Dennis Bushnell, Chief Scientist, NASA: Keynote Speaker at BlueTech Forum 2016

The following are excerpts from an interview that we recently conducted with Dennis Bushnell. This will provide you with a snapshot of some of the themes that Dennis will cover in his keynote address at BlueTech Forum on 1st June in San Francisco.

Dennis is the Chief Scientist at one of NASA's key research centres, in Hampton, Virginia, USA. Bushnell is responsible for technical oversight and future programme planning at the centre. He recently took some time to share highlights of his work with BlueTech Research Chief Executive Paul O'Callaghan.

NASA's involvement in space exploration and aeronautics is well known, but the work you do here on earth less so, can you tell us about it?

As well as space exploration and aeronautics, NASA is also in the business of trying to determine what humans have done to the atmosphere in terms of pollution and climate change. We invent sensors that we put on satellites and then we archive the data and scientists around the world use these data to determine what is going on. In the process of all this I became interested in how we might grow things on Mars. That led me to a consideration of how and why we grow things on this planet and that then led me to issues of national security and how well this climate and ecosystem crashing business is going and also how to fix it.

In your work looking at how climate change impacts resource depletion, including water, you have said some of the tactical approaches are moving at snail's pace. Could you elaborate on that a little?

Well there are two extreme ways to approach a problem, one is to manage scarcity and the other is to create wealth. You are about to have a water forum and I would wager that 90-95% of the papers in discussion will be on managing scarcity as opposed to trying to generate water wealth.

Most of what has been going on in water is about managing scarcity - and there is not much available fresh water. About 97% of water on Earth is saline, but about 70% of fresh water use is for agriculture. So, is there another agriculture that might use saltwater? It turns out there are 10,000 natural halophytes, plants that grow quite well on saline, and there is a huge spectrum of these plants. You can grow food, fodder, biofuel; tubers, berries, greens, and also oils.

There is another way to solve this problem. It involves very cheap energy desalination using low-energy nuclear reactions. This is the old cold fusion business people have been doing experiments in for about 25 years. If it works out, it is going to change the whole energy situation, so you are looking at energy about one-fifth the cost of coal, about one-third to one-fourth of the current cost of renewables, so that is another option but it is just not as near-term as halophytes. The halophytes we can do anytime.

So we're not resource limited in an absolute sense. It sounds like you believe we have a somewhat myopic view and an addiction to freshwater in the same way we were addicted to readily available cheap oil.

Some 60-70% of all of the new electrical generation on the planet is renewables. Parity of price has dropped to four US cents (¢) per kilowatt hour for solar voltaics and prices as low as 2.3¢/kWh are being contracted for wind; whereas natural gas and coal are up to around 5-6¢/kWh, so people are now going to renewables. Batteries and others ways to store energy are developing very fast, the cost of both storage and renewables is still dropping. With renewables there are no fuel costs, so if the fossil fuels cost anything at all, this is to their detriment. Coal plants are being closed all over the place and the gas plants that are being built are used primarily as peaking plants. Germany's found out that the sun is always shining or the wind is always blowing somewhere. Also, with renewables there is no need for so much cooling water, so we are reducing water.

So we could move to a low carbon economy purely based on economics as opposed to anything else?

Oh yes, exactly. I consult for our national security people and we are currently writing an analysis of this as something that is really happening and we are curious as to what it means for world econometrics, for world national security, along with the financial implications.

You mention the way we are bumping our heads against limits of growth and sustainability and population, but in one sense if you turn your gaze to saltwater we are not limited and if you turn your gaze to renewables, we are not energy limited - does it give you cause for optimism that we are not resource constrained in that sense?

At any given time there is a certain population requiring a certain standard of living and a certain share of resources - or they think they do. But there is an issue around the process of wealth accumulation and wealth distribution and as you get extremes of wealth accumulation like is happening now, unpleasant things happen and this will become compounded by the fact that machines will take people's jobs.

The Arab Spring and the Occupied movement were progenitors of potential social unrest due to various issues including climate change, crashing of the ecosystem and machines taking the jobs. So I have been looking at what is going to happen.
Firstly, four countries, including Germany and Switzerland, are working seriously at a guaranteed income so you put the machines that are taking the jobs in global commons or you do progressive taxation and you provide some reasonable income for people.

Secondly, we are currently turning humans into cyborgs very rapidly; 10,000 people are walking around with brain chips in their heads. In 15-20 years if you don't have the latest chip, you probably can't compete, so as we turn humans into cyborgs they can compete with and join the machines, so we're changing ourselves.

The third approach, which I really like, is that before 1820 or so, in the US, there were very few jobs. Some 94-96% of the workforce were subsistence farmers. Jobs are an artefact of the industrial age, where we ruined the social cohesion in agricultural villages, moved people into cities and learned how to spell alienation. We now have tele-everything - tele-education, tele-medicine. We have 3D-printing, so you can do you can make just about anything you want in your backyard. There is enough acreage on the planet for the current population to have about six acres; you only need one. On one acre you could make anything you want; you could grow anything you want; you could go off all the grids. No one will need a job and therefore the current econometrics go away.

With regards to BlueTech Forum, if there was one thing that will come out of it or one message that will reach the delegates there, what would you like that to be?

Raise your eyes to the horizon and think longer term. We as a species are far too terminally tactical. The Chinese I think have a 1,000-year planning cycle, the Japanese 140 years, and the US planning cycle is three months on Wall Street to the four-year presidential cycle.

If we really get up against it, we could change both plants and people to survive in whatever mess we make. The humans are now in charge of the evolution of everything, including the planet, the people and everything there is.

BlueTech Forum is taking place on 1st June in San Francisco.

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