

## Botanic gardens: Gateways to the future

Stephen Blackmore

Royal Botanic Garden Edinburgh, Edinburgh, Scotland, UK

I want to take the opportunity, here at the Third Global Botanic Gardens Congress in Wuhan, to present a personal perspective on the role of Botanic Gardens as gateways to the future. By gateways to the future I mean places where people can go in order to find their way in this complex and rapidly changing world. It has been very evident from the main themes and the programme of this Congress that, around the world, botanic gardens are responding to the challenges of global environmental change. More importantly, the collective responses of botanic gardens are already making a positive difference.

Sometimes, in thinking about the world I like to see it not as a stage, as William Shakespeare did in his play, *As You Like It*, but as a garden (Blackmore, 2000). Shakespeare wrote:

*All the World's a stage,*

*And all the men and women merely players,*

*They have their exits and entrances;*

*And one man in his time plays many roles*

The way that I, personally, like it sees all the world as a garden in which we are the players and in which we can indeed play many roles: as individuals, family members, citizens and members of society. This idea appeals to me because I regard gardeners as people who have a particular attitude of mind that can be of great value even when we think of gardening carried out at the scale of a small planet such as the one we live on (Blackmore and Paterson, 2005). What is this special mindset? Firstly, all gardeners are people who set out to manage nature by actively favouring the growth of one species over another, whether they do this in a botanic garden or a domestic vegetable patch. In so doing, gardeners work towards a vision of the garden as it will be in the future. This is often a vision of a quite distant future and one that the gardener may not necessarily live to see or achieved in full. My favourite example of gardeners thinking long term is a majestic avenue of giant redwoods planted at Benmore Botanic Garden in the west of Scotland in 1860. The planting of these trees clearly involved a long term vision and those who carried out the act of planting them knew that they would not see the finished work in the way that we can experience it today. I like to tell visitors to Benmore that if they were to come back in a few thousand years time, they would find that this avenue of trees will still be there. Certainly, giant redwoods are capable of surviving that long under ideal conditions, in nature, but will they have the opportunity to do so at Benmore as the climate of Scotland changes? Gardeners, I suggest, feel strong connections to their garden and an intense sense of engagement with this special place. Finally, they act decisively, with a strong sense of purpose, and are not afraid to roll up their sleeves and get stuck in. Such characteristics should, I believe, be applied by all people when thinking about our relationship with the Earth and how we can best manage it for the future.

We need a clear vision of how we would like the planet, with its rich biodiversity, to be in the future. The 2010 Biodiversity Target and the Global Strategy for Plant Conservation both set out such a vision: a world in which the loss of biodiversity has been significantly reduced and ultimately even halted. These bold visions challenge the many players whose efforts will be needed to achieve them. Although much has already been achieved in response to these strategies we know that they require much greater effort and resources and that, for now at least, the pace of extinction is accelerating, not declining. How can botanic gardens do more in response to this situation and, in particular, how can they act as Gateway into the future, to lead people through the times of great change that lie ahead?

Firstly, the Global Strategy for Plant Conservation calls for botanic gardens to develop the plant collections and expertise needed to maintain global plant diversity for the benefit of people in the future. This Congress has shown many examples of the positive benefits botanic gardens are providing around the world.

Equally importantly, botanic gardens can enable ordinary people and their families to understand how the world is changing and inspire them to take action for a better future. This is something that almost all people want to do but most still do not know where to begin. Global change is extremely complex and there is much that is not certain. In this situation, it is not surprising that most people do not know how to act or what choices to make for the best.

The challenges that lie ahead of us are greater than anything we have ever faced in all of human history. Climate change, biodiversity loss and the biological impoverishment of our planet really do present greater challenges even than the great wars or plagues we have confronted in our past history. So although some people say, "Don't worry we have been here before, we have survived major climatic change and even ice ages. Nature will take of itself." But in today's world nature cannot simply take care of itself. Humans have indeed survived many great challenges in the past, especially when we lived in small, independent and self-sufficient communities. Today, with our clever gadgets, processed food and other features of modern industrial society, we may behave as though we no longer depend on nature, but we do. We will never stop being dependent on food and energy created by photosynthesis - the ability of plants to capture and store energy from the sun powers our whole planet. The environmental challenges confronting us now are faced by complex societies that are in some ways less adaptable than the small self-sufficient communities of the past. More than half of the world's people live in cities, dependent on food and water from surrounding regions and most of the world's cities are situated in low-lying coastal areas most vulnerable to elevated sea levels or extreme storms. We are no longer very adaptable in the way we live and the speed of change is much faster than anything we have survived in the past.

It is no surprise that around the world, environmental problems are headline news every day. We should not make the mistake of thinking that awareness of these problems is the same as solving them. Many people are still reluctant to admit that we and our planet face serious difficulties. A common reaction to environmental crises is to ignore them and to hope that they will go away. I think that this is simply a normal part of human behaviour which enables us to get on with our lives even in terrifying situations. How then can we, in botanic gardens, overcome human nature and get our fellow citizens to look into the future? To dare to look in the face of the greatest challenges ever and think, "What shall I do about this?" I think that we need to think carefully about our message so that we are not simply dismissed for scaremongering. We need to make complex scientific information accessible and understandable at a personal level. We need to keep positive and to say more about what we need to do to address the challenges than about the bad things that what will happen to us if we don't change our ways. We need to make our communication entertaining and engaging. Thinking about the future has to compete with other things that people find important in life, such as football or fashion. We need to use all media of communication. In today's multimedia world, the scientific paper in a peer reviewed journal is as important as ever but it does not reach many people. Finally, we need to show examples of success in tackling issues like biodiversity loss and climate change. There are many good news stories and this Congress provides numerous examples.

The latest findings on greenhouse gas emissions published in February by the Intergovernmental Panel on Climate Change show very clearly how high above long term, background rates the principal greenhouse gases are rising, and how rapidly. It can help people who are not scientists to understand such things if we place them in the context of a human life time. A lot of very visible changes took place in Hong Kong between 1966 and 2006 as I found out when I visited some of my childhood haunts last year. But the invisible changes that were going on were huge increases in global human population which have placed enormous demands on the Earth's primary productivity. During the same period carbon dioxide concentrations increased from between 40 and 100 ppm above the pre-industrial background level of 280 ppm representing an increase of 60 parts per million in just 40 years. Of, course, it is still difficult to grasp what difference such increases in carbon dioxide actually make. But asking people to calculate changes that have occurred in their own life time is a good way of getting them to start thinking about the exceptional

nature of recent changes. The uncertainties that exist about likely future levels of greenhouse gases and changes in global temperature are equally difficult to explain. The headline idea of global warming sounds like a good thing to many people in northern Europe until the nature of climate change has been explained in terms of extreme weather events, changing weather patterns and increased flooding which is now a serious problem in much of Europe. The Intergovernmental Panel hoped that 2 February 2007 might go down in history as the moment when many people finally heard the alarm bell ringing and accepted climate change as a fact. Whether or not it did we need to explain the urgency with which climate change needs to be addressed. The idea that the later we wait before responding is an important point to get across. Dealing with the environment follows the law of diminishing returns: the more time that passes without action the more biodiversity is lost and the chance there is of reversing negative trends, for example, in climate change.

It is clear that the educational work of botanic gardens has never been more urgent. The Royal Botanic Garden Edinburgh has a wide range of educational activities. In addition to the more formal courses to diploma, degree, master or PhD level, we place a lot of emphasis on introducing children to the importance of plants in our daily lives. Whilst educating children, and their families, about the world we live in and how it is changing we try more and more to focus on the solutions, not the problems.

What kinds of solutions are available to these unprecedented challenges? And who are the players? Who can provide the solution? Some of the most important solutions relate to the protection and maintenance of biodiversity and the provision of food security, through sustainable land use. Both of these issues are addressed, in part by the Global Strategy for Plant Conservation. Others relate to our energy use and the urgent need to escape from the use of fossil fuels, especially coal, that result in the release of greenhouse gases. Infrastructural solutions such as energy efficient housing and transport systems are needed. None of these solutions is cheap. They all require substantial resources, but in the slightly longer term all of them will be regarded as bargains compared to the cost of inaction.

In addressing global challenges we all have a part to play. Some solutions will come from the actions of families and individuals who have a huge and often unrecognised influence over the outcomes simply as a result of the daily choices they make in life. Around the world, amongst people wealthy enough to have a choice, there is a move towards ethical consumerism and people are expressing political preferences according to environmental policies too. The role of government is, of course, also of great importance. It can provide the international, national and local leadership needed to bring about changes in the way we live and our fundamental relationship with the planet. Making policy commitments provides the framework for action, for example, through the GSPC.

Government also has a vital role in establishing positive financial incentives that will shift the balance towards a more sustainable relationship with the Earth. There is need for much greater action by governments. In the UK there has been much talk of taxation in response to the global environmental challenges but very little discussion about using the income from taxes to make positive changes. However, that will come, I have no doubt, because voters will demand it.

The solutions to the global challenges will be diverse. I want to emphasise that although new technologies and new ideas will undoubtedly be needed for the future, we already have solutions that could be applied even to the biggest problem, that of stabilising greenhouse gas emissions. An important paper by Pacala and Socolow (2004) has stimulated much discussion. It proposes that carbon dioxide emissions could be stabilised at current levels by seven “wedges”, each of which is an activity that reduces carbon emissions by zero in year one and by 1 Gigaton per annum in 50 years. Pacala and Socolow suggest that 15 wedges are available right now, even without the development of new technologies such as nuclear fusion. These 15 actions are all things that governments around the world can encourage through positive financial incentives. To illustrate how they work, the first “wedge” assumes a fourfold increase in the number of motor vehicles in the world (to 2 billion) yet achieves a saving of 1 gigaton of carbon dioxide emissions per annum if the fuel efficiency of engines increases from 30 miles per gallon to 60, a level of fuel efficiency available in some vehicles today. Surely that can be achieved over 50 years? The last three “wedges” are interesting to botanic gardens because they all relate to plants as primary producers in the global ecosystem. As such they

connect directly with the aims and objectives of the GSPC. Pacala and Socolow estimate that forest management could contribute half a wedge if the clearing of primary forest reduced to zero over 50 years rather than to half. A second half wedge could be generated by reforesting 250 million hectares in the tropics or 400 million hectares in temperate regions and a third of a wedge could be created by 300 million hectares of new plantations on non-forested land.

Whilst governmental leadership is needed to achieve any of the “wedges”, individuals also have a part to play. In the wealthier countries of the world there is a rapid rise in ethical consumerism and people realise the power they have to influence the outcome depending how they chose to spend their money. This is still a new phenomenon but it is starting to influence some of the largest manufacturing and retail companies, not necessarily for altruistic reasons but because they must compete for the consumer’s custom. Consumers are starting to make more thoughtful choices whether in fashion, energy efficient light bulbs and appliances, fuel efficient cars, investments, travel or practically anything else that money can be spent on. This will undoubtedly be a powerful influence for a better future although half of the world’s population currently live in such poverty that they do not have any choices and must simply struggle to stay alive.

In conclusion, the challenges of the global environment are clear enough for us to know that we must act now. We still need to put effort into enabling the public to understand the challenges but we must take care to place emphasis on the solutions. Botanic gardens should see themselves as leaders of this change, providing gateways into the future. I believe that the mindset of the gardener has much to offer – we must be prepared to actively engage with nature and to think about long-timescales. It is likely that plants will not be able to migrate in response to climate change through the greatly dissected landscapes of the modern world without our active help. That means we must have living plants and seeds in our collections and we must be involved on the ground in *in situ* conservation. As individuals we often feel small and insignificant, especially in the face of great challenges. But remember, we can play many roles: it is our actions as individuals, family members, institutional staff, voters and members of society that will decide what kind of future we will have. We must make our best efforts to see that the children of the future get a planet as good as this one to live on as this one.

## References

- Blackmore, S. 2000. All the world’s a garden. *The Horticulturist*. 10: 13-16.
- Blackmore, S. & Paterson, D. 2005. Gardening the Earth - the contribution of botanic gardens to plant conservation and habitat restoration. In, E. Leadley & S.L. Jury (Eds) *Plant Conservation and Taxonomy*. pp. 266-273. Cambridge University Press.
- Pacala, S. and Socolow, R. 2004. Stabilization wedges: Solving the climate problem for the next 50 years with current technologies. *Science* 305:968-972