how that leads to the ecological footprint.

REES (3:38):
Well, as I say, I was interested in human ecology. I couldn't find a job in a university in an ecology department that would let me study humans. So I stretched out, and to my absolute delight was able to win a position at UBC, a joint position between what was then the Institute of Animal Resource Ecology headed by Buzz Holling, one of Canada's greats, and the School of Community and Regional Planning. So I had a joint position; I could keep my one foot in the academic domain as it were, where my roots were, but I was free to teach what I wanted about human ecology at the planning school. So I was struggling to find concepts because this was such a novel idea that could translate from animal

ecology into human ecology.

Keep in mind this is in the early 1970s, *The Limits to Growth* had not yet been published, and carrying capacity seemed to be one principle that made sense. Carrying capacity by ecologists is just defined as the maximum average population of a given species that can occupy a habitat without destroying that habitat. So we think of range capacity, if we are talking about cattle or moose in a field, you can only have so many before they wreck their own habitat. Well, are humans any different? So I did a quick and dirty little model of the Lower Mainland of B.C., just to assess what its carrying capacity should be. How much human body mass, biomass, could it support at its defined standard of living? And I came up with an answer. I think it was somewhere between 35,000 and 50,000 max.

Well I gave this little paper at a gathering of colleagues, one of whom happened to be one of UBC's and Canada's prime resource economists, who took me aside after the presentation and said that he really had to take me to lunch to talk about my ideas around carrying capacity. And I was delighted to get this recognition from a very prominent economist. So we met and indeed he gave me a very fine lunch, but he said, “Look, I've really come to tell you that if you continue to pursue this line of work, this area of research, then your academic career at UBC is going to be nasty, bitter, and short.” Which was a very Hobbesian way of looking at things, of course. But those were his exact words. And he then proceeded to tell me how economists had long since abolished the concept of carrying capacity. Because of technological development, human ingenuity would always keep us ahead of the Malthusian idea that we could never produce enough food to sustain ourselves. And in any case, why should this region be constrained by its own resource base when it can import things from all over the planet? Now I'd never heard of the idea that economists took to be doctrine, that technology could continually substitute for nature. I was familiar with trade, obviously, and he pointed out that how can you say the carrying capacity of this area is only 50,000 if there's already a million people living here? That's a reasonable question.

So I went away from that meeting feeling somewhat, I had my tail between my legs to be honest, because I was exploring new ideas; I'd never had a course in economics. He gave me a stack of things to read, and the more I read, the more I became uncomfortable with the economists’ position, but I had no real response to it at that point. To make a long story short, I woke up one night, actually two or three years later, with one of those light bulbs over my head. It was my “yahoo!” moment. And I realized that, “Look, it's true if we define carrying capacity as the number of humans that can live in this region, then it means nothing if you can import all you need from everywhere else, or if technology is going to improve efficiency.” But, if we turn that carrying capacity ratio over, and ask “how much area is required to support this number of people, wherever on earth that area may be?” you are in an entirely different ballgame.

So what the economists haven't really taken into account was the fact that trade in goods to sustain a population is really importing land from someplace else. So a country like the Netherlands, for example, we now have shown occupies about seven times as much land outside of itself as is available within its domestic territory. That's all acquired through trade, and it means that in some sense the carrying capacity of the Netherlands has been artificially inflated by its appropriation of bio-capacity from other parts of the planet. And although places like the Netherlands, or Japan, which is in a very similar state, are often held up as models for the world to follow—because high populations, not

much in the way of resources, but extremely rich—they are not models. Because for every place like them that is running a huge ecological deficit, there has to be another place that has a comparable surplus. And the fact of the matter is that about 80 per cent of the people on the planet right now live in countries running ecological deficits. And a relatively few countries have surpluses; Canada happens to be one of them. Of course the global commons has a lot of capacity as well.

The main point of it is that the carrying capacity of most high-income, densely populated countries, the population of those countries now vastly exceed their domestic carrying capacities. And they are living by drawing down the bio-capacity surpluses in other countries, which has two effects. First, it inhibits the growth of these other places to some extent. And it means that the countries that are dependent on imports can continue to expand oblivious of the fact that they are causing ecological damage half a planet away. So we now have a planetary circumstance in which we are all dedicated to perpetual growth, but we've removed the negative feedback from the environment that shows we're in excess of carrying capacity. The net effect is that we're all going to hit it at the same time. In fact, we already have when it comes to climate change and fisheries collapses and so on. But there is such momentum in the system it's going to be very difficult to get people to back off.

CAMERON:
If you are explaining the concept of an ecological footprint to someone for the first time, how do you do that? What do you say to them? How do you describe it?

REES (10:30):
Well, the ecological footprint is a very simple measure. It is intended to measure one thing, and that is, how big would the little planet required to support just Silver Donald Cameron be? So if you think for a moment—obviously you eat food, you drink water, you deposit waste back into the environment. And if you multiply that by the thousands of products that we consume, each of us, every year, it's quite clear, and we can show this now, but everything we consume has an origin somewhere on the Earth. And every waste that we produce has to be assimilated somewhere on our planet. And for this to happen sustainably, there has to be a continuous capacity to produce the things we consume and to assimilate those things that we waste. So the question for you is, how much land would be needed to grow food? How much to produce the wood fibre that you'd consume? How much is carbon-assimilation land for the carbon dioxide that you would net? And so on and so forth. If you added all that up, that's your personal planetoid. And that becomes, in effect, the footprint you have on the Earth.

So every one of us, whether we are conscious of it or not, requires a certain land area, a productive ecosystem area. It is producing everything we consume and assimilating the wastes that we produce on a continuous basis. It's an exclusive area, in that the land growing your food can't grow my food; I mean obviously Saskatchewan grows food for a lot of people, but you could apportion it square metre by square metre. The point is, then the ecological footprint is designed simply as a measure of the productive ecosystem area required to sustain any specified population, at any specified material standard. It's the area that the population uses on a continuous basis all over the planet to produce the resources it consumes and to assimilate some of the important wastes.

CAMERON:
And basically you've been able to use that as a tool to describe global inequities, right?

REES (12:38):
Oh absolutely, because clearly if you have a lot of money, you can access the world's markets. And the world's markets are the way in which we expand our ecological footprints. So there is a very tight correlation between income and the demands that each of us makes on the planet. An average North American uses about nine hectares of global average productivity in order to sustain his lifestyle or her lifestyle, but if we go to the poorer countries in Africa, it's less than half a hectare. So there is at least a twentyfold difference in the scale of the impacts that rich people have compared to those of the very poorest people.

CAMERON:
And that's what we demand in respect of the planet, is “sustain us in the style to which we've become accustomed.”

REES (13:26):
That's right. And the simple fact is that if you take most rich countries' per capita footprints and multiply that by their populations, then the demands by those countries exceeds their domestic territory, and we can show that the deficit is made up through trade. And right now, I mean we are seeing in the world a situation in which countries are beginning not even to trust the normal market to acquire what they need from offshore. They are now going into other countries and more purchasing huge blocks of land to sustain themselves.

So China, for example, has a couple of million hectares of Zaire, another couple of million in the Congo. Saudi Arabia is buying large chunks of impoverished North African countries to grow grain for the whole market. So in effect those countries are establishing extra-territorial eco-footprints now, through long-term leasing or purchasing agreements, no longer satisfied that they can merely buy food in the global marketplace. And I think this, over the long run, will turn out to be a very destabilizing trend in world geopolitics.

CAMERON:
It's almost a new form of colonialism, isn't it? You just go and buy the country instead of conquering it.

REES (14:36):
Yeah, absolutely. In fact, the whole idea of globalization is really the means by which wealthy countries can continue to appropriate the wealth of poorer countries through legal means. So literally, we now achieve through commerce what used to require territorial occupation. And the outright purchase or long-term leasing of landscape is certainly part of that.

CAMERON:
In the sense of, the instinctive sense of people all over the world that this globalization project is not of value to them as individual people, turns out to be pretty well-founded.

REES (15:15):
Well, certainly a lot of ordinary folks have been disadvantaged by globalization. And there's no question that the net effect has been a huge increase in wealth creation on the planet. But we also know that

most of the new wealth goes to the already wealthy. So it's frequently the case, and we can certainly see this through structural adjustment programs fostered by the World Bank, and so on, that as the country's GDP per capita rises, its poorer classes may be impoverished—they're displaced from the land, they get fewer services from their governments. But the elites in those countries benefit. And so they may well support the continued global growth model that sees that increasing inequity. The simple fact of the matter is that even though growth is supposed to solve our problem of poverty globally, or that in the last 25 or 30 years of growth, we've seen an increasing poverty gap. And today, as we speak, the richest 20 per cent of the world's people consume about 70-, or take home about 75-, 76 per cent of income, probably consume about 80 per cent or 85 per cent of private consumption. The poorest 20 per cent of people get by on about one-and-a-half per cent of global income. And that disparity is that actually increasing.

CAMERON:
And that's…this is supposed to be the solution. The rising tide is supposed to lift all boats.

REES (16:41):
Well, it lifts the bigger boats first, and leaves some of the smaller ones savaged by the reefs, unfortunately.

CAMERON:
Let me come back to the footprint, because you've also found ways to use things in much more micro kinds of ways. I mean for example, you describe the relationship between the United Kingdom's use of timber, and its growth of timber. So it turns out to be a very flexible instrument?

REES (17:05):
Oh yes. The basic data that goes into eco-footprint analysis includes all of the consumption and trade flows. So, let's put it this way: The ecological footprint is a land measure, a surrogate measure of consumption by a specified population. Consumption equals domestic production plus imports minus exports. Now to make those kinds of calculations at the national level, we need data on virtually all of the components of trade. So we've done a number of studies in which we look at specific countries and specific trade goods to show how much of other countries is imported through timber or food or whatever it might be. So yes, we can tell you how much tropical forest land Japan appropriates from the rest of the world. What Great Britain's agricultural impact on the rest of the world is. These are all two-way flows, of course.

But we are looking at the net numbers, and in those terms, most high-income countries in Europe, including, by the way, the United States and Australia—not in Europe but elsewhere—have fairly significant ecological deficits. Let me back off, I said the United States and Australia. I meant the United States and Japan are other examples of countries with large ecological deficits. Canada is one of the few with a surplus. But, our surplus is taken up by other people's deficits. So we just completed a study to show, for example, that about half of the land in the Canadian prairies which produces about 80 per cent of our agricultural trade, is exported. And we can nail that down to which countries appropriate what kinds of land base. So it becomes a very detailed tool in that sense.

CAMERON:
You had a comment somewhere I think that said in effect, that a surplus in one place can be created, in effect, only by creating a shortage in another place.

REES (19:08):
Well, OK, or the other way around. Yeah, OK.

CAMERON:
There is a reciprocal relationship. If I'm importing it…

REES (19:15):
Somebody else has to be producing it.

CAMERON:
Yeah.

REES (19:17):
But you see, now, and many economists would argue, “Well what's wrong with that?” Well here's what's wrong with that: In a global market situation, there may be half a dozen producers of some goods such as rice, for example. They are all competing for market share in that marketplace. So countries that are importing rice or grain—whatever it might be, it doesn't really matter—will seek out the lowest price among producer countries. But that drives down prices. And now again, economists say that's a good thing, because it means there is a greater stimulus to produce efficiently, and lower prices means that more people can consume it and so on and so forth.

From the ecological point of view, the consequence of that is to increase overall consumption and overall production. But if the price is being driven so low that the producers have no economic surplus —a producers' surplus with which to husband their resources, manage the soils, take care of the fish stocks, or whatever it might be—then the tendency in a competitive global marketplace is to draw down the natural capital assets. So we are eroding the fish stocks; they are disappearing. The soils are being eroded. Our best forests are disappearing, because there is just not the surplus to take care of those things.

Meanwhile, in Europe or wherever it might be, people are unaware of what is happening half a world away, and therefore continue to consume at their current rates. It's very similar in a sense to that individual who falls off the roof of a tall building. You know, he's fallen 40 floors and there are 10 more to go and he thinks, “Well, so far so good.” If you're in the situation where the price mechanisms aren't revealing incipient scarcities, if you have no idea that the source of your current substance is disappearing, then you have no incentive to change your consumption patterns, or do anything else to help the situation.

So globalization achieves everything the economists, well not everything, but it certainly achieves the purpose of enhancing production, increasing wealth (although not distributing it fairly). But it also accelerates the rate at which we are destroying the productive capacity of the Earth, because we are trading in bio-capacity; we are trading in carrying capacity.

CAMERON:
And because we don't count it, we treat it as though it doesn't count.

REES (21:43):
That's right.

CAMERON:
As though it doesn't matter.

REES (21:44):
Yeah. I mean I think most people would be horrified to know that most standard economic models have no connection whatsoever to the real world. In other words, they are based on money flows. The circular flow of exchange values is the classic mother model of all economic thinking. But there is no point of contact to the outside world. So economists have always in effect treated resources as free goods. So when you pay for gasoline, nobody pays the Earth for the oil and gasoline that it has produced. The cost of gasoline is simply a reflection of the cost of stealing it from the planet is at were, and processing it, plus the taxes the government throws in. And the same is true of any product. So we don't pay for nature's output at all. It's simply considered a free good.

And economists have been able to get away with this, because there has been such super-abundance that it hasn't mattered. And if something has gone scarce, we have substituted something else for it. So in the early days of the Industrial Revolution, Britain actually ran out of wood; it cut down its forests to fuel the Industrial Revolution. But it didn't matter; we shifted to coal. And the idea from that kind of incident, is that we can now do that indefinitely. So every time we run out of one thing, we simply shift to another.

One of the great Nobel laureates, Robert Solow, did his work in this whole area of technology's capacity to increase productivity. And he wrote in a very famous paper, it is virtually a direct quote, "If it is easy to substitute other factors for natural resources, then in effect the world can get along without natural resources, so exhaustion is merely an event, not a catastrophe." So the idea is, it doesn't matter if fish decline, because we can build fish farms. It doesn't matter if you run out of wood, because we can make aluminium studs. So as long as you believe that every resource that goes extinct has no other consequence than that resource disappearing, and we can find a substitute for it, then all our environmental problems disappear. What's there to be concerned about? And that, unfortunately, is the kind of idea that is fuelling most people's attitudes toward environments today.

CAMERON:
Yeah, and it's so patently obvious to somebody like me coming from the east coast, that that's not the case. Once the fish are gone, the consequences of that are vast and perpetual.

REES (24:23):
Well those particular fish are gone, but look what's happened. We've now diverted our efforts towards the shrimps, you know, other forms of fish. So what we're seeing around the world, is major fish stocks collapse. We simply redirect our fishing effort towards stocks we haven't exploited. We move down the

food chain. One of my colleagues at UBC, Dan Pauly, who is the former director of the Fisheries Centre, coined the term “fishing down the food web.” So as each stock is over-exported, we simply move one rung down in the ladder. I mean, look at Canada.

CAMERON:
Jellyfish are doing very well.

REES (24:59):
Exactly. So at some point, we'll be eating algae and jellyfish and so on—the lowest end of the food chain. But you know, you've raised this whole question, coming from the East Coast: One of the most egregious mismanagements of any national resource on the planet is the collapse of the North Atlantic cod, under Canada's watch, which I think we should be ashamed of. But it's a perfectly good example of a number of things. First of all, the extent of which economics and politics simply overrides biological or scientific considerations. But more importantly, the cod didn't collapse because Canadians ate too much fish. It was basically an export market. And so you see another perfect example of how the so-called surplus in Canada was drained to the bottom to satisfy the deficit in fish products elsewhere on Earth. And we can see that repeated over and over again around the Earth.

CAMERON:
Which kind of brings us back to a point that we haven't made explicit, which is your comment that a North American requires something like eight or nine hectares of the Earth to support him or her in the lifestyle we've achieved, but there isn't that much to go around for everybody, and that's not what other people appropriate.

REES (26:22)
No, it isn’t. You know, there’s nothing tricky about these numbers. You could go to any resource atlas in your local library and add up all of the productive ecosystems on the planet: forest, agricultural land, grazing land, grasslands, and so on and so forth, the productive parts of the ocean, which are only about 10 per cent of the seas. And if you add up all of that, and you can use any number of sources, you never come to much more than 13.5 billion hectares. So on the whole of planet Earth, there is only 13.5 billion ecologically productive hectares, capable of producing products that are capable of sustaining human life. Well, there are 6.7 billion people on Earth. So do the math. It means there’s less than…let’s say for the sake of simplicity, two hectares per capita on Earth. That’s all you’re entitled to. And if this were a totally equitable, or fairly managed planet, each person, assuming everyone is equal to everyone else, would be entitled to the bio-capacity of two hectares of average Earth. Well, you and I need, on average, seven to nine hectares to keep us going. So we get four or five times our fair share in North America, while people in places like Malawi, that are really at the bottom of the global food chain in human terms, get less than one-quarter of their fair share.

So in some sense, it reflects another great tragedy in the current situation. There’s about a billion people on Earth who are obese, and there are another billion who are in chronic caloric malnourishment, and the eco-footprint reflects that as well. Some of us take four times our fair share, others get a quarter of their fair share. And the point is, you cannot, with any conceivable or known technology, raise the entire population to North American material standards. It’s not difficult at all to show that it would take at least three to four additional Earth-like planets to support seven billion

people at North American material standards sustainably. That is to say indefinitely, without wrecking the planets.

CAMERON:
And this is what you've called the moral dimension of sustainability.

REES (28:39):
Absolutely. It's a moral dimension, because you see as long as you can assume that growth will address the poverty question, then there's some legitimacy to say "All right, you've made it, but now we're going to continue growing to enable other people to rise to that same standard." But if that's not possible, if it's *not* possible, without destroying the entire bio-physical basis of Earth—or at least significant components of it so the whole system might come down—then there's another question. And that is, "How much are you willing to give up so that somebody in a Third World country can at least achieve a reasonably decent standard of living?" And that's the dilemma I think we're going to have to face in the coming decades as climate change descends upon us, as we see increasing resource scarcities—fossil fuel, for example, peak oil phenomenon, peak fish, peak phosphorus, and so on.

We're in a situation now where it's becoming increasingly clear that we're overtaxing the self-productive capacities of the global ecosystem. And in order to enable the billion-and-a-half or two billion extremely impoverished people to rise to sufficiency, the extremely rich are going to have to come down. It's an extension of an idea called contraction and convergence, which Aubrey Meyer in the U.K. is using to argue that U.K. and other rich countries have to reduce their carbon dioxide emissions so that other countries can use a little more fuel. And this is contraction and convergence to some sustainable level. Well, right now on planet Earth, the sustainable level of consumption is the equivalent to the production and assimilative capacities of about two average hectares, and we need four times that to get by in North America.

CAMERON:
So that tells you that for the, if you're going to deal with this moral issue, you really have to talk about a great deal less consumption in the first world to allow an adequate consumption in the Third World.

REES (30:49):
We do. And to many people, that's a horrific notion. But you know, it's actually technically not that difficult. And there is lots of literature out there to suggest that we could probably get four or five times as much a utility, or usefulness out of every resource input. Most of our cars use four times as much fuel as we need to get around. Just replacing a standard light bulb with a spiral one saves you 80 per cent of the energy right there. So if we look through the economy—by the way, there's a book called *Factor Five* that summarizes much of this—we might be able to double production with half the input, which is equivalent to increasing what is called factor productivity by four, without changing our lifestyles very much. Now that means that we can actually remain where we are, while reducing our consumption by a factor of four, freeing up resources to be used by someone else. So that's the technological side of things.

But there's another issue here, and this is more important, and that is that if you look at so-called

objective indicators of population health or well-being, there's almost no correlation between the continually rising incomes in rich countries and those objective indicators. So in other words, for at least 40 years now, we have not been gaining in any substantive way in terms of infant mortality rates, longevity of post-operative survival, and so on and so forth. Those things are not changing in ways that can be correlated to rising incomes, per se, OK? So at something like $10,000 or $12,000 per capita per year, a fraction, a quarter or less of typical rich country material standards, you've already got it all in terms of most of those factors of population health. Similarly, if we look at various surveys of people's so-called subjective well-being, their sense of felt well-being, similarly there's no correlation with income. So that in fact in North America…

CAMERON:
To a certain level there is…

REES (33:05):
Oh yeah, at say below—well if you're in poverty and not being fed, clothed, or housed, clearly there's a great benefit in rising income. But again, it's called diminishing returns. So you have a very strong relationship between income and well-being to a point, and then it starts to level out. And then it just goes flat. And in fact in terms of felt well-being, there's evidence that in many countries there's a negative correlation beyond a certain point. So there's some evidence that suggests North Americans were overall happiest in the 1950s. And even though incomes have doubled or trebled since then, there's been a decline in the numbers of people reporting themselves as happy or very happy on various indices in the literature. So again, you have to ask yourself, what would an intelligent species do?

So we have all of this evidence that rising rates of consumption are destroying the planet, which will ultimately result in huge problems for all of us, yet we insist on growing, which is causing that problem, even though there are no objective or subjective indications that those of us who already have reached some critical income level are benefiting from further growth. So if we were truly a rational or intelligent species, we'd be looking for two things. Where is that income level at which we max out in terms of our felt well-being as well as population-health indicators? And secondly, what is the optimal scale of the global economy? How much throughput, how much energy and material can move through the economy without drawing down the critical capital, the natural productive capital, or filling up the waste sinks? So what we need to do is to identify the optimal scale for the global economy, and then allocate it among different countries on a fair basis, and determine how we're going to live within the limits of the planet. Because if we don't do that, it's going to take us down.

In many ways, the collapse of the North Atlantic cod would have been devastating to Newfoundland, had there not been someone else ready to bail them out, right? Are we still paying $425 a month for each family affected by that collapse? If there hadn't been that external source of succour, then Newfoundland would have been in a tragic situation, much worse than it already is.

CAMERON:
Well, now it's doing fairly well, and it's the consequence of oil.

REES (35:39):
But again, that's another depleting source. So it will rise to a certain point, and then "bang!" it will be left just as high and dry when the oil's gone as it was when the fish were gone. But economists say, "Well it doesn't matter; they'll find something else, making computers or whatever it might be." But how long can you keep doing that? How long can you keep serially destroying, over-exploiting, resource after resource after resource, before the whole global system begins to unravel? And that's the concern that many ecologists have today, that with increasing species loss, with increasing destruction of major resources that provide the life-support functions of the planet, that we're going to reach some tipping point beyond which we can't recover. Climate change is perhaps the most obvious area in which that's a real possibility.

CAMERON:
You introduced a concept here that I think it's important to sort of dwell on for a second, because somewhere you talked about the optimal size of the world economy. You're basically saying there ought to be such a thing as enough.

REES (36:45):
Oh, absolutely.

CAMERON:
That's not an economist's perspective, is it?

REES (36:49):
No, an economist's perspective is our material wants are insatiable. And you know, there's some basis for that. I mean when you buy a new car, you're thrilled, and for the first month you wash it every third day, whatever, but after a while, it's just a car. And so, what happens then, biologists talk about satiation: you reach a point where you are satiated with a thing, so you have to move on to something else. Well, there are all kinds of ways in which we can either encourage or discourage this kind of thing.

So in the post-war period, building on the ideas of a guy called Edward Bernays. Bernays was a nephew of Sigmund Freud, and he knew that we could appeal to people's subconscious wants and desires. And he used this information between the wars to convince North American corporations that they could increase market share by making people feel that they needed things they didn't really need at all. And in the post-war period, we had all of this under-employed labour, returning soldiers, and under-utilized capital, factories that had been making guns and ships and equipment lying idle in the post-war period. Well, let's get that capital and labour together, to produce stuff. Well you also had a population that had been effectively trained by the Depression and the rationing of the Second War to live on very little. People were happiest then, by the way. They had come through this period of deprivation; they had learned and adapted to living on not very much, and suddenly they're being told they've got to throw stuff out.

So the consumer society was an invention of the North American industrial enterprise, and the public relations and advertising industries, to convince people in effect, to quote one marketing expert, we have to make a religion of consumption—to burn up, throw out, and use up stuff as fast as possible—to

put this incredible, potentially productive economy in place. And so we literally, sociologists claim, we've socially constructed consumer society—the throwaway society—and made of people instead of being active citizens engaged in our communities and in our governments, we've become passive consumers who are trained to respond, you know, with bright eyes and competitive glee with each other, to purchasing the newest gadget, whatever it might be. So, we've got to reverse that. We can use the same technology, the same…by the way, this is social engineering, and most people…

CAMERON:
So was that.

REES (39:43):
Of course it was. And people today are not aware, I mean they're appalled at the idea of propaganda; they'd be appalled at the idea of conscious or deliberate social engineering. But the point I'm trying to make is, that the generation today is the single most socially engineered group of people ever to inhabit the planet. And they're not even conscious of it. But the point of it is, that with the Internet, with television, with radio, with all the massive capacity for communications that we have, if governments were to take seriously the human dilemma—the dilemma of climate change, of ecological change—we have at our hands the means by which to turn things around in a generation or so. But it would be a very, very difficult task. And by the way, there's no incentive to do it. Corporations have an enormous incentive. The advertising industry in North America, the largest on the planet, is tens of billions of dollars. But they get back all of that and much, much more. Not many people are going to want to put money up to slow the economy down.

CAMERON:
Except as the crunch really comes at some point.

REES (40:53):
Yeah, well what most of us who work in this domain are trying to do is to get people to understand the nature of the dilemma before the crunch comes. You see, I hate using the Titanic as an analogy, but it's a good one. There's no point in standing on deck and pointing out the iceberg if nobody's going to pay any attention. If we wait until we've struck it, it's too late to do anything. You know, you've got two hours before the ship sinks; it may be two decades, but is that really where we want to go?

So people are very odd animals. We don't want to respond to something until it is clearly a crisis. Nobody is going to believe in global warming until they are up to their knees in water in their own living rooms. You see, so that's our kind of instinctive response: it's a very short-term, reflective, self-interested response. We are endowed with an intellect that knows that that's probably stupid, but our intellectual capacities haven't developed enough to overcome our instinctive capacities to stay put and look after number one right now in the short term. We are very bad at planning for the future, even though that's what planning is all about.

CAMERON:
What do you do?

REES (42:08):
We have evolved, as economists would call us, discounting. We discount the future. So damage is often the future of very little weight in the present-day calculus. We know it's wrong, but we do it anyway.

CAMERON:
See, here's where I think, when I look at the work of Bill Rees, and I have not looked at it profoundly, but even on a fairly quick view there seem to be two huge things that stand out. And one of them is the ecological footprint as a way of understanding some of these relationships. One of the phrases that you use somewhere along the line that I like very much was the quasi-parasitic relationship between advanced nations and Third World nations. But the other one you've tackled is the huge lethal paradox that we know what needs to be done, and we don't do it. And then that's even at an individual level. I mean somewhere along the line, you mention the situation where you're having the hors d'oeuvre, and you think, "Well, I've had enough," and five minutes later you find yourself nibbling at them again. But you relate that to evolution, right?

REES (43:14):
Yeah, well it's a very, very complicated question obviously. Human beings are a species of organism. And we share a number of things with every species of organism. If we had a Petri dish here, of nutrient agar, and we drop a single bacterium into it—it doesn't matter what species—it will do the same thing. It will start to use those resources to replicate. And within a very few days the entire dish is covered with a colony of bacteria. They've used all the resources; they sporulate and go off to find another Petri dish. So every species has that capacity, and the innate ability to expand, to fill all the available habitat. Humans are more successful at this than any advanced vertebrate animal. You can't find a patch of habitable landscape on this earth any longer that isn't occupied by people. So we exhibit exactly that tendency to expand, and to fill all available habitats.

But organisms also tend to use all available resources, and we use the same rationale that I'm sure is being used in other species: "If I don't use it, somebody else will." I mean, it's logical. And if you go back a few thousands years, when there was no refrigeration, no means of storing things that was effective, you would probably eat every fruit you possibly could on the tree, right now—pack it on your backside as fat—because if you didn't do it, the next person or tribe or whatever through this area would. So we have a strong built-in incentive to consume as much as we can right now, a tendency to use all available resources. And that tendency was a perfect adaptation 10,000, 50,000, even five or six thousand years ago. We still have the tendency, even though it's now maladaptive.

So we are out there, like every other species, driven by subliminal, subconscious tendencies to expand and to consume. And the idea that you go to a buffet—I've done this a thousand times, where, "Oh well, those are really good; I'll just have one; I don't want to spoil my dinner." And even without thinking of it, I'm back at that buffet, 10 seconds later, 10 minutes later, having yet another. I'll make the same little game with myself. Well, we are driven by those kinds of propensities. It's one of the reasons why obesity is such a huge problem in North America, at least among the rich; there's another reason for obesity among poor people. The point is, then, we share these common properties with non-human species.

At the same time, we are in a competitive environment. So that exacerbates the tendency to over-consume and to expand. When the ice disappears from the north in Canada—in fact it's already disappearing, the floating ice in the Arctic—we should stand back in horror, because this implies that global warming, climate change is accelerating. But we're not. Instead, we can hardly wait to get research vessels up there to map the ocean floor, to stake a claim to the remaining oil and gas reserves that are causing the problem in the first place. So wherever you look around the planet, in every resource domain, the same old stuff is coming out. The overriding of that primitive urge to expand and get all the resources we possibly can, and consume the oil to the last drop, at whatever risk.

The blow-out in the Gulf of Mexico recently is a perfect example of the hazard associated with deep-water drilling. And yet we'll do it anyway, just to get that 8 billion barrels, or whatever it might be. By the way, that's one year's supply for the United States, and there's not nearly that much oil down there, and look at the risk we took to get it. So we are driven in that way, we know that we're driven in that way, and yet we don't seem to be able to organize ourselves socially to put a stop to it. Any country that goes it alone, acting intelligently in the face of the data, would be overrun by all the others scrambling to do the wrong thing. So our government in Ottawa constantly uses the excuse for not having a carbon dioxide reduction policy, "We can't harm our competitive position in relation to the United States. We'll wait and see what they're going to do." Well, of course the United States being pressured by its own corporate lobby groups, has all but abandoned its effort now to get even the most marginal of climate change legislation through Congress. So we're competitively stuck in a position that is killing us all simultaneously.

CAMERON:
Now you relate this to three levels of brain development, and to the tension among the three levels, and I thought this was an extremely revealing analysis.

REES (48:12):
Yeah. What I'm drawing on there is an idea, I guess going back to MacLean, [Paul] MacLean, who coined the term the triune brain. Now some people think this is oversimplification, but the general pattern is clearly there, that human beings have the most advanced neurosystem of all organisms. We share with all vertebrates, at least advanced vertebrates above reptiles, something called the brain stem, reptilian brain stem. And this is the seat of our instinctive behaviour, our territorial behaviour, fight or flight responses, the release of adrenaline, and all of these kinds of things over which we have no control whatsoever. So basic survival instincts, which obviously were necessary for reptiles, well, we've still go that. The brain has evolved by adding layers, as opposed to disposing of the earlier models and coming up with something altogether new.

So think of crude instinctive survival behaviours as existing in the reptilian brain stem. Very infrequent parental control, or parental care—the eggs are just laid, and so on. So there's not much going on there except basic survival. The mid-brain, or so called paleo-mammalian brain, the old mammal brain, introduces emotion for the first time. And we see in other mammals, and in birds for that manner, emotional responses, much higher levels of parental control, evident pair bonding and so on and so forth. The next level up is the cerebral cortex, which is more highly advanced in humans than in any other organism. So we have instinct in the reptilian brain stem, emotions in the mid-brain, and then the

intellectual sphere in the higher regions of the brain, the cerebral cortex, which in humans is about two-thirds, by volume, of the human brain. So we have unique capacities endowed upon us in that brain—the capacity for intelligence and logical reasoning, the capacity for moral judgments, the capacity for planning, thinking ahead, and so on and so forth.

Now my argument is that these things have come upon us relatively late in the evolutionary sequence. So you could say that there's tens of millions of years of testing the basic instincts that operate at the level of the reptilian brain stem. There are millions more years of testing the appropriate emotional responses to various circumstances associated with the mid-brain. But intellectual activity has only a few tens of thousands of years at best of being tested as an evolutionary strategy. And almost inevitably—and always in situations where there's a threat, or a perceived threat to our safety, our social status, our political status, our wealth—we act out of the lower centres rather than the intellectual centres. And you can understand this on a very simplistic level. If I see a tiger running at me, I don't have time to sit down and work out all of the possible intellectual options that might be available to me in dealing with this tiger. I act instinctively. I'm up the tree as fast as I can, or I shoot without thinking. Whatever. And that's basically, it's a caricature, but it's not far removed from how we seem to act in these other domains.

So we see the threat posed by climate change, but we're not going to do anything, because it threatens our current economic status in a competitive global environment. We don't have the capacity to move beyond those instinctive responses to threats to our perceived political positions, wealth, and so on and so forth. Now I'm oversimplifying here, but I think it's undeniable that these factors are at play. Neurobiology shows it to be the case that the human intellect is constantly at war with other urges. If you think of it in these terms, many of our instinctive qualities, we've created legal frames to attempt to overcome them. So marriage is an institution that attempts to civilize people, to stop them from being what we naturally are, which is polygamist. OK? Well that won't do, if you want to have a stable culture. So you need to erect a cultural framing of that issue, that suppresses or overrides the natural, instinctive kind of behaviour.

And what I'm arguing is, we have to recognize there's a huge domain of instinctive behaviours out there that are currently controlling our economic and political behaviour as it were. And that we need to erect on an international basis, a series of formal, legal institutions and laws that will restrain that kind of behaviour, so that we can come together at a much higher lever, an intellectual level, and work out the plan for the future. There has to be a global plan, not just a competitive scramble to use up the last remaining resources. And I guess I'm passionate about this because we're seeing in history the results of our failure to do this. I mean societies that continue to be driven, and who continue to ignore the writing on the wall, as it were, are prone to collapse. And I think we're now a global society, and there's nothing that makes us so different from earlier cultures that we won't also collapse, should we pass over some tipping point beyond which there's no return.

CAMERON:
But if we do it this time, we do it for the whole species, not just for a local society.

REES (54:21):
Well, yeah. I mean that's true in two ways. First of all, it won't do—Canada could become, in theory, an

ideal sustainably behaving nation. But if the rest of the world carries on, we'll go down with it, right? So there's nothing in it, for any one nation to go it alone. Which should provide, again, this is the intellect operating: if we can't go it alone, and we're almost certainly doomed in the competitive struggle for remaining resources and so on, then this is insane. The only way out is to come together, and to form some kind of mutually assured—I mean, this is what it is, it's mutually assured—survival, as opposed to mutually assured destruction. And we need to create, in our common interests, the kind of international framework that will reorganize the global economy so that there's adequacy for all, and therefore sustainability, instead of attempting to bring everybody up to an impossible material standard that the planet can't support. And we either do it or we don't.

Let me make one other point here. You see, throughout the evolution of any species, the individuals act in ways that enhance their own survival, and their capacity to have offspring. So we are very finely tuned to satisfy our individual self interests. This may be extended to the tribe. So you know, we're still tribal. That's why nation states exist. That's why we still have religions. That's why different ideologies will go to the wall. They are fighting for common interests that are shared by members of that tribe. Well, the point is that for the first time in the evolution of humankind, it may well be that my individual best interests are served by serving the common interests of humanity at large. So that if every nation, and every individual within every nation simply tries to satisfy their own short-term, utilitarian relationship with the planet, it's doomed. We will just consume everything, and compete. There'll be resource wars, and all the rest of it.

But if we recognize that that's the case—that by following our highly adaptive, 50,000-years-ago tendencies that have become maladaptive today, we first of all have to recognize that this is a maladaptive trait today because the environmental circumstances have changed. That means we need to go to the next level up. So for the first time in the history of our species, my individual interests have converged with the common good, with the interests of the community as a whole. Sustainability is a collective problem. It needs to be solved at the level of collective governance. We can't solve it as individuals; we can't solve it as individual states.

CAMERON:
And you've also identified a second maladaptive area, and that's the area of what you call memetic maladaptions, right? Cultural maladaption, the problem of narrative, as you once described it.

REES (57:34):
Yeah, we've kind of touched on this in the earlier conversation, but I mentioned that humans are like other species. We have a natural propensity to expand and use all available resources. Well, in the worst of all possible worlds, and I think that's where we are right now, the culture in which we are embedded will reinforce those tendencies. So if you think of our current economics, it's a competitive economics. It makes the assumption that human beings are "self-interested utility maximizers" with fixed preferences and insatiable material demands. So it portrays people as greedy individuals who can never get enough, and that the only job of the market is to make sure that there is always a sufficient supply to maintain these people who have insatiable demands going. So this is our cultural narrative, if you like. It's the economic mythos around which we've created a whole society. So it tends to reinforce the now maladaptive tendencies that we have inherited as living beings that have been so successful in bringing us to this point.

Now, what could be worse than a world, driven by its primitive instincts to expand, to compete and to consume everything, to have a cultural narrative that says growth is possible, and the only thing the economy needs to do is to get more efficient, and to create markets and means by which we expand, expand, expand, and expand? Well, when you have the the cultural narrative, or the memes reinforcing the genes, then you've got the worst of all possible circumstance. A meme is simply a nugget of cultural information, a set of beliefs, values, or assumptions. Ideological paradigm is a meme or a meme complex. So we now have genes that are driving us to expand, and cultural memes that reinforce that tendency.

Sustainability will only come when we understand the nature of our genetic drivers and create counterweights in the social domain. Culture is the primary driver of human evolution today. But if we have a culture that is reinforcing the worst in maladaptive tendencies, it can do us in. So we need to take advantage of our cultural evolution, which is much more rapid than our genetic evolution, to override the maladaptive genetic tendencies and to create the kind of stable, steady state configuration that ecological economists think is necessary.

CAMERON:
Which brings you out, at the point of saying again, the way you have said in the past, that the environmental crisis is less an environmental and technical problem than it is a behavioural and social one. Because I take it your view is, this is not insoluble if we could get our behaviour in order.

REES (1:00:35):
No. Technically, it's a soluble problem. We know exactly what we need to do. Well, not exactly, but we know generally what we need to do. And we're dealing here with complex individual behaviour, social behaviour, the behaviour of groups, which is quite different from individual behaviour, and political behaviour. And again, we've known about the basic dimensions of the problems we're confronting here for a very long period of time.

A wonderful book you can download from the Internet is called *The Crowd: A Study of the Popular Mind*, by a French psychologist [Gustave Le Bon] in the late 1900s. The late 1800s, sorry, the 19th century. And it's all about how mob behaviour, which by the way is what advertisers take advantage of in exploiting our desires for this, that, or whatnot. Another marvellous book is called *The March Of Folly* by Barbara Tuchman, who is an American historian. And the folly she's referring to is the lack of intelligence in government. The fact that over and over again—she goes right back to Troy and takes it all the way up to the Vietnam era in the United States to show that time after time after time, governments implemented policies against the long-term interests of themselves or their people. In spite of the fact that alternatives that were clearly better were known, they did it anyway. Why did they do it? They did it to protect the political status of the individuals involved, the corporate wealth of the backers of the individuals. So we act in a kind of cage here, where the intellectual knowledge of what should be done is overridden by these primitive instincts to protect our individual status in society or whatever it might be. And she laments the fact that it just doesn't ever change.

And of course it doesn't, because you are dealing with people. And until people come to understand what it is that truly motivates them, and the decisions they are taking, we don't have a hope of

changing those very motivations.

CAMERON:
You've got a lack of self-knowledge, coupled with a set of narratives that are desperately counterproductive. So the point of attack in a way would seem to be the cultural narrative.

REES (1:02:58):
Absolutely.

CAMERON:
That would be the point where we have the possibility of evolving fast enough to make some real difference.

REES (1:03:04):
That's what I've been arguing in a lot of my recent work, that until we are prepared to examine the fundamental underpinnings of the prevailing cultural narratives—including our economic narrative, our competitive relationship narrative and all of that—until we begin to examine what they are all about, and understand their role in driving the ecological crisis, it's not going to go away. So we really do need, in fact it's a privilege if you think about it: This may be the first generation that self-consciously takes up the pen, in allegory here, and rewrites its cultural narrative for survival. So all the others have simply evolved over time. Here we now have a crisis that our intellect at least tells us is upon us, and yet our behaviour is so disconsonant with that impending crisis. We need to examine what is it in our cultural narrative that is causing that spread—it's partly the cultural narrative—and then rewrite that narrative so that it comes into consonance with the nature of the crisis upon us. And it's a huge job.

We can look at the controversies that come out over something like climate change. There you have a group of big coal, big oil, who have literally rewritten the narrative so that people don't believe climate change is real. So there is an enormous, a multi-billion dollar campaign going on, because the corporate sector knows very well how important it is to in effect change the narrative so that it favours what they are doing and is against the broader and common interests. So what I'm saying is not impossible. It can be done. It is being done, but it's being done against the interests of the commonwealth. It's being done in favour of the people with the greatest stake in the status quo.

So one of my colleagues in the States has identified something like 700 new think-tanks that have been founded in the last few decades for this specific purpose of denying global-change science, particularly climate-change science, and to create such a sense of doubt among the public that no significant policy action can be taken to change it around. Well, that protects their corporate interest. They've rewritten the narrative. They've made it sound as if climate scientists are a bunch of maniacs. And so people deny what they can see with their own eyes around them in favour of this belief that nothing's happened. Created through the social engineering of think-tanks under the rubric of trying to deny climate science.

CAMERON:
At one point you mention—it's really striking—you mentioned the gap between the front page and the business page. You look at the front page and there is the Gulf oil catastrophe, and there's the floods in

Pakistan, which I would guess are related to the melting glaciers. You know, the waters of the Arctic are becoming visible; a big chunk of ice has dropped off Greenland—this is all on the front page. And on the business page you don't believe they'd be on the same planet. There is no sense of this reality at all.

REES (1:06:32):
That's right. I think there is a complete dissonance between what we are willing to entertain, news has almost become entertainment. But what we really do is in the business pages. I mean that's where the heart of enterprise goes forward; that's where our government takes its cue. So we don't seem to be able to make the connection between the large-scale global changes that are apparently taking place around us, and the business-as-usual stance that the governments take. Many would say this is symptomatic of clinical denial; we're in a state of denial about the nature of our reality. We are so entrained in thinking a particular way, that the observations that something has gone awry are taken as kind of curiosities. Or if we accept them, then we are confronted with the wall of denial that emerges as an official policy of big coal and big oil to put that stuff aside. So I think it's a pretty good illustration of the kind of internal tension that exists between our instinctive and our intellectual capacity to cope with the world.

There is another element here. And that is that cognitive psychologists, cognitive neurologists, have discovered in the last couple of decades that as the individual brain develops, a person growing up in a particular cultural environment will repeatedly hear certain values, certain beliefs, certain cultural norms. And over time, the repetition of these things becomes literally a part of the hard-wiring of that individual's brain. What I'm really saying here is that in the course of the first 20 or 25 years of a person's life, social experiences, environmental experiences that are repeated over and over again literally help to shape the synaptic circuitry of the brain. So that by the time you've reached early adulthood, you have acquired a set of circuitries or neural networks that like to be reinforced. They release the pleasure hormones when they are reinforced. So we have a situation in which people tend to seek out experiences that reinforce their already existing beliefs and values, and to reject experiences, deny experiences that tend to conflict with those norms.

So if you can imagine—we do this generation after generation—what our schooling does, what our economics schools do and so on and so forth, is train people in a particular way of thinking about reality. And they acquire what we call a paradigm, an academic paradigm. It can be a religious dogma, it could be a political ideology. Once it's in place, it becomes really difficult to dislodge it. Now again, this is the biological quality that interacts with our cultural environment. If you think back a few thousand years, when people lived in small tribes, there was a real advantage to an individual learning and having embedded in his neural circuitry the beliefs, values, assumptions, legends of the tribe. So that after all, if that group was surviving, it must be doing something right. So for the individual to acquire a successful strategy for negotiating his or her way through the world, was an adaptive thing.

Well, leap forward. We are the same animal, basically. We still go through that process of having our cultural norms in a sense ingrained in our brains. But now it's maladaptive. If we're in a situation with a prevailing—we talked earlier about the prevailing cultural narrative; it's all part of that. If that narrative is dissonant with the rest of the world, with the nature of the reality within which we find ourselves, it's going to cause us to ignore those things which threaten the narrative. So going back to the newspaper,

all of those horror stories on the first page are clearly threats to the business pages, which is really where we live. I mean that's the kind of narrative that we all want to talk about—the growing economy. We think of an economy that's growing at three per cent a year as a bit sluggish. Two per cent is almost...and if it's in recession, it's a horror show. But two per cent per year growth is a doubling in 35 years, which may mean an almost doubling of our impact. So this is an insane policy, and yet it's the one to which we are wedded, right? Intellectually, in terms of our political ideologies, even the religious right in the United States would pick up on that.

So we have many, many forms of cultural reinforcement of a particular neural circuitry, that encourages behaviour that keeps us stuck in the status quo. And that means that we tend to trivialize or marginalize the various signs that we are going off the rails. And hence we are all in a sense in enormous tension between the intellect and the more hard-wired and instinctive parts of the brain.

Cameron:
This isn't a very hopeful scenario, doesn't yield a very hopeful scenario, you know?

REES (1:12:17):
Well, you could think of it that way. I vacillate between completely unrealistic optimism and utterly depressing despair. But the optimum, I don't like the word optimism—optimism, pessimism, they are states of mind that don't have anything to do with reality. But what we can be is realistic. And the realistic thing is to say, look here, it's kind of, you would say pessimistic to think of the way these things operate. But knowing about them gives us the opportunity to change them. So if a hard-wiring, or if the cultural narrative, beliefs, values, and assumptions within which a person grows have a real influence on our behaviour, because it becomes entrenched in some neural circuitry, then let's create the narrative that will be constructive in the circumstances in which we find ourselves. And that's the only way cultural progress occurs.

If you don't adapt to changing external or exogenous circumstances, you will go down. And if you read a book like Jared Diamond's book *Collapse: How Societies Choose to Fail or Succeed*, those societies that succeeded, small as they were, were cultures that were able to examine their core values, were able to connect them to the problems they were having, and then to toss out those core values and replace them with something that conformed to the nature of their new reality. They survived. But cultures that insisted on the maintenance of the status quo—"I don't care if that's happening, I'm going to keep; it was good enough for my dad it is good enough for me"—that kind of attitude is sure death, and certain collapse for a culture in a rapidly changing environment.

So what I'm saying is that in many ways we've been pre-adapted, both culturally, and biologically, for a fairly static situation in terms of the external environment. And so it's not surprising that we tend to retain behaviours that were successful in those kind of environments. It's not surprising that the learning that goes on in our society creates the neural circuitry that reinforces the status quo. It was an adaptive strategy. If you are in a culture in which the exogenous, the outside environment—in this case the climate and the ecosphere—is changing very rapidly, if you aren't able as a culture to track those changes and to maintain yourself in relation to those changes in ways that guarantee your survival...it's what we mean by resilience. If you can't be resilient, you are dead. And unfortunately, we see very little evidence on a large scale of cultural resilience in the face of global change.

CAMERON:
And that may be the place where we need to put our efforts.

REES (1:15:09):
Absolutely. And that's why I—there are so many small marginalized movements around the planet now, everything from back to the Earth to, you know, voluntary simplicity. These are kind of little life boats. The Titanic is blasting along, but a few people are getting in lifeboats. And if the Titanic goes down, then maybe there'll be sufficient wisdom among survivors in the life boats to see us through for yet another round.

CAMERON:
I find that theme in a lot of people that I talk to on this project that have the sense that it may be impossible to stave off a very large catastrophe in terms of human numbers, but there may be fragments of the population that survive in these kinds of ways, and that those will be the ones that are the points of light for the next phase.

REES (1:16:01):
Some people say it's the end of the Earth, or we're going to destroy the planet. I don't believe that at all. I mean, first of all, life will go on. There's almost nothing we can do to the planet to eliminate life. Maybe 10 billion years from now, not billion, in 10 million years it may be as productive and wonderful as it was before the industrial era. We could conceivably extinguish our own species, if we got into a nuclear conflagration over the remaining oil reserves or for any reason at all that relates to these primitive instinctive responses; that could do us in, make it impossible to survive as a species. One problem is that, and I think it was Hoyle a long time ago, pointed out, his words were something like "civilization is a one-shot affair," because we've used up all of the available energy, we've scattered the resources and so on and so forth. Well if we keep this intact, and learn to tap into the sun, we might be able to keep the whole thing going. But if we destroy it in some kind of great nuclear, you know, outrage, then there'll be almost nothing left with which survivors could reassemble global civilization. At least it wouldn't be nearly as easy as it has been for us.

So there is a real possibility that we could completely eliminate the possibilities for global civilization. We won't destroy the planet. We could destroy ourselves in that sense. What the neural psychology tells us is that it is possible to rewire, to retrain the brain. We have a lot of expressions in English that reflect this view: you can't teach an old dog new tricks, people do become habituated in the way they think and so on. What the psychologists say is that although you can retrain people, it's very difficult. It is very difficult for people to give up cherished beliefs, for a scientist to abandon the paradigm on which he's worked forever. It took a long time for people trained in the Newtonian mode of physics to think highly of Einstein, and certainly the new physics around particle physics and quantum mechanics and so on. Very difficult paradigms for people trained in the old way to accept.

It's the same in other disciplines—whole books written about it. *The Structure of Scientific Revolutions* by Thomas Kuhn was all about what it takes to push one old idea out of the way when a new and better idea emerges. It's a very, very, difficult thing. So here is the problem on a cultural level. When there are competitive reasons to stay in place and all the rest of it, it seems even more difficult. It would

be tragic, and this is one of the things that does move people to accept the new paradigm, the new way of thinking, is catastrophe. So denial is most easily broken by catastrophic events. So I have to say, I'm among those people; I sometimes find myself wishing for a catastrophe that doesn't actually derail the whole system, at least wakes it up sufficiently to make it easy to facilitate the kind of shift that we need. So once we're trained in a particular way of thinking, once that neural circuitry is in place, it is difficult to shift. But catastrophe is one way to make it happen fairly quickly. Unfortunately for…

CAMERON:
For those involved.

REES (1:19:39):
That's right.

CAMERON:
But you know, for that to work, there has to be an obvious link between the catastrophe and the new paradigm, the fear of the old paradigm. And I think one could make a pretty good case that we've seen that already. A good example would be New Orleans. We've known for a long time that New Orleans was below sea level; we've known the sea level is rising; we've known they stripped away the coastal defences; we've known the hurricanes.... I mean Katrina should not have been a surprise, right?

REES (1:20:07):
No. And indeed it wasn't. It was foreseen, and two or three very detailed papers predicted almost exactly what happened.

CAMERON:
But it's not connected in people's minds to these larger issues that we've been talking about.

REES (1:20:19):
There's a great deal of public ignorance there. I have to say I'm sometimes asking myself whether if that had been New York, we wouldn't have seen a more active response on the part of the U.S. government. There is a racial element here that I don't think we can deny: that it was relatively poor, and mostly a black population that suffered the worst consequences of the Katrina disaster. So there has to be some, well like 9/11. Now 9/11 was a trivial event compared even to Katrina. And yet it galvanized the entire United States because there was—I mean who would dare attack the United States? It brought forward all of those tribal instincts in defence of the home domain. So it was such a powerful response, precisely because it tapped into not only the cultural narrative of the United States' utter supremacy on the planet, but also it threatened the fundamental survival instincts at the very level of tribe: "I mean, we are being attacked." And because of that it's a perfect illustration of many of the things we've been talking about.

The Bush administration was able to fabricate an entire scheme of lies around why they went into Iraq, justified on the basis of the 9/11 attack and so on and so forth. No truth to it at all, but it didn't matter because the nation was already primed by these previous events to go with the tribal interests as defined by their government. So again, it's the kind of small catastrophe—I mean yeah, I have a great deal of [sympathy] for the 2,000 or 3,000 people killed there, but goodness we killed hundreds of

thousands of innocent civilians in Iraq in the subsequent...we never hear about them. The point is though, that event was the kind of galvanizing catastrophe that brought the whole nation together to spend billions and billions of dollars on a particular issue. If a fraction of that were put into alternative energy, or dealing with the climate-change issue, it would have an astonishing effect, particularly if it were a global virus that started moving, and that's what we need.

We need something like an ecological 9/11 to galvanize some major nation like the United States into taking that kind of action. In fact I've often fantasized, what would be the effect of the prime minister of Britain, or even Canada, but particularly the president of the United States, standing up on the world stage and saying, “Look, we have really screwed up. Our economic paradigm is completely incompatible with the nature of biophysical reality. We need to now begin a fast-track program of global reassessment and what it means to be a globalized civilization, and to work toward the kinds of things that we've been talking about.” It might have an incredible impact, but I haven't seen anyone…

CAMERON:
But something would have to motivate the president to do that. And there's your 9/11 again.

REES (1:23:33):
That's right, there's my 9/11. I mean, the simple reality is, that even this extreme summer we've had—Russia has gone right off the charts in terms of its [temperatures]. It's statistically possible that it could have happened without any human intervention. So it's not until you've reached a certain, I mean if you get a dozen statistically remote events happening all at once, it's pretty clear there's something else going on there. But when you see individual events like that hurricane or this heat wave, it's very difficult to make that formal connection to something much bigger than that. But if we were to see, you know, massive meltdown of the Greenland and Antarctic ice caps simultaneously and a doubling or trebling of the rate of ocean-level rise, that might be a sufficient connection to get people to realize that hey, there is something to this climate change. But so far, no go.

CAMERON:
Bill Rees makes a habit of asking the really difficult, really searching questions, and trying to quantify the answers. He’s a leader in the worldwide movement to find better answers by taking better measurements. If you enjoyed this interview, you may want to check out our interview with Ronald Colman, about the Genuine Progress Index, and our interview with the Prime Minister of Bhutan, Jigme Thinley, whose government uses these measurements to assess Bhutan’s progress towards a sustainable future. The Green Interview is produced and directed by Chris Beckett, with the generous co-operation of Mount Saint Vincent University in Halifax, Nova Scotia. For the Green Interview, I’m Silver Donald Cameron. See you next time.

[End of Transcript 1:25:24]