



At a meeting of the World Federalists, guest speaker Dr. William Rees gave this speech standing, without notes. It shines with clarity, developed form decades of lecturing, in the field of his passion, which he himself developed – the “ecological footprint.” Rees is a professor at the University of British Columbia, Canada – and a Fellow of the Post Carbon Institute.

It is no exaggeration to say that Bill Rees has taught and inspired at least two generations of students, ecologists, and environmentalists around the world. Here he outlines the condition of humanity on a small planet, with thoughts on how both can survive.

The recording is from April 14th, 2010 at the Unitarian Church in Vancouver.

## IS HUMANITY (INHERENTLY) UNSUSTAINABLE?

"We have a lot to cover. I have to say at the outset, that some of you will be uncomfortable with parts of this. It's not easy. But I don't apologize for that, life isn't easy, and we are clearly going through quite a difficult period, as a species on the planet right now.

I've spent a fair amount of time thinking about these ideas. And in particular, as an ecologist, I've spent a lot of time measuring the kinds of things that are indicative of human kind's relationship with Nature, the rest of the ecosphere. And through that whole period of my career, I think it's fair to say that things have been going downhill at an accelerating pace.

It's not as if we are ignorant of this. We've known about it for some time. The environmental movement is 50 years old, even as old as my career. So it's not news to anyone. We advertise ourselves as an intelligent species, a species capable of logical thought. We pretend we are capable of forward planning. I teach in a planning school. We act as if we are compassionate toward others. Recently there's been a great interest in human compassion.

And yet if you look at the way we behave on the international stage, there's not much evidence of intelligence, forward planning, or compassion. And I think perhaps the most recent global example would be, in my view, the gross failure of the Copenhagen talks around climate change.

So the question, to me, is what is going on here? Why is that our self image, this notion that we are evidence of intelligent life on Earth, seems to deviate so much from the facts of the matter?"

[Rees begins with an early warning, following the 1992 United Nations Conference on the Environment. It is a statement by the Union of Concerned Scientists issuing a warning to humanity.]

"Many of the Nobel Laureates in science signed on to this particular document but the bottom line is pretty clear: 'A great change in our stewardship of the Earth and our life on it, is required if vast misery is to be avoided, and our global home is not to be irretrievably mutilated.'"

[Dr. Rees says this warning had no effect whatsoever. He moves to a more recent statement, from the Millennium Ecosystem Summary Report, in which Rees participated, along with 10,000 other scientists. It was the largest study ever taken of the world's ecosystems. It warned that:

'human activity is putting such a strain on that the natural functions of the Earth that 'the ability of the planet's ecosystems to sustain human endeavor can no longer be taken for granted.'

"The problem is: if we plot the actual impact of human kind on the planet, you cannot see any evident of an awakening, of a coming to consciousness, of the reality of that relationship, if indeed it is real."

### OUR ECOLOGICAL FOOTPRINT

"This is just a plot of the human ecological footprint. Now this is something that I've developed with my students. I want to define it for you. Your ecological footprint is simply the area of productive ecosystems required to produce the resources that you consume, and to assimilate your waste output.

And it's an exclusive area. Obviously, the grain land that you use can't be used by me. So we are all competing with each other for the limited bio-capacity of the planet, whether we are conscious of it or not.

Here is the simple reality. The average human needs about two hectares to sustain the average life-style on Earth. That includes the assimilation of carbon dioxide and other waste, but primarily it's consumption in the Third World. Waste production enters in to this very much in the First World.

Canadians use about 8 hectares. So we are four times above the world average. Americans almost 10 hectares, about 5 times above the world average.

The point then is, that the world is growing in population, the per capita input in consumption is increasing even faster. And so we passed sometime in the 1980's, the point at which the average consumption on Earth exceeded the average capacity on the planet to maintain that level of consumption.

So if you add up the total aggregate human ecological footprint, it is greater than the biocapacity of the planet.

Now you can ask 'Now how can that be? How can we be consuming more than there is?' And the answer is by drawing down the bank account.

Ecosystems are like bank accounts. They are productive assets. A fish stock will produce an annual interest of catchable fish, without being depleted. A forest adds a couple of percent a year, of total biomass. We can harvest that sustainably. But if you forest is adding biomass at a rate of two percent per year, and you are harvesting at four, and five and six percent per year - you are depleting that asset. You've exceeded the productive capacity of the forest, or the fish stock, or the soil, or whatever it might be.

So we are in a state of overshoot, exceeding the productive capacity and assimilative capacity of the planet. That's what climate change is all about. More carbon dioxide is produced than can be assimilated by the photosynthetic processes of the green plants. And for that reason, we can be in a state of overshoot for some considerable time before a collapse is induced.

Things are getting worse. This is a quote from a paper just a few months ago, well I guess toward the end of 2008... It was one of the very first papers in the science of climate literature which actually made a political statement. Scientists generally refrain from getting engaged in political debate. They like to believe that their work is value-neutral. They simply put it out there to be assessed by the people and by politicians.

[ECONOMIC COLLAPSE REQUIRED] [8:00]

In this case, Anderson was slapped on the wrist for having gotten his nose a little bit too far into the political pie. But the point is that the statement stands as a pretty remarkable one in the scientific literature. This study indicated that by examining previously unaccounted for sources of carbon emissions, and a number of other things that aren't included in the standard model, that we are on a track to reach about 650 parts per million of carbon dioxide equivalence in the atmosphere later in this century.

The pre-industrial level was 280 parts. We are already at 390 parts, and the trajectory is an accelerating one. The rate of increase is increasing every year. At 650 parts per million, we can anticipate a global temperature increase, on average, of about 4 degrees Celsius by the end of this century.

To avoid this, they argued, that unless we can reconcile economic growth with unprecedented rates of decarbonization, - we need to be reducing by about 6 percent per year our use of fossil fuels - the only way to do this in the present structure of the economy, with current technologies, is to talk about a planned economic recession. A planned withdrawal from nature in the sense that we can not continue to sustain current levels of impact and expect to survive.

So if we go on to the next slide, this is what a four degree world would look like. The yellow and brown bits are areas that become virtually uninhabitable. The brown is desert, essentially. The yellow is much dried out. And you can see from this, that China, India, much of South America, Africa, areas where 3 or 4 billion people live, will become virtually uninhabitable if this particular model is correct.

[MASSIVE MIGRATION] [9:43]

This means massive translocations of people. Migrations of tens or hundreds of millions of people from their homes by the end of this century. We are by no means prepared to even discuss this kind of possibility in polite company. Certainly it's not something that the Harper government in Ottawa [Canada] would even allow to be brought forward for a point of discussion.

But I bring it to your attention because it is serious science. And just a year ago, Australia looked pretty much like this. The Southern part of the country which had never reached 40 degrees Celsius before, was seeing temperatures of 47, 48 degrees for example, in the Melbourne region. Eight of the ten hottest days in the instrumental record occurred in the same ten day period in Tasmania, the little island state at the very southern end of Australia.

So every now and then we see a portent of the future occurring locally. The problem is that if we see a four degree world, the kind of situation that happened in Australia a year ago will become more or less normal, if the science is correct.

And believe it or not, despite the enormous efforts, and hundreds of millions of dollars spent by big coal and big oil to deny the correctness of the basic science, there is no reason to doubt that the basic science - particularly the greenhouse effect, which has been understood clearly since the middle part of the Nineteenth Century, - there is no reason to hold it in doubt.

[EXPANSION OF THE TROPICS] [11:15]

Incidentally, in just the last 50 years, the area that we call 'the tropics' has expanded by about 275 kilometers on each margin toward the Poles. So as the Earth warms up we are seeing in the migration of species, in the shift of climate belts, the effects today. It's not a question 'Is global warming occurring?' It is occurring, full-stop, period.

You can dispute a little how much the human effect there is in that observation. But I think that the only what we call forcing mechanism sufficiently strong to explain the climate change observations to date, is the increase in greenhouse gases in the atmosphere since the beginning of the industrial age. There are lots of other factors, but none of them have changed nearly so much as that single factor, for which humans are responsible. So just think about that, if you are harboring climate change doubts, and try to reconcile it with your doubts.

[HOW CAN WE CLAIM TO BE INTELLIGENT?] [12:17]

Now, I started out in my introductory remarks, by asking this question: 'In the face of the evidence, and our non-response to it, how can we claim to be intelligent?'

We have this unique capacity for logical reasoning, for forward planning, for compassion toward other species, and other human beings. And yet we don't seem to exercise that very much.

No corporate entity, no national government, no major international organization has begun to take seriously, or at least to act in a way that reflects the seriousness of the scientific data that suggests that human beings are changing the nature of the ecosphere that may not be amenable to the future of human civilization. That's simply the facts of the matter as I see them.

The question then arises 'Why is this?' If we are all of those things, if we have these unique qualities as humans, and yet fail to respond to evidence that our own action is at risk, what is going on here? And so perhaps naturally enough, as a biologist, I fall back on my biological roots.

[THE BRAIN & THE LENS OF EVOLUTION] [13:48]

I remember reading, and having a light going on in my head, when Theodosius Dobzhansky - this goes way back to the '70's actually, wrote in a paper - it was a phrase in a paper, and then he put out a whole paper on this topic - that nothing in biology makes sense unless you can interpret it through the lens of evolution.

I argued that human beings are products of evolution. The human brain is a product of human evolution. Human social behavior - we are social animals. We are not individual animals, solitary organisms, we are social organisms. That's a fact, that comes to us from the evolved nature our neurosystems. We are not solitary, we are social organisms. Most of our instinctive behaviors derive from the brain.

So given that we are as much a product of evolution as a slime mold, there's no reason to think that everything in human affairs... nothing in human affairs makes sense except in the light of evolution.

Now, I am not for a moment saying that's the only quadrant in which we can extract valuable information to explain human affairs. But it's something that we don't think of.

So what I want to do is to at least open the possibility that in what we are observing here, in this disconnect between what we claim to be, and the way we act, may in fact reside in something that we aren't conscious of, precisely because we tend not to want to think of ourselves as just another species. It's an insult to people to think that they are 'merely' an animal for example.

What I'm going to argue for the next few minutes, whether you like it or not, folks, we are the product of evolution. And our evolution is controlled, as the evolution of other species is, by our genetic make-up. But also, and more so than in any other species, by something we call our 'memetic' make-up.

[MEMES] [15:48]

Genes are nuggets of biological information, genetic information, that can be passed from one generation to the next. A 'meme' is a nugget of cultural information that can be passed from one generation to the next, but also within the generation. Memes accumulate over time. Cultural information accumulates. Technology improves. The libraries get fuller. We acquire more and more knowledge. And we act out of that knowledge as much as we act out of our genes.

Human evolution is a code-dependent product of the interaction between genetic information and the memetic information, that is a reflection of our culture.

[WE CONTINUE TO EVOLVE] [16:23]

Now the second premise here, is that we think of ourselves as at the pinnacle of evolution, but we are just, you know, part way there. We are continuing to evolve, as are all other species. We are incomplete. We're not perfect. We aren't completely intelligent, we are not completely instinctive. We are in transition between a species controlled almost automatically by the impulses that are innately acquired, and say that a very primitive organism like a lizard or a snake might primarily act out of instinct, we may primarily act, or at least we think we act, out of higher intelligence.

So there is a whole gradient here, and we are somewhere in the middle.

[THE STRUCTURE OF THE HUMAN BRAIN] [17:05]

If we can look at the structure of the human brain, there is some purely physical evidence of what I'm suggesting here. One of the most I suppose dramatic expressions of this, came to us from John McLean, about three or four decades ago, who supposed the human brain is a triune [three part] organism. Now it's not as simple as this. But in general, his thesis has proved to be quite robust to tests.

What we can argue from this thesis is that there are three large sub-components of the brain, each

with its own kind of intelligence. The reptilian brain stem, at the very bottom here, is the old brain. Now keep in mind, that humans are a species of vertebrate organisms that shares in its personal development, on our ontogeny, the same kinds of transition states as do other organisms that are vertebrate animals.

As the human organism evolved over time, we obviously had to start from where we were. So at one point, when we were much closer to reptiles, the brain basically had that structure. When mammals evolved, they added to that structure. They didn't abandon the instinctive centers of the brain.

Down here is where all the automatic functions take place. You are not conscious of having to breathe. You don't control your heart rate. It's all taken care of for you, automatically, down there [pointing to the brain stem] as it is in much more primitive organisms.

As mammals evolved, they acquired this middle brain where our limbic system resides. This is the seat of our emotions, and our affection for one another. The feelings, responses to food, sex, and so on and so forth come from that part of the brain.

Humans have added, more than any other organisms, something called the 'neo-cortex' - the third great layer, as it were. And this is the seat of our intelligence, our capacity for forward planning, our capacity for compassion, the thought-centers, the language centers, and all of those so-called higher functions, that we exhibit to a much greater extent than any other organism.

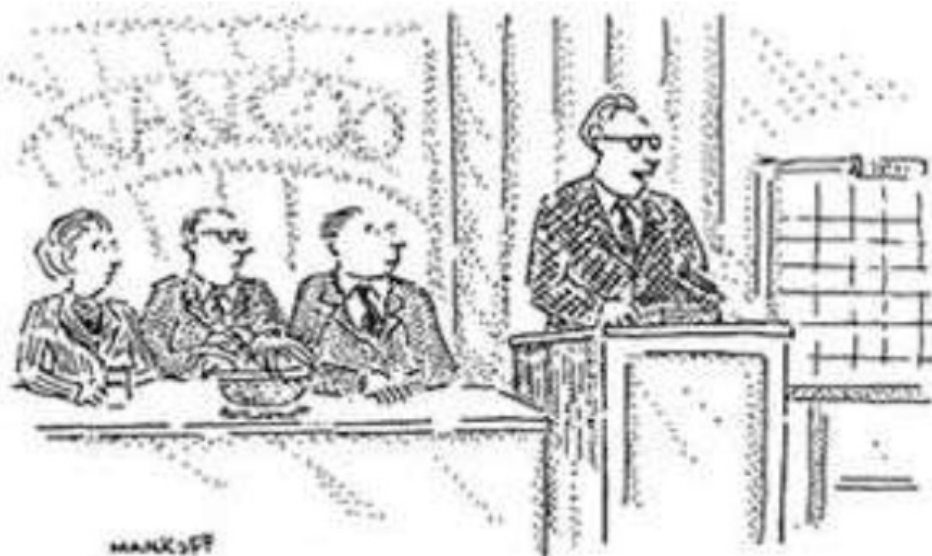
[MORE ON THE THREE BRAINS] [19:18]

So, in many respects, humans have three brains, all operating at the same time, each influencing the other, in a very tightly integrated way. At any point of time you may not even be conscious of which part of that brain is actually in control of your actions.

There isn't a person in this room, who hasn't given in to some emotion, and then regretted it afterwards. There isn't anyone in this room who hasn't done something shameful, that comes from the reptilian brain stem that they regretted afterwards. And there isn't anyone in this room who hasn't at some point made an intelligent decision to over-ride some less primitive urge, and therefore showed that we are capable, on rare occasions, of allowing our intelligence to over-ride some of these more instinctive or emotional kinds of responses.

The point is: it's a big mixed-up package and we're perhaps in transition toward the upper end of this

## *H. sapiens* is deeply conflicted



*"And so, while the end-of-the-world scenario will be rife with unimaginable horrors, we believe that the pre-end period will be filled with unprecedented opportunities for profit."*

spectrum, but we ain't there yet in it's entirety.

There is tension in this integrated mind. We think we are uniquely self-conscious and rational. So we live in that cerebrum. But there are circumstances in which reason predominates, and other circumstances in which it does not.

[PASSION AND INSTINCT WILL TRUMP REASON] [20:41]

I'm going to argue that reason dominates in relatively trivial circumstances, or unimportant ones. When your safety or survival is at stake, when your socio-economic status is at stake, when your political position is at stake - you will fight to conserve and maintain your prestige, your wealth, your power. And you are not often, or even usually, acting out of intelligence. It's much more instinctive or emotional at that level.

What I'm arguing, that in these circumstances, in eight behavioral propensities, that operate beneath consciousness, in the mid-brain and reptilian brain stem, will over-ride your rational behavior. Passion and instinct will trump reason in many, many circumstances, in both ordinary people's lives, and certainly in the political arena. We see it daily on the news.

And by the way, we seem to pay a hell of a lot more attention to ridiculous things, such as the current kaffuffle over who, well somebody was arrested over drunk driving, and his wife happened to be in the Cabinet, and how come he only got a five hundred dollar fine - this is not exactly earth-shaking stuff. But it appeals to the human connection at that middle part of the brain. It doesn't quite reach the higher end.

Now, it's not as if this is "news". I've put it in kind of a modern context. If not literally the triune brain, this mixed brain model - then going back hundreds of years. The philosopher Mirandola recognized in human behavior exactly the kinds of tensions that I've been talking about. This is the Renaissance philosopher who wrote a marvelous article, almost a book, that you can download from the Web:

'Man was created by Nature in such a way that Reason might dominate the senses. And by its law, the law of Reason, the law of rage and desire of passion and lust, might be restrained.' [Mirandola]

So, there's that tension again, between the reasonable, rational man having to control the more instinctive and passionate aspects of his character. And in fact, some would argue that God was invented as a kind of threat to make sure that we did this.

So he [Mirandola] goes on to say:

'But when the image of God has been forgotten, we begin to serve the beasts within us.'

Again, it's this notion that we are this compound individual, that is individual intention, and we create social constructs, such as our religions, to help reinforce the kinds of behaviors necessary for civilized existence to take place.

Antonio Damasio, the second quote, is one of the most well-known neuro-scientists today. He studies the brain, the brain function, and the functions of the nervous system. And he's saying exactly the same thing, but in modern language.

'There are potions in our own bodies and our brains. The brain is a gland which generates hormones.'

It's the hormones that stimulate the kind of behaviors that I was talking about a moment ago.

'There are potions in our bodies and brains capable of enforcing on us behaviors that we may or may not be able to suppress by strong resolution.'

Again, you have all been in situations where you know you shouldn't do that, but you go right ahead and do it anyway. Because in that case, you weren't able to suppress that strong emotion by acting rationally.

Mirandola and Damasio, although they were 500 years apart, are really tapping into the same sensibilities about the nature of the human organism.

[A CARTOON: Profits from the end times.] [24:32]

This is the best cartoon I've ever seen in my life. I'm not sure where it appeared. But here it is: this is our modern world. Every morning I think of this cartoon when I read the paper. Because the first section will be full of the latest climate event, or catastrophic collapse of this, or the soils are eroding there, or something that, and so on. But in the Business pages, there is not a hint that they are even on the same planet.

So here we have a Chamber of Commerce meeting, in which the guest speaker has obviously been reading both parts of the paper. He doesn't want to disappoint anyone, and so he says:

'While the end of the world scenario is rife with unimaginable horror, we believe that the pre-end period

is filled with unprecedented opportunities for profit.'

[THE GREENING OF BUSINESS] [25:26]

The whole of the greening of business in my view, fits nicely into this particular characterization. When we look at many so-called "green" enterprises, they are nothing of the kind. It's a kind of a kind of a greenwash over what they were doing anyway.

I've been in a number of meetings where I've heard senior executives say 'Of course we are interested in sustainability. We are greening our company. But as soon as it starts to negatively affect the bottom line, we're out of here.' That's a direct quote from a senior executive from a corporate entity right here in Vancouver.

This is not far removed from the kind of truth that I'm trying to get us toward.

[CARBON CREDITS] [26:17]

The private sector is responding to the profit potential in the massive trade in carbon credits, for example. What has been the principle response of nations to the rapid melting of floating ice in the high Arctic? To move in and claim territory to get at the oil that is causing the problem in the first place.

So it doesn't matter where you look. You see these tensions and these manifestations of this conflicting neurological disorder that we have, emerging.

[THE UNSUSTAINABLE MIND]

I'm arguing, for the sake of getting you all excited here, that unsustainability, the state of where we now find ourselves, is an inevitable emergent property of the interaction of the human species, as we currently think. It's the modern mind interacting with Nature. It's the way we think, in terms of the beliefs, values, and assumptions under which we operate, particularly in our economies, are so far removed from the way in which natural systems function, that there is no way that you can compatibly integrate the two.

So, if you have two systems that are so fundamentally different in their structure and operation, and you try to merge them together, - unsustainability is an inevitable emergent property.

I'm going to argue that both genes, that is to say our natural genetic behavior, as well as our cultural belief set, is involved in this. And I'm going to further argue that the behavioral adaptations, or rather the behavioral drivers in this, the innate qualities, were once adaptive.

They stood us well 50,000 years ago, when the environment was relatively constant. But when we are in a situation of rapid environmental change, they are no longer adaptive.

We have literally made ourselves maladaptive to the very ecological or environmental conditions that we ourselves have created.

Here is the kicker. And there is plenty of evidence in our history. What happens if a genetic mutation is maladaptive to the environment in which the organism carrying that mutation finds itself? Well, it is wiped out.

So if you have a maladaptation, you will not survive. If you think in a maladaptive way, if your memetic constructs, if your cultural paradigm, if your world-view, if your ideology is inappropriate for the circumstances in which you are expressing that ideology, you will be selected out.

I'm arguing here, that just as bad genes are removed by natural selection, so can bad memes, memetic constructs, be removed by natural selection. And that is the basis for arguing that whole societies have failed, have collapsed historically because they failed to change their beliefs, values, and assumptions in the face of contrary knowledge.

Now where did we start this? We are seeing knowledge from many, many disciplines piling up to show that we are on a wrong tack. And yet we do not respond, because we stick rigidly to a particular set of beliefs, values, and assumptions about the economy, about growth, about a whole variety of things that are completely at odds with the nature of the reality in which we find ourselves embedded.

We are no different from previous cultures that have gone down as a result of that dilemma.

Let's then look in detail at the drivers I am talking about here.

[EXPANDING TO FILL ALL SPACE]

Human beings are, as I said, evolved species, just like any other. What happens if you drop a single bacterium on a Petri dish of nutrients? It becomes a colony, and within a few days under ideal conditions it will completely cover that Petri dish. It will just continue replicating and replicating every 15 or 20 minutes, until all of the resources are used up, and the entire space is covered. And then it dies out.

Actually, the bacteria have the advantage of being able to sporulate, and then they blow away to find another Petri dish, or dead fruit or whatever it might be.

The point is: every species has two tendencies that we humans share. The first is the tendency to expand to fill all the potential habitat.

What do you think is the species, the large-scale vertebrate species, with the largest geographical range on the planet? It is sitting in your seats. We are just much better, because of our intellect, our cumulative memetic endowment, at exploiting the habitats on this planet. No habitat that is even remotely capable of sustaining human life does not have it. We are there, in numbers, in every habitable landscape on Earth. AND, we will, like other species, use up all available resources.

Now this one, a lot of people have problems with, because they'll point out this or that indigenous culture that has not destroyed its habitat. I would argue that in the case of humans, whether or not we are able to use all the resources is technology-dependent. I'm not going to get into a big argument about this. I think I can sustain that, if I had to get into such an argument.

I will illustrate it in a different way. How many of you own a credit card? Not only will humans use up all available resources. But when you run out of resources, you will invent one called a piece of plastic, which enables you to use up even more resources, that don't yet exist, and you have to go out and earn to pay down your credit card. This is a predisposition.

How many of you have gone to a buffet, eaten your fill, and said 'That's it, this is the last canapé I'm going to touch.' And within three minutes you are back there, almost unconsciously, eating - and you've done this, saying 'I wasn't going to do that.' Well, guess what's working. That's a little reptilian brain stem just trying to stuff you, because you see, under primitive conditions you wouldn't leave food lying around. It would rot. So there was an advantage to cramming yourself as full as you could, when you had the food available. And packing it on to your butt and your tummy for those lean times.

It is by no accident that the Northern Hemisphere, well I shouldn't say that any longer - that the rich people on this planet, have among their numbers about a billion people who are obese. Precisely because they cannot keep their fingers out of the cookie bowl. We will use the available resources to which we have access.

There are another billion people who are malnourished, at the other end of the income spectrum. All of which is just to illustrate a simple point. We are no different from other species. We will use all the habitat, and we will consume all the resources.

[THE 'K' STRATEGISTS] [33:28]

We are also characterized by certain qualities that make us out to be what is called a "K strategist," by biologists.

Different species have different strategies by which to propagate themselves. Some do so by having an inordinate growth rate, or potential growth rate. They produce prodigious numbers of eggs or seeds. So if you think of a cod fish that may be two meters long, a big full female - thirty thousands, sixty thousand eggs. If you think of an older tree, one of our more adapted, opportunistic tree species in this area, thousands and thousands of winged seeds. They are called "R strategists." "R" for rate.

They get by, by just spreading seeds all over the environment, and not one tiny fraction of one percent ever grows. That's all you need, one to replace the tree, but billions of eggs or seeds go out there. That's a strategy.

But we're way out there, at the other end of the spectrum, called "K strategists." R strategists tend to have short lives, prodigious reproductive potential, no parental care whatsoever. Codfish do not look after their 60,000 offspring. K strategists: long lives, relatively large, low reproduction rate, large degrees of parental care, high survival, most of our offspring survive today, for example.

And so humans are characteristic K strategists. Now what K strategists do always is press up against the carrying capacity of their habitats. Human kind will press up against the limits of their habitats. So, resource depletion, pollution of the environment, overcrowding, and other symptoms of this nature. We will occupy all the habitat and use all the resources.

For the longest period of time, humans survived at carrying capacity. In fact we could draw this [line of population] way, way back here, a flat line for 50,000 years. There were ups and downs as civilizations or local communities rose and fell. But for the most part, growth is not a persistent in human or any K strategist population.

[THEN WE FOUND OIL... ]

Then we found oil. Oil gave us access to everything else. More food. More resources of every kind to create the infrastructure we needed to sustain more and more people - and so more and more people came along. Only eight generations of people have really experienced a consistent period of growth - sufficient so they would notice it really in their lifetimes.



Almost everything important about modern technology didn't exist when I was born. Certainly not that camera, or these computers, or projectors or anything. Change is just inordinately fast today.

It's a unique period in history. It's only been since the 1950's that any government on planet Earth has taken growth to be an important part of its economic platform. Do you realize that? Only since the 1950's has economic growth been a part of any official government economic platform. It took us five or six generations to really figure out that we could use this.

The point I'm really getting at here is that each of us takes to be the norm - of course growth is normal, we need three or four percent just to keep the economy on its feet - it's really the single most abnormal phenomenon in the history of our species.

Now again, there have been other cultures that have risen or fallen. But the time dimensions are different and the scale is different. In the 20th century we saw a four-fold increase in human numbers in just a hundred years alone. It's completely unprecedented.

Just a couple of things. Some of you may be thinking 'Well, surely we don't use all resources.' There's actually been studies of the history of human resource exploitation. One of the more famous ones was undertaken by three of my colleagues at UBC [University of British Columbia] in the '90's.

This is a quote from an article in [the journal] 'Science:'

'Although there's considerable variation in detail, there's remarkable consistency in the history of resource exploitation. Resources are inevitably over-exploited, often to the point of collapse or extinction.'

That is a fact of human resource exploitation. As our technology improves, and we will take the last one - unless powerfully restrained by international regulation, or some other form. This is where Federalism comes in, at either the global or national level: you need a basis in law to prohibit what humans would otherwise do naturally. That's the history.

[THE EXAMPLE OF THE COD FISHERY CRASH]

Here is a perfect example of non-response to science. This is not a short time period. From 1962 to 1992 is a thirty year period, during which Canada had responsibility for the world's largest fishery, a fishery that had sustained human fishing for hundreds if not thousands of years.

We watched over that period the steady decline in the spawning stock biomass, to the point where it collapsed in 1992, now eighteen years ago. We stopped fishing, and the stock has not recovered. The fish haven't disappeared. They haven't gone extinct, but the impact of human exploitation has so altered the ecosystem structure, that the fish can no longer exploit or retain the niche that they once occupied within that particular ecosystem.

It's not clear that the stock will ever recover, without some other knock of some kind or other, pushing them back into that original state. This is a shameful example of ignoring the scientific data that something is awry here. I won't go into the details, but it was quite clear for many, many years before the collapse actually occurred.

[CULTURE AND BIOLOGY]

One more, and this will be the last bit of evidence, that we are like other species only more so. A group of scientists just about three years ago, actually it's not, it's seven years ago, compared human beings to about 96 other species very similar to humans in their ecological requirements. They measured a dozen different qualities or characteristics. They found that in almost every case, humans were the outlier.

That's all biology. What has culture got to do with this? Because I'm often berated by sociologists and political scientists for underplaying the role of culture. Now look, there's a hell of a lot more sociologists and political scientists out there promoting culture, and there's very few biologists who are willing to stick their neck out the way I am. So I don't apologize for trying to put the biological argument forward. But I want to now bring in the cultural, and show that it reinforces the biological.

This is actually a combination of culture and biology. Humans are a myth-making species. Sociologists talk about the cultural narrative. Every culture has its narrative: its origin myth, its destination myth, and a whole lot of other mythic constructs that make us behave, and so on and so forth. We need stories. In fact, it's the shared mythologies, the shared stories that make this group different from that group.

Look at how this disrupts geopolitics. You've got the Muslim group of myths in conflict with the Christian group of myths. These myths are extraordinarily powerful. Enough to get people to go out and blow themselves up in support of their particular mythic constructs.

I'm sorry if I'm offending anyone here. But the myths that we believe in are more powerful than even the survival instinct. That's how powerful the need for mythic constructs are in the human organism. And they are a very dominant force, a prevailing force in geo-politics, even today.

## [GROWTH AS CULTURAL MYTH]

We in the Western scientific tradition are no less myth-bound than any other culture. In fact, I would argue that the notion that we are a science-based culture is our biggest cultural myth. It simply enables us to ignore the reality that we actually don't behave that way at all. And there's been lots written about this. The theologian from Mount Alison University back East, Colin Grant, simply called "Myths We Live By" - it's a wonderful story about the human propensity for myth making.

Here are a couple of examples or statements of the current, increasingly global cultural myth. This is one that emerged with the explosion of the post Enlightenment industrial revolution in Europe, and it's now spreading around the world: it's the perpetual growth myth. The myth of progress. The idea that you can have unlimited growth, economic material growth, on a finite planet.

Lawrence Summers was the President of the World Bank when he made this statement in the early 1990's - does anyone know his current position? That's right. He is President Obama's Chief Economic advisor. He is the Chair of the U.S. President's Council of Economic Advisors. Lawrence Summer said:

'There are no limits to the carrying capacity of Earth'

- remember that humans tend to press up against, well - he wouldn't believe there are any limits so we can just go on forever....

'that are likely to bind at any time in the foreseeable future. The idea that we should put limits on growth because of some natural limit, is a profound error with staggering social costs.'

## [GROWTH AND THE PROBLEM OF POVERTY] [43:41]

Now it has staggering social costs, because we use growth as the means by which to solve the problem of poverty. See, if we can grow sufficiently, so that even the thinnest slice of the pie is large enough to keep people going, then they won't bug us to share.

So growth becomes the means by which we can avoid the question of more equitable distribution of the world's biological and economic output.

And just to show that he's not alone [Summers], one of the most frequently quoted individuals is the late Professor Julian Simon from the University of Maryland School of Business:

'Technology exists now to produce in inexhaustible quantities all the products made by Nature. We have in our hands now the technology to feed, clothe, and supply energy to an ever-growing population for the next seven billion years.'

Not a modest statement. This is the latest number I could get my hands on from the World Bank on the distribution of income on the planet Earth today. Now keep in mind, that when the growth dynamic got underway, really about 50 years ago, and became the primary means by which to obliterate poverty, you would think that we would pay attention to the impact of that growth on poverty.

But what we see here is that as of right now, the world's richest 20 percent, the 20 percent of the population that is the wealthiest on Earth, and by the way every one of us in this room is in that category, we use about 76.6 percent - we get all that much of the world income. Actually, we consume about 80 percent of world output.

The poorest 20 percent of people on Earth get by on one and a half percent of global output. And those ratios are worsening. So the question is: if you are an intelligent species, if growth is being designed as a mean of reducing poverty, why is it we can go for 30 years in a failed experiment and not pay attention to the fact that it's not solving the problem that we set out to do?

The share of the private consumption by the poor is in decline. Most world growth goes to the rich who don't even benefit from it.

Why is this problematic? Because if we are already at carrying capacity, in fact we're about 20 to 30 percent over carrying capacity, and it's 20 percent of the world's people who use 80 percent of everything. That right away shows you that we've got a problem.

## [IF EVERYONE LIVED LIKE AMERICANS... ]

If everyone on the planet today consumed at the level of North Americans, we'd need the equivalent of four additional Earth-like planets to produce all those resources, and to assimilate all of those wastes.

Now, if you don't believe that, just think about it in terms of two nations. The United States has 4.7 percent of the world's population. Four point seven percent of the world's people. It uses between 20 and 25 percent of everything. About 22 or 23 percent of petroleum, for example.

China has over four times the U.S. population. See what I'm saying here? If China achieves it's goal, of the same material standard as is now enjoyed by Americans, U.S. plus China is 125 percent of the entire world economic and biological output. And you haven't even begun to count countries like Canada, Europe, India, Africa, and so on and so forth.

That is why we have fair confidence in the kinds of numbers that our [ecological] footprint work shows to be the case. We cannot, by any stretch of the imagination, reach a stable sustainable state through growth of the world economy, such that everyone achieves the material standards even to pull them out of poverty, let alone live like North Americans.

The really inconvenient truth, which we do not wish to discuss, and certainly is not on any political platform to date, are these ones. This is actually a statement from the World Business Council on Sustainable Development, or at least the output from a workshop they held in the early '90's in Antwerp, Belgium. Looking at the data on material resource trends, pollution around the Earth, matching this against production and carrying capacity, that workshop concluded that in the industrial world, reductions of up to 90 percent would be required by the middle of this century, in order to enable necessary growth to occur in the Third World, and to keep the whole within the carrying capacity of the planet.

#### [CONTRACTION AND CONVERGENCE]

This is now a version of what we call 'contraction and convergence.' We in the rich countries have got to slow down. In fact reduce our consumption to create the ecological space necessary for those who deserve to grow, so that they can come up to a decent standard.

Keep in mind there are now officially a billion people on Earth who are malnourished, that's calorically malnourished.. And probably another two billion who are deficient in some dietary standard or other. We don't notice, because we've always had plenty in this resource-rich part of the planet. But the fact is, about half the people on Earth are still living the Malthusian dilemma.

Just based on our consumption date, we in North America should be designing an economy that uses 80 percent less in absolute terms in order to create the space for others to gain their fair share.

Again, keep in mind, on Earth there are two hectares of biologically productive land and waterscape [per person]. We [North Americans] need about 7 or 8 hectares. The average person [on the planet] is already using 2.5, but there are many places on Earth, particularly in grossly impoverished African countries where people survive on a third or a half of a hectare. In other words, a tiny fraction of the Earth's space that we require. For them to go from a half a hectare up to two, requires that we come from 7 down to two.

Contraction and convergence has to be the way, if you are going to have equity on a single planet, and sustainability at the same time. We should be designing a smaller, equitable steady-state economy, that maintains itself within the carrying capacity.

This is not difficult. The concepts are easy. The getting there is the difficult part, because of the conflictual nature of the human animal.

Now, many people are horrified at the thought that we would have to shrink, but there's plenty of evidence to show that this shouldn't be a problem, if we really were an intelligent species.

Here is a graph from a book called 'The Loss of Happiness in Market Democracies' by Robert T. Lane. What Lane documents here is the lack of any correlation, any continuous correlation, between felt well-being, between people's sense of happiness, security in the future and all of that, and rising incomes.

#### [I CANNOT BE SUSTAINABLE ON MY OWN]

Today, we for the first time in the history of our species reached the point where my selfish interests are identical to our collective interests. I cannot be sustainable on my own. No country can be sustainable on it's own. If the rest of the world carries on down the current pathway, they will take us down with it.

Instead of being able to act out my own personal selfish fantasy, I've got to begin to be able to identify my interests with your interests. Because together we can pull this off, if we can convince enough people that it is in their selfish interest to serve the collective interest. It's the only way that we're going to make any real difference on this planet.

So a movement like the World Federalists, although I have problems with this or that dimension of it, is precisely the direction we need to go, at the level of creating a common cultural mythology across the planet that reinforces the inherent need that we have, for a planet that works for our mutual benefit. It can't work if each of us decides always to appropriate the most we can in our short lifespan on Earth.

Thanks so much.

Dr. William Rees was recorded April 15th as a guest of the World Federalists of Vancouver, at the Unitarian Church in Vancouver, Canada by Alex Smith of Radio Ecoshock. Transcription by Alex Smith. Audio available as a free mp3 download in the Radio Ecoshock show released May 28th, 2010 at [ecosshock.org](http://ecosshock.org).