Don't turn your back on science - An open letter from biologist Richard Dawkins to Prince Charles

Article in The Observer Sunday May 21, 2000

Your Royal Highness,

Your Reith lecture saddened me. I have deep sympathy for your aims, and admiration for your sincerity. But your hostility to science will not serve those aims; and your embracing of an ill-assorted jumble of mutually contradictory alternatives will lose you the respect that I think you deserve. I forget who it was who remarked: 'Of course we must be open-minded, but not so open-minded that our brains drop out.'

Let's look at some of the alternative philosophies which you seem to prefer over scientific reason. First, intuition, the heart's wisdom 'rustling like a breeze through the leaves'. Unfortunately, it depends whose intuition you choose. Where aims (if not methods) are concerned, your own intuitions coincide with mine. I wholeheartedly share your aim of long-term stewardship of our planet, with its diverse and complex biosphere.

But what about the instinctive wisdom in Saddam Hussein's black heart? What price the Wagnerian wind that rustled Hitler's twisted leaves? The Yorkshire Ripper heard religious voices in his head urging him to kill. How do we decide which intuitive inner voices to heed?

This, it is important to say, is not a dilemma that science can solve. My own passionate concern for world stewardship is as emotional as yours. But where I allow feelings to influence my aims, when it comes to deciding the best method of achieving them I'd rather think than feel. And thinking, here, means scientific thinking. No more effective method exists. If it did, science would incorporate it.

Next, Sir, I think you may have an exaggerated idea of the natural ness of 'traditional' or 'organic' agriculture. Agriculture has always been unnatural. Our species began to depart from our natural hunter-gatherer lifestyle as recently as 10,000 years ago - too short to measure on the evolutionary timescale.

Wheat, be it ever so wholemeal and stoneground, is not a natural food for Homo sapiens. Nor is milk, except for children. Almost every morsel of our food is genetically modified - admittedly by artificial selection not artificial mutation, but the end result is the same. A wheat grain is a genetically modified grass seed, just as a pekinese is a genetically modified wolf. Playing God? We've been playing God for centuries!

The large, anonymous crowds in which we now teem began with the agricultural revolution, and without agriculture we could survive in only a tiny fraction of our current numbers. Our high population is an agricultural (and technological and medical) artifact. It is far more unnatural than the population-limiting methods condemned as unnatural by the Pope. Like it or not, we are stuck with agriculture, and agriculture - all agriculture - is unnatural. We sold that pass 10,000 years ago.

Does that mean there's nothing to choose between different kinds of agriculture when it comes to sustainable planetary welfare? Certainly not. Some are much more damaging than others, but it's no use appealing to 'nature', or to 'instinct' in order to decide which ones. You have to study the evidence, soberly and reasonably - scientifically. Slashing and burning (incidentally, no agricultural system is closer to being 'traditional') destroys our ancient forests. Overgrazing (again, widely practised by 'traditional' cultures) causes soil erosion and turns fertile pasture into desert. Moving to our own modern tribe, monoculture, fed by powdered fertilisers and poisons, is bad for the future; indiscriminate use of antibiotics to promote livestock growth is worse.

Incidentally, one worrying aspect of the hysterical opposition to the possible risks from GM crops is that it diverts attention from definite dangers which are already well understood but largely ignored. The evolution of antibiotic-resistant strains of bacteria is something that a Darwinian might have foreseen from the day antibiotics were discovered. Unfortunately the warning voices have been rather quiet, and now they are drowned by the baying cacophony: 'GM GM GM GM GM GM!'

Moreover if, as I expect, the dire prophecies of GM doom fail to materialise, the feeling of let-down may spill over into complacency about real risks. Has it occurred to you that our present GM brouhaha may be a terrible case of crying wolf?

Even if agriculture could be natural, and even if we could develop some sort of instinctive rapport with the ways of nature, would nature be a good role model? Here, we must think carefully. There really is a sense in which ecosystems are balanced and harmonious, with some of their constituent species becoming mutually dependent. This is one reason the corporate thuggery that is destroying the rainforests is so criminal.

On the other hand, we must beware of a very common misunderstanding of Darwinism. Tennyson was writing before Darwin but he got it right. Nature really is red in tooth and claw. Much as we might like to believe otherwise, natural selection, working within each species, does not favour long-term stewardship. It favours short-term gain. Loggers, whalers, and other profiteers who squander the future for present greed, are only doing what all wild creatures have done for three billion years.

No wonder T.H. Huxley, Darwin's bulldog, founded his ethics on a repudiation of Darwinism. Not a repudiation of Darwinism as science, of course, for you cannot repudiate truth. But the very fact that Darwinism is true makes it even more important for us to fight against the naturally selfish and exploitative tendencies of nature. We can do it. Probably no other species of animal or plant can. We can do it because our brains (admittedly given to us by natural selection for reasons of short-term Darwinian gain) are big enough to see into the future and plot long-term consequences. Natural selection is like a robot that can only climb uphill, even if this leaves it stuck on top of a measly hillock. There is no mechanism for going downhill, for crossing the valley to the lower slopes of the high mountain on the other side. There is no natural foresight, no mechanism for warning that present selfish gains are leading to species extinction - and indeed, 99 per cent of all species that have ever lived are extinct.

The human brain, probably uniquely in the whole of evolutionary history, can see across the valley and can plot a course away from extinction and towards distant uplands. Long-term planning - and hence the very possibility of stewardship - is something utterly new on the planet, even alien. It exists only in human brains. The future is a new invention in evolution. It is precious. And fragile. We must use all our scientific artifice to protect it.

It may sound paradoxical, but if we want to sustain the planet into the future, the first thing we must do is stop taking advice from nature. Nature is a short-term Darwinian profiteer. Darwin himself said it: 'What a book a devil's chaplain might write on the clumsy, wasteful, blundering, low, and horridly cruel works of nature.'

Of course that's bleak, but there's no law saying the truth has to be cheerful; no point shooting the messenger - science - and no sense in preferring an alternative world view just because it feels more comfortable. In any case, science isn't all bleak. Nor, by the way, is science an arrogant know-all. Any scientist worthy of the name will warm to your quotation from Socrates: 'Wisdom is knowing that you don't know.' What else drives us to find out?

What saddens me most, Sir, is how much you will be missing if you turn your back on science. I have tried to write about the poetic wonder of science myself, but may I take the liberty of presenting you with a book by another author? It is The Demon-Haunted World by the lamented Carl Sagan. I'd call your attention especially to the subtitle: Science as a Candle in the Dark.

• Richard Dawkins is the Charles Simonyi Professor of the Public Understanding of Science at Oxford University. His latest book is 'Unweaving the Rainbow' xxxxxxxxxxxxxxxxx

A response to Prince Charles' Reith Lecture

A Royal View... Back
The Prince of Wales

Presenter: James Naughtie: Good evening from Highgrove in Gloucestershire - the home of His Royal Highness, the Prince of Wales, and welcome to this special programme to mark the end of this year's Millennium Reith lecture series. With me are the Prince of Wales and the five Reith lecturers, who over the past few weeks have dealt with our theme of sustainable development. They've travelled from all around the world to join in this discussion and we hope that our lecturers - an American scientist, an Indian academic, a European politician, a world businessman and the Director General of the World Health Organisation will pool their ideas and speak tonight of practical things. What can be done to keep the world safe for the generations still to come? But first let's hear the thoughts of His Royal Highness, the Prince of Wales.

Prince Charles: Like millions of other people around the world I've been fascinated to hear five eminent speakers share with us their thoughts hopes and fears about sustainable development based on their own experience. All five of those contributions have been immensely thoughtful and challenging. There have been clear differences of opinion and of emphasis between the speakers but there have also been some important common themes, both implicit and explicit. One of those themes has been the suggestion that sustainable development is a matter of enlightened self-interest. Two of the speakers used this phrase and I don't believe that the other three would dissent from it, and nor would I.

Self-interest is a powerful motivating force for all of us, and if we can somehow convince ourselves that sustainable development is in all our interests then we will have taken a valuable first step towards achieving it. But self-interest comes in many competing guises - not all of which I fear are likely to lead in the right direction for very long, nor to embrace the manifold needs of future generations. I am convinced we will need to dig rather deeper to find the inspiration, sense of urgency and moral purpose required to confront the hard choices which face us on the long road to sustainable development. So, although it seems to have become deeply unfashionable to talk about the spiritual dimension of our existence, that is what I propose to do.

The idea that there is a sacred trust between mankind and our Creator, under which we accept a duty of stewardship for the earth, has been an important feature of most religious and spiritual thought throughout the ages. Even those whose beliefs have not included the existence of a Creator have, nevertheless, adopted a similar position on moral and ethical grounds. It is only recently that this guiding principle has become smothered by almost impenetrable layers of scientific rationalism. I believe that if we are to achieve genuinely sustainable development we will first have to rediscover, or re-acknowledge a sense of the sacred in our dealings with the natural world, and with each other. If literally nothing is held sacred anymore - because it is considered synonymous with superstition or in some other way "irrational" - what is there to prevent us treating our entire world as some "great laboratory of life" with potentially disastrous long term consequences?

Fundamentally, an understanding of the sacred helps us to acknowledge that there are bounds of balance, order and harmony in the natural world which set limits to our ambitions, and define the parameters of sustainable development. In some cases nature's limits are well understood at the rational, scientific level. As a simple example, we know that trying to graze too many sheep on a hillside will, sooner or later, be counter productive for the sheep, the hillside, or both. More widely we understand that the overuse of insecticides or antibiotics leads to problems of resistance. And we are beginning to comprehend the full, awful consequences of pumping too much carbon dioxide into the earth's atmosphere. Yet the actions being taken to halt the damage known to be caused by exceeding nature's limits in these and other ways are insufficient to ensure a sustainable outcome. In other areas, such as the artificial and uncontained transfer of genes between species of plants and animals, the lack of hard, scientific evidence of harmful consequences is regarded in many quarters as sufficient reason to allow such developments to proceed.

The idea of taking a precautionary approach, in this and many other potentially damaging situations, receives overwhelming public support, but still faces a degree of official opposition, as if admitting the possibility of doubt was a sign of weakness or even of a wish to halt "progress". On the contrary, I believe it to be a sign of strength and of wisdom. It seems that when we do have scientific evidence that we are damaging our environment we aren't doing enough to put things right, and when we don't have that evidence we are prone to do nothing at all, regardless of the risks.

Part of the problem is the prevailing approach that seeks to reduce the natural world including ourselves to the level of nothing more than a mechanical process. For whilst the natural theologians of the 18th and 19th centuries like Thomas Morgan referred to the perfect unity, order, wisdom and design of the natural world, scientists like Bertrand Russell rejected this idea as rubbish. 'I think the universe' he wrote 'is all spots and jumps without unity and without continuity, without coherence or orderliness. Sir Julian Huxley wrote in "Creation a Modern Synthesis" - that modern science must rule out special creation or divine guidance.' But why?

As Professor Alan Linton of Bristol University has written- 'evolution is a manmade theory to explain the origin and continuance of life on this planet without reference to a Creator.' It is because of our inability or refusal to accept the existence of a guiding hand that nature has come to be regarded as a system that can be engineered for our own convenience or as a nuisance to be evaded and manipulated, and in which anything that happens can be fixed by technology and human ingenuity. Fritz Schumacher recognised the inherent dangers in this approach when he said that 'there are two sciences - the science of manipulation and the science of understanding.'

In this technology driven age it is all too easy for us to forget that mankind is a part of nature and not apart from it. And that this is why we should seek to work with the grain of nature in everything we do, for the natural world is, as the economist Herman Daly puts it - 'the envelope that contains, sustains and provisions the economy, not the other way round.' So which argument do you think will win - the living world as one or the world made up of random parts, the product of mere chance, thereby providing the justification for any kind of development? This, to my mind, lies at the heart of what we call sustainable development. We need, therefore, to rediscover a reference for the natural world, irrespective of its usefulness to ourselves - to become more aware in Philip Sherrard's words of 'the relationship of interdependence, interpenetration and reciprocity between God, Man and Creation.'

Above all, we should show greater respect for the genius of nature's designs, rigorously tested and refined over millions of years. This means being careful to use science to understand how nature works, not to change what nature is, as we do when genetic manipulation seeks to transform a process of biological evolution into something altogether different. The idea that the different parts of the natural world are connected through an intricate system of checks and balances which we disturb at our peril is all too easily dismissed as no longer relevant.

So, in an age when we're told that science has all the answers, what chance is there for working with the grain of nature? As an example of working with the grain of nature, I happen to believe that if a fraction of the money currently being invested in developing genetically manipulated crops were applied to understanding and improving traditional systems of agriculture, which have stood the all-important test of time, the results would be remarkable. There is already plenty of evidence of just what can be achieved through applying more knowledge and fewer chemicals to diverse cropping systems. These are genuinely sustainable methods and they are far removed from the approaches based on monoculture which lend themselves to large- scale commercial exploitation, and which Vandana Shiva condemned so persuasively and so convincingly in her lecture. Our most eminent scientists accept that there is still a vast amount that we don't know about our world and the life forms that inhabit it. As Sir Martin Rees, the Astronomer Royal, points out, it is complexity that makes things hard to understand, not size. In a comment which only an astronomer could make, he describes a butterfly as a more daunting intellectual challenge than the cosmos!

Others, like Rachel Carson, have eloquently reminded us that we don't know how to make a single blade of grass. And St. Matthew, in his wisdom, emphasised that not even Solomon in all his glory was arrayed as the lilies of the field. Faced with such unknowns it is hard not to feel a sense of humility, wonder and awe about our place in the natural order. And to feel this at all stems from that inner heartfelt reason which sometimes despite ourselves is telling us that we are intimately bound up in the mysteries of life and that we don't have all the answers. Perhaps even that we don't have to have all the answers before knowing what we should do in certain circumstances. As Blaise Pascal wrote in the 17th century, 'it is the heart that experiences God, not the reason.'

So do you not feel that, buried deep within each and every one of us, there is an instinctive, heart-felt awareness that provides -if we will allow it to- the most reliable guide as to whether or not our actions are really in the long term interests of our planet and all the life it supports? This awareness, this wisdom of the heart, maybe no more than a faint memory of a distant harmony, rustling like a breeze through the leaves, yet sufficient to remind us that the Earth is unique and that we have a duty to care for it. Wisdom, empathy and compassion have no place in the empirical world yet traditional wisdoms would ask "without them are we truly human?" And it would be a good question. It was Socrates who, when asked for his definition of wisdom, gave as his conclusion, "knowing that you don't know."

In suggesting that we will need to listen rather more to the common sense emanating from our hearts if we are to achieve sustainable development, I'm not suggesting that information gained through scientific investigation is anything other than essential. Far from it. But I believe that we need to restore the balance between the heartfelt reason of instinctive wisdom and the rational insights of scientific analysis. Neither, I believe, is much use on its own. So it is only by employing both the intuitive and the rational halves of our own nature - our hearts and our minds - that we will live up to the sacred trust that has been placed in us by our Creator, - or our "Sustainer", as ancient wisdom referred to the Creator. As Gro Harlem Brundtland has reminded us, sustainable development is not just about the natural world, but about people too. This applies whether we are looking at the vast numbers who lack sufficient food or access to clean water, but also those living in poverty and without work. While there is no doubt that globalisation has brought advantages, it brings dangers too. Without the humility and humanity expressed by Sir John Browne in his notion of the 'connected economy' - an economy which acknowledges the social and environmental context within which it operates - there is the risk that the poorest and the weakest will not only see very little benefit but, worse, they may find that their livelihoods and cultures have been lost.

So if we are serious about sustainable development then we must also remember that the lessons of history are particularly relevant when we start to look further ahead. Of course, in an age when it often seems that nothing can properly be regarded as important unless it can be described as "modern", it is highly dangerous to talk about the lessons of the past. And are those lessons ever taught or understood adequately in an age when to pass on a body of acquired knowledge of this kind is often considered prejudicial to "progress"? Of course our descendants will have scientific and technological expertise beyond our imagining, but will they have the insight or the self- control to use this wisely, having learnt both from our successes and our failures?

They won't, I believe, unless there are increased efforts to develop an approach to education which balances the rational with the intuitive. Without this truly sustainable development is doomed. It will merely become a hollow- sounding mantra that is repeated ad nauseam in order to make us all feel better. Surely, therefore, we need to look towards the creation of greater balance in the way we educate people so that the practical and intuitive wisdom of the past can be blended with the appropriate technology and knowledge of the present to produce the type of practitioner who is acutely aware of both the visible and invisible worlds that inform the entire cosmos. The future will need people who understand that sustainable development is not merely about a series of technical fixes, about redesigning humanity or re-engineering nature in an extension of globalised, industrialisation - but about a re-connection with nature and a profound understanding of the concepts of care that underpin long term stewardship.

Only by rediscovering the essential unity and order of the living and spiritual world - as in the case of organic agriculture or integrated medicine or in the way we build - and by bridging the destructive chasm between cynical secularism and the timelessness of traditional religion, will we avoid the disintegration of our overall environment. Above all, I don't want to see the day when we are rounded upon by our grandchildren and asked accusingly why we didn't listen more carefully to the wisdom of our hearts as well as to the rational analysis of our heads; why we didn't pay more attention to the preservation of bio-diversity and traditional communities or think more clearly about our role as stewards of creation? Taking a cautious approach or achieving balance in life is never as much fun as the alternatives, but that is what sustainable development is all about.

James Naughtie: Your Royal Highness, thank you. Now that phrase 'the living world as one' has been in a way the objective of the five different approaches that we've heard in this year's lectures. So what are the hard choices that need to be made and will they be made? All the lecturers are here. They're all eminent and more to the point, perhaps, they're all in positions of power. They're in places where those decisions must be made. Chris Patten, the European Union's Commissioner for External Relations, Gro Harlem Brundtland, the Director General of the World Health Organisation, Sir John Browne, the Head of BP Amoco, Thomas E. Lovejoy, Chief Biodiversity Advisor for the World Bank and Counsellor to the Smithsonian Institution, and Vandana Shiva, campaigner and Director of the Research Foundation for Science, Technology and Ecology in Delhi. Chris Patten let me ask you first to set our discussion going to take that phrase - 'the living world as one.' It's clear from what you said in your lecture and by general consensus that the language has changed to an extraordinary extent in the last decade or so - people use the language of sustainability and talk about a world as one quite naturally now in a way that they didn't before. What are the dangers of that becoming a piece of political fashion rather than an engine of change in decision making?

Chris Patten: I think considerable. I start with good old St. Matthew and the lilies which I think he went on to say 'neither spin nor do they weave' which is of course true. And life is about value as well as price. I don't think that there has been all that much change in philosophy or approach in the recognition of value over the last few years, even if the language has changed. I think that may have happened at the margins but not very centrally. And secondly, even though I think that policies have in a strictly environmental sense often changed - I mean I remember my days at the Environmental Council in Brussels over a decade ago having to be with other ministers dragged kicking and screaming to accepting more sensible environmental policies. While that to some extent has changed, I think the paradox is that in other areas we've gone backwards, and one of the problems I think that we face today is that globalisation hasn't been accompanied by the rich countries accepting that there is a poor agenda so that we've seen a fall in development assistance to poor countries, with I think a really substantial impact on the environment. So I think some things have actually gone backwards rather than progressed.

James Naughtie: Vandana Shiva, you used the word I think 'smug' while talking about globalisation in your lecture. And that's the point here that we've got to isn't it? - where the issue is whether the language to some degree has become a cover for doing nothing?

Vandana Shiva: Well I don't think it's just a cover for doing nothing - it's a cover for basically doing unjust acts, engaging in non sustainable processes. The idea that rules written by a group of commerce officials are irreversible means that we can never correct our errors. These are not God given, they are not natural phenomena. The rules of commerce and free trade and globalisation are basically rules human beings got together and wrote. There are other rules human beings wrote like the climate change treaty, like the convention on biological diversity which are being marginalised and I think it's time to bring the rules that protect people and the planet at the core of decision making and make commerce derived activity rather than the foundation of our existence.

James Naughtie: So the question John Browne for businessmen like you is whether you can deliver the sorts of changes to which you're personally committed and of which you spoke in your lecture - it's fine to say I believe in these things and I believe we're moving in the direction that will produce real sustainability, but will it happen?

John Browne: I think it will, provided the right time scales are thought through and that in fact rhetoric doesn't overtake the reality of what has to happen on the ground. I think we have to be very authentic in what we say we're going to do - lay it out and then do it and do it again and again. And sometimes the achievements are smaller than people would expect. And therefore they always beg the second question which is, well do more.

James Naughtie: Some people might say that that kind of authenticity is in fact caution is it?

John Browne: No it's not caution. I think it's practicality. And it takes more than ten seconds to figure out what to do - how to, for example, capture CO2 and re-inject it into deep reservoirs. How to create very minimal disruption to the environment as necessary things are happening - whether that is the discovery of hydrocarbons or the building of homes. These things take time. It's not to say that people are taking all the time. They just have to move as fast as they can and it's not as fast as the words can be spoken.

James Naughtie: But when you go the Amazonian rain forests Tom Lovejoy which you do all the time, do you sense that that process with governments and with businesses is happening fast enough? You talk in your lecture about a spasm of extinction greater than any we've known since the age of the dinosaurs - the polar ice caps starting to melt in 20 years - pretty alarming stuff. Do you think that the thinking through progress if you like is happening at the right pace?

Tom Lovejoy: There are good signs all over the place but you know they're still insufficient to the challenge in front of us. And I guess the reason that I would be optimistic is that when I see humanity confronted with challenges, I often see great creativity arising in response to it and that's exactly the kind of thing we need to be dealing with now.

James Naughtie: What does that creativity mean to you Gro Harlem Brundtland as you look at the tragic cost of poor health across the developing world?

Gro Harlem Brundtland: As Chris Patten was saying here the reduction in attention to development co-operation and the redistribution of funds in the global economy - the fact that that has been sliding back is a tragedy. In the face of all the necessary needs for change it still has happened. However, what we also see now is that civil society, private foundations are coming forward trying to fill part of the gap. Not that that is the only answer, but I just feel that it may add to the awareness in many societies that we need to be sharing because only based on shared values can we move towards sustainability.

Chris Patten: I think the point that's just been made is absolutely fundamental. It's quite extraordinary that during the l990s when admittedly our rhetoric about the environment has become more sustained and developed, when our rhetoric about internationalisation has become more sustained that we've seen a real fall in the amount of assistance which rich countries give to poor countries. And it's not enough to say that is made good by private investment. Private investment doesn't go to the poorest and it doesn't go to the poorest countries. And the sort of figures which you mentioned in your lecture are an affront to our common humanity and they also lead to the real prospect of insecurity - environmental insecurity and political insecurity. And I think it is terribly important to re-establish the moral and the practical, the expedient case in relation to the environment, in relation to our political stability of good old fashioned development assistance - spending money on people, on their health, on their education as well as on their environment.

Vandana Shiva: I think part of the problem that needs to be addressed at this millennium threshold is that there are new ways being found of draining the last resources of the poor - and no matter how much development assistance is given, even if it's brought back to the older levels - if meantime you have patents on seeds, you have patents on plants and medicine which will increase the debt burden of the third world countries ten fold just to pay royalties for knowledge and biodiversity that was theirs in the first place. You've got a mechanism for creating poverty.

James Naughtie: How do you challenge that mechanism politically?

Vandana Shiva: I think you need to challenge it by challenging the models of intellectual property rights that have been enshrined into the World Trade Organisation, that are implemented through the trade related intellectual property which all third world governments, all of Africa, India, Central America are saying these need to be re-written. These laws are not suitable to governing a world for justice and sustainability. We really need to revise those norms.

James Naughtie: Tom Lovejoy you've talked about sustainable development as a theory and as a way of life for a very long time now. You're working with the World Bank at the moment. Now the World Bank is seen by many people who'd agree with Vandana Shiva's point as somehow an agent of these practices which is making things worse not better. Why can you say that it isn't?

Tom Lovejoy: Well I mean the World Bank is sort of a mix like any government, any country - I mean there are a lot of good things that go on and there are a lot of shall we say 'old fashioned' things that go on. But the point I really wanted to make is I have an uncomfortable feeling about the wave of prosperity that we've had in the United States in particular - not just because it doesn't seem to be accompanied by greater generosity in overseas assistance, but it's sort of leading to inward looking tendencies and more consumption instead of taking advantage of it to do good.

James Naughtie: John Browne you were nodding there. Do you think that prosperity means that the sense of urgency is dulled?

John Browne: I think it's a matter of understanding where the power actually lies. The reality is that however again in my experience business is done in the world it is inter connected. Trade has always been around and it remains the vital fundamental of business. So to say that everything could be done inside a country and that you're fine and everyone else isn't is I think to sign a very bad certificate for the future I would say. I think that the connectivity of the world that we now have where people can understand what's going on anywhere at anytime simply makes it more difficult to sustain that position.

James Naughtie: And yet Chris Patten when you sit in the Commission in Brussels you can be accused by outsiders as being part of a great sort of lumbering machine which acknowledges that things can't be done in one country and yet to many outsiders seems to have failed in vital areas like agriculture, producing an agriculture policy that makes sense over many decades and all the rest of it. It's seen as wasteful and inefficient isn't it? And do you see it as wasteful and inefficient - at least in its past incarnation?

Chris Patten: Well I see some - I see some of its manifestations - let me be careful in how I put this as less than desirable. But I want to make a point about international organisations whether, it's not a very adequate description of the European Union, whether the European Union or the WTO or the World Bank - we all know that the nation state remains the basic political unit, but we also know that everybody recognises that because of global trends, more has to be determined on a regional, international, global level, so we set up these organisations which, alas, haven't yet found a way of commanding the loyalty which people feel towards national institutions. Now I want to speak up for the poor old World Bank. I actually think that the World Bank has probably done more than any other global organisation to recognise the new world we're living in, to recognise the importance of the environment and of social issues, and the consequence of the sort of demonstrations that we've seen against the World Bank is that the World Bank will get fewer resources to spend in poor countries because of it being discredited in Washington bang next door to Capitol Hill. This is the awful paradox - here is an organisation which reflects the importance of transfers from rich to poor, which reflects the importance of having international rules. The World Bank which is on the side of the poor has I think been - and on the side of a better environment - has I think been extremely unfairly criticised.

Vandana Shiva: When the World Bank and IMF actually go for replenishments - they lay out figures and say that for every dollar they put into poor countries they make three dollars for the rich countries and that's the justification which keeps them running. My own lifetime of being an environmental researcher and campaigner has brought me against project aid after project aid from the World Bank, that has devastated our people and our eco systems. The entire conversion of our rich forest biodiveristy into eucalyptus mono culture is financed by the Bank, the destruction of the mangroves along our coasts leading to huge cyclone damage, salinity for coastal areas financed by the Bank for industrial shrimp farming, the erosion of our genetic diversity in agriculture financed by the Bank for the green revolution - the list is absolutely endless, and in fact if the World Bank is an issue for northern environmentalists and northern campaigners it's because movements of hundreds and thousands of tribals and peasants in the Third World have talked about the threat to their very survival.

James Naughtie: If we accept that globalisation in some form is here, can't be wished away, is going to continue - what are the changes that you would like to see in the way that the global economy is encouraged and managed if you like that would avoid that kind of disaster as you would see it?

Vandana Shiva: Well you know when it's made to look like it's the first time we're doing international trade I keep thinking of all the pepper from India that brought the British and got Columbus sailing in the wrong direction, claiming he'd discovered North America. We've had international trade before. We've had rules of international trade before. We've also had free trade rules before which in my view lead to the Bengal famine of '42 and I think what we need to do is allow countries to restrict exports and imports if the environment requires it and if public health requires it and if livelihood protection requires it. We'll have to put that freedom of countries back on the agenda, because on it is based the freedom of people.

James Naughtie: Gro Harlem Brundtland you made the point that slum clearance in the 19th century happened when it was in the interests of society to stop it developing. You talked about us all swimming in the same sea, sharing the same diseases if you like, to put it crudely, around the world. Is that the kind of incentive that is going to produce real change?

Gro Harlem Brundtland: Well I hope so. It's one I think strong argument about why we are in this together. And the fact that in European countries historically they dealt with what was next door - the things they saw and understood and they made changes in the policy directions which improved the quality of life and the quality of societies. But they didn't go far enough to look at it around the globe and to see the same problem far away in the colonial parts.

James Naughtie: You argue that at one point in our history governments tended to look on the developing world, on health as a luxury that came after basic economic development, and you're arguing well, that's not what it is at all. If you produce better health then you will get poverty down. Is it the sort of idea that the governments with whom you deal understand and are willing to act upon?

Gro Harlem Brundtland: Increasingly, I see that it's happening. Several governments are now aware that it is not wise to let human capital, even in, you know, said in those terms, let it down and sink into poverty instead of, for instance, giving all children vaccines. Now 30 million children don't get vaccinated with basic, simple technologies that all of us in our countries take for granted. Three million die because they don't get those quite cheap vaccines at the time in life when they need it, and of course families keep getting more children, families feel that they cannot depend on their children growing up, and it adds to the total burden of people feeling incapacitated and disempowered. So why are we not able to vaccinate every child? I use it as an example. Why is that not an obligation to all of us as it is in our own countries? We wouldn't dream of not being able to vaccinate all our own children wherever they live.

James Naughtie: You talked about human security in the United States being as important now as national security - a very striking phrase. Do you think people believe that, or have yet understood it assuming that it's true?

Gro Harlem Brundtland: Well there is a debate going on which I believe can be brought forward about that issue.

James Naughtie: ... Chris Patten's shaking his head there...

Chris Patten: Well the focus in the United States is on investing in spectacular out of space technology in order to protect the United States from the insecurity of the world in the 21st century. Whether or not that's a sensible approach, for most of us geography renders that simply impossible, and the only way you can actually deal with insecurity is by trying to invest in people's prosperity and in their stability. And a point which I think the Prince of Wales was getting at earlier and which has been touched on in this discussion is the extent to which what is right is also what's expedient. But it's actually in our interest to invest in peoples' health and this isn't a great breakthrough discovery - as the Asian development bank has pointed out, one of the reasons for East Asia's spectacular success was of course land reform, was of course opening or believing in leaving business to businessmen, but was also investing in people, in their basic health and basic education. And the extraordinary improvements in literacy rates, in child mortality statistics and so on in East Asia was one of the reasons for economic take off there. I think the point about vaccines and ill health in developing countries, which is of course related to environmental issues, I think that reflect on what we were saying earlier about the rich countries' agenda. Take pharmaceutical companies - there's no difficulty in getting pharmaceutical companies to invest in - in the ailments of the rich, in baldness and impotence, in their heart disease - but get them to invest in malaria - a vaccine against malaria - 80 million only a year being spent on that. Jeffrey Sachs from Harvard has suggested all sorts of market mechanisms for increasing that, but it kills malaria I think what - 2.5 million people every year?

James Naughtie: Right John Browne - you're a businessman, how do you do that? - you don't make pharmaceuticals but ...in this game... how do you get companies to understand the interests in that kind of investment which to many of them it seems is less obviously a good investment than what they do at the moment?

John Browne: I think it is the case not just in pharmaceuticals but in a lot of activity where the full value of the activity has to be exposed very transparently...

James Naughtie: By whom?

John Browne: Oh by both the business people and the government. There's always a sharing of rent - in one way or another between government and a business and that I think is something we shouldn't forget because many people think business just comes in, does something and leaves. In my business that's the last thing we can do. We're actually there for hundreds of years and therefore we must strike a balance of who gets what part of the rent distribution? Because when you think of all the things involved then I think you'll get the equation right.

Chris Patten: Companies invest in slow ripening tomatoes because they think there's money in it.

Vandana Shiva: They didn't make any money......

Chris Patten: And they invest - and they invest - they invest in baldness rather than malaria because they think there's money in that. I think that governments can actually help to shape the market. First of all, by making the real costs of things apparent - the externalities as economists call them, but secondly by actually offering inducements and the idea that Jeffrey Sachs of Harvard has put forward in relation to malaria is the rich countries, the rich governments should be actually giving a guarantee to pay for each vaccine which is used against malaria which will then stimulate the private sector to do the research and development of the drug which is necessary.

John Browne: The tools and techniques are well known. They're to do with taxation, to do with market instruments - all these sorts of things and they really do work. If you take the case of the environment you know you could pass thousands of regulations to do with reducing carbon dioxide emissions. But actually if you just get to trade permits you have an extraordinary way of clearing the market, letting people get on with things and actually getting a result.

James Naughtie: What precisely are we talking about? - let's get practical about this - what do you want to see - Tom?

Tom Lovejoy: Well in the short term - a corporation that is facing some activity they want to get into which will release CO2 paying for a CO2 off set elsewhere in the world - wherever that market may be.

James Naughtie: We're talking in a way about punitive taxes aren't we - are we John Browne?

John Browne: No we're not. We're talking about a balance of incentives. I mean there's always a carrot, and there's always the stick - there must be that. There must also be enforcement and transparency.

James Naughtie: You're happy to see a bigger stick?

John Browne: Oh - I'm very happy to see transparency and fair play.

James Naughtie: But what do governments do and what do societies do about businesses which aren't enlightened, and aren't behaving in the way that in the best of all possible worlds you hope they do?

John Browne: Well I think no business wants to have a free loader around - someone who takes advantage of the system. So I think in today's practical terms - first, there's a huge demand for transparency, so say what you're going to do, and then report against what you have said so that keeps going well. Secondly, market based mechanisms where people who break the rules have to pay a tremendous amount of money. And finally, enforcement. I think that's important - I mean it is the contract with society that is expressed by the role of government here as the enforcer.

James Naughtie: Vandana Shiva can a mixture of market mechanisms and enforcement produce what you want?

Vandana Shiva: I think the parts that we constantly forget is people in society and it's not just government acting through business and regulations on business, but governments empowering, defending the rights of people, ensuring small farmers are able to stay on land, practice organic farming, that public health is a universal right for all, that food access and entitlements is a global right - that that defence of rights of people is the biggest obligation of governments and we can't always mediate those rights via the market and by purchasing power because large number of poor who do not have purchasing power cannot get their entitlements through the market, and I think it's the exclusion of those rights and the exclusion of the government functions in the defence of those rights that has been the big sacrifice in globalisation. We need to reintroduce that debate.

Gro Harlem Brundtland: I think it's a difficult call to find the exact balance given what you're just saying. And as the world is negotiating in different areas, not only in commerce as you talked about earlier on WTO, but on biodiversity, on climate convention, and looking for solutions which can work across the board. I think that process has to continue, but one has to take into greater account and take into the balance more of what you're saying than what has been the case until now - because some of the rich countries who are dominating negotiations have had the ability to make definitions about how they take care of all parts of their societies, and then they negotiate and have a stronger negotiating power than smaller countries or poorer countries, so the balance is not right. And that is also what you are reacting to.

James Naughtie: You said in your lecture that the world should learn to look at itself through the eyes of the poor - I think I more or less quote you accurately there - now do you really believe in a world of vast transfers of money across borders, enormous explosions of wealth in the developed world - that that is happening or will happen?

Gro Harlem Brundtland: Well it is happening and our ability in our democracies to take care of those who need to be taken care of with their rights, with their human rights, with their place in society, that has to be increased. But when we talked earlier about the climate convention and the permits and the exchange of rights or duties with regard to emission of CO2, I don't think that there would be real disagreement around this table that that must be in that case the way to go.

James Naughtie: You talked Chris Patten about the importance of government being inclusive perhaps more outward looking than it's been in the western world in the past as a means of meeting that challenge. Do you think that it is happening? I mean we've just heard from Gro Harlem Brundtland that she believes in many respects there is a profound change in peoples' attitude beginning to appear. Do you share that view?

Chris Patten: I'm not sure that governments and traditional political structures have yet found a way of coping with entering a proper and comprehensive dialogue with present manifestations of civil society which aren't always candidly very democratic. I mean they're sometimes democratic, but not always. It is a very curious world that we live in - in which NGOs are often very much better resourced for example than UN bodies or UN institutions.

James Naughtie: The non-governmental organisations who work in so many fields .....?

Chris Patten: Absolutely - you see it in the human rights field. You see it in the environmental field as well. And I don't think one should always begin from the assumption that the government democratically elected or the international organisation which is very often a combination of the political efforts of democratically elected governments is wrong and the NGOs are right. I think we have to develop a much more open dialogue between them if we want to have the changes in society and the changes in political attitudes which we began by discussing.

James Naughtie: But you see Tom Lovejoy you have some fairly practical suggestions here. I mean you talk for example - let's have some biodiverse areas around the world - very specific - Los Angeles you know - somewhere in South America, somewhere in the Indian sub continent which is a pretty startling thought, which most governments would say - oh well lovely idea, great to hear it in a Reith lecture but it will never happen. Can something like that occur and is that the kind of spark without which this just remains academic talk?

Tom Lovejoy: Well I mean first of all some of it is happening - a surprising amount is happening - like a middle American biological corridor from Mexico all the way to Columbia. It is of course not enough. I think the really important thing is what comes down to happen in particular places. And if I think about the Amazon for example - there is no solution to the Amazon problem until the 20 million people living there have an adequate quality of life, and that's what we have to sort of join all the different sectors together to address.

James Naughtie: Well let me quote two of your experiences to you - when you delivered your lecture in Los Angeles it was pretty clear afterwards in the questioning that some people said - well fine but don't ask me to give up my car. And then you take American senators regularly and congressmen down to the Amazon and you say here is the situation - here is what we have to tackle. Now how do you cope with the senator's reaction who says well this is fine, and I see the enormity of what you point to me, but back home they're not going to give up their car?

Tom Lovejoy: Well I mean actually the interesting thing is that the senators I've taken down are very good about all of this - it's the one who - the ones who haven't gone I worry about. And that's not just a problem of the particular elected officials although I think there is always a big lag time between who's holding office and public opinion. I don't think public opinion is strong enough in the United States yet. I don't think they get the sense of urgency.

Chris Patten: It's always been the most difficult task of political democratic leadership to convince people that something which seems to be painful or involving sacrifice in the short term is actually best for them in the medium or long term, and the excitement of democratic politics is that it should enable you to mobilise opinion in that sort of way. I'm not sure perhaps we see enough of that just at the moment.

James Naughtie: What you are referring to is what we often call leadership isn't it?

Chris Patten: It's what we call leadership rather than focus groups - rather than going to a focus group to discover not just what you want to say but how to say it.

John Browne: It brings us back to...

James Naughtie: John Browne yes...

John Browne: The tools and techniques are available - I agree with you - governments do have to take a real position of policy in leadership in amongst all this noise and debate. It's valid - but the NGOs, business, many sectors of society - I think to opt out is really to give a very strange result to this where the voice of the few will direct the actions of the many and that I think is a problem.

James Naughtie: Let me try to be practical here, because if we're talking about leadership you are all leaders in your organisations, and in a sense in the opinions that you're generating and discussing in these lectures and this discussion and let me ask you how we put flesh on the bones of this - we've heard the Prince of Wales talking passionately about the need to understand how people and progress are different sides of the same coin, how the Earth is still a sacred trust - wherever you come from on the religious or moral spectrum. Now how do we put together the enormity of such thoughts with the practical business of day to day life - in politics, in business, in organisations which are trying to tackle seemingly insoluble problems of health - in practical terms what do you all do in the next five years? - Gro Harlem Brundtland?

Gro Harlem Brundtland: Well I was thinking of the summit in Nigeria that I just came from where 20 African leaders came together for 2 days, really going into in great detail the problem of malaria. On that continent 3 hundred million people are sick every year and it undermines the future, the economic potential, the human potential and it creates insecurity for life. Now if you don't get to the government leaders in dealing with basic human concerns like this, and it's linked to the environment, there is no way I think forward. If they don't focus on these issues as basic social and environmental concerns how can they lead their countries into the future? We see ourselves as supporting those kinds of actions. In practical terms - getting bed nets to every African child in every country where their life is threatened by malaria.

James Naughtie: There we have an action plan - John Browne what's yours?

John Browne: I don't want to sound too programmatic but I think you can break it down into a programme. The first and most important thing I think is that for the leadership of any enterprise, commercial enterprise, the leadership itself needs to be educated and experienced. People must see with their own eyes what is actually going on in Bombay, Azerbaijan, Algeria . It doesn't matter where. You have to go to go to see and you must talk to people and you need to understand what it means and therefore a sense of educative presence I think, an experienced presence is critical. Secondly I think then deciding what to do, saying what you're going to do and reporting against it and making it part of everyday life. This is not something which is separate and apart from making money, or educating - or developing your staff. It's one and the same thing. It's part of everyday experience - how do we clean up the water a little bit, how do we make sure less CO2, how can we ... how can we develop one more person to give them an idea of what the promise of the future is. These things are day to day, but they're all to do with delivering a business result.

James Naughtie: Tom Lovejoy you gave an alarming picture of the kinds of disasters that might lie around the corner if we don't get this right. In practical terms how do we get it right?

Tom Lovejoy: Well I think it sort of breaks down into almost two distinct but related issues - one is climate change and I think we've dealt with that. We just simply can't allow CO2 to accumulate to two, three even more times on our pre industrial levels, and things can be done in terms of carbon trading and new technologies like hydrogen fuel cells. But the other really comes down to biodiveristy and what happens in landscapes. And that only can be addressed properly if - if all the elements represented by the other Reith lecturers have brought together with those who are worried about the details of the biology.

James Naughtie: We've had many comments by e-mail and by more traditional means during the course of the lectures about what's been said, and many people are arguing that there is a willingness to accept some short term pain given the enormity of the issues that we face. Do you believe that's true or are the sort of people who write e-mails like that the people who've always believed that anyway - the goodies?

Tom Lovejoy: Well looking at a couple of the examples I used in my own Reith lecture, I think it turns out that the pain was less than people thought. That was the good news in those particular examples. And maybe I'm being a little optimistic here but I would view those as at least partial success stories.

James Naughtie: Vandana Shiva, looking ahead what are the practical things that you want to see to move towards the kind of sustained world that everyone is talking about in different ways?

Vandana Shiva: Most immediately what I work towards and what I'd like to see is the possibility that small farms in every country, north and south, rich and poor are able to survive into the future with sustainable methods - that that becomes a reality and to make that reality happen we will need to change the rules of trade, national agricultural policies - we'll have to rewrite the agreement on agriculture in the WTO - centre more on sustainability and small farm survival - then on maximising the profits of five grain traders in the world. I want to see farmers everywhere have the inviolable right to save seed because seed is sacred. It's their duty to save it and that would mean changes in the intellectual property rights laws world-wide, to exempt and exclude life forms from patentability because life as his Royal Highness mentioned is sacred. It's not a human engineered invention. It is the very symbol and embodiment of creation and its continuity.

James Naughtie: Do you see that threatened by the genetically modified organisms that are beginning to....?

Vandana Shiva: Very, very seriously and I think we now have more than enough evidence that the idea that genetic engineering is an imperative because without it people will starve - it's not at all true. Organic production increases food production many fold. It sustains biodiversity, protects the Earth, and protects all farmers while bringing us good food. And I think it's time that at least 50 percent of the world's money was put into research on organic methods and improvement of indigenous methods rather than this blind investment only in genetic engineering whose hazards are known, whose counter productivity is now established and which increases monopoly controls which we can't afford.

James Naughtie: So finally Chris Patten, a practising politician and I suppose in Brussels you feel like Sisyphus pushing his rock up the hill - it's always about to come down and crush you. How do you succeed in the task that's a shared objective by everybody here to make a difference?

Chris Patten: I think you have to believe that people are capable of being and doing better. I think the words that were used earlier - reverence and awe and value are all important and I think it should be much more part of our political debate and to talk about the morality of issues and the combination of morality and expedience. I think one has to challenge people with the fact for example that today we spend what 11 billion Euros, dollars in Europe on ice cream which is about twice what it would cost to provide access to clean drinking water for people in poor countries. I think those sort of moral affronts are things that people have to be challenged with and I don't despair of being able to lift peoples' eyes beyond the GDP figures to a rather more important horizon.

James Naughtie: Thank you all very much - Chris Patten, Gro Harlem Brundtland, Tom Lovejoy, John Browne and Vandana Shiva. Perhaps we should all meet again in 10 years or so and see how far we have got. Thank you very much indeed to all our Reith lecturers here. Thank you to all of you who've been sending comments to us as it's gone on. We hope that those continue. Thank you also to our host here at Highgrove - his Royal Highness, the Prince of Wales for his own thoughts on sustainable development. Now from me, James Naughtie, and this year's Reith lecturers, good night.

READ THE DEBATE | THE ARGUMENT | THE LECTURERS | PROGRAMME TIMES