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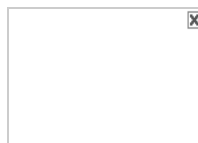
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[Interviews: Stewart Brand Answers Your Questions 22](#)

Posted by [samzenpus](#) on Monday May 12, 2014 @10:00AM
from the listen-up dept.

[samzenpus \(5\)](#) writes "Last week you had the chance to ask biologist Stewart Brand about his books, his life, and his [Revive & Restore](#) project, which aims to to [bring back extinct species](#) and provide [genetic rescue for those that are endangered](#). Below you'll find his answers to [your questions](#)."

Your position on nuclear energy
by TheRealHocusLocus

I accessed The Well when it was a dial-up BBS (at great expense!) and devoured the Whole Earth Catalog. You are one -- if not 'the' -- most notable environmentalist to 'break ranks' on the topic of nuclear energy. On this topic you are a great orator, for you do not merely have the gift of calmly and diplomatically dispelling myths, at the same time you clearly communicate a love for people and a love for the most awesome aspects of modern technology, the 'keepers' such as rural electrification. I am also a staunch advocate for LFTR and my heart is gladdened to hear you mention it. My question is, has your position and persistence on the topic of nuclear energy brought you joy... or grief?

Brand: Interesting question— where is the pleasure and where is the pain in taking a public heretical position?

For me the main delight came with rethinking my previous knee-jerk opposition to nuclear.. Once I decided to research the topic on my own, I had the pleasure of finding out that EVERYTHING that most environmentalists and liberals thought about nuclear energy was wrong— radiation risk, finances, waste storage, Chernobyl, etc. I discovered the same thing with GMOs (though as a biologist I had been mildly for them anyway; once I studied the subject I became fiercely for them.)

Piercing an illusion for oneself is a pleasure. Piercing an illusion for the public gives the satisfaction of being a responsible citizen.

Grief hmm. I was annoyed that what is probably my best book, *Whole Earth Discipline*, got roundly shunned in American media—most likely because of the pro-nuclear position in it. (In the UK the book got a huge public reception, being seriously reviewed in every major medium.)

Impossible, Impractical or Unpopular?

by jacksdl

I've been a fan of your eclectic perspective and rational style since I bought the "Last Whole Earth Catalog". I know you were an early proponent and popularizer of space-based solar power and space colonies (at least in late 70's as I recall). Have you changed your views on those? Can I hope that my children will see an O'Neill Cylinder in space (or at least a Bernal Sphere)? I know faster than light travel is impossible. I know personal jet packs are impractical. Do building those space colonies we dreamed about in the 70's fall in the impractical category -- or just unpopular?

Brand: I defer to Elon Musk on satellite-based solar. He claims that even if getting the apparatus into orbit were free, the economics still would not work out. I figure the head of SpaceX and Solar City knows what he's talking about.

Re: space colonies - There needs to be an economic reason to have humans in space, and we're hugely expensive and easily bored compared to robots. Maybe asteroid mining will justify something.

We do have a fair amount of experience of people living in artificial structures in hostile environments—big ships at sea. Sailors are pretty eager to cycle off of the aircraft carriers. Even luxurious cruise ships could not retain passengers if they had to stay aboard indefinitely.

LSD and technology

by CRCulver

How have your experiences with LSD affected your later work? (For those unaware, Ken Kesey and the Merry Pranksters went around turning people onto the substance, as documented in Tom Wolfe's "Electric Kool-Aid Acid Test"). Many participants in the counterculture speak of having new spiritual perspectives after taking LSD, but has it given you any special insights into working with new computer technology?

Brand: LSD was a swell way for my generation in the '60s to establish a generational specialty. And it was an intriguing way to discover one's own mental apparatus at work. The main effect I would call consciousness-contracting rather than consciousness expansion. You would obsess. I got my "Why Haven't We Seen a Photograph of the Whole Earth Yet?" campaign of 1966 from an afternoon of that kind of obsession.

As for spiritual perspective, it went various directions for various people. I lost interest in "mystical experience," once it became routine and chemically inducible. My friend Kevin Kelly, a Christian, got roundly God-smacked on LSD, and loved it.

Computer tech stuck me as better than drugs, because it kept getting better almost daily, whereas drugs and drug experiences stayed the same, so I switched my interest to computers and hackers. The upshot was that I had my last acid trip in 1969 and was pushing personal computers in "CoEvolution Quarterly" before they existed (1974) and co-organized the first Hackers Conference in 1984.

As for now, I agree with something Danny Hillis said to Brian Eno on the Long Now stage earlier this year. (Danny has invented no end of standard computer usages, from massive parallel processing to the "pinch" you use to change the size of images on your smart phone.) He told Eno that if he was a grad student now, he wouldn't study computer science, he would study synthetic biology.

What surprises you?

by Anonymous Coward

What is the most surprising thing you have learned from working on the 10,000 Year Clock, and Revive & Restore? (Thanks for building the Clock, by the way. I can't wait to visit.)

Brand: An early surprise for us was discovering that the Clock is perceived by many people as an embodiment of optimism about the future---rational and emotionally persuasive optimism. And that many young people are attracted to it for that reason.

Remember, the Clock is neutral, content-free. All it does is give permission to think long-term. If people use that permission to think well of the future, that's pretty interesting.

Captive Breeding programs and viability

by Anonymous Coward

Posting as AC because who knows what some politico might think of this:

What are your thoughts regarding captive breeding and has any work gone into determining population size to get a good spread of genetics so that in the future, if a reintroduction effort is raised, would help ensure the species' continued survival?

I, along with a few dozen people worldwide, work with endangered/threatened/extirpated fishes in our fishrooms. Some of the fish I work with, for example, were once found in a single location (a temporary/annual pool in Brazil), only to be found to be destroyed by human encroachment the following season (condos built on the site). No other locations have been found in the area, and as far as we can tell, the fish in our tanks are the last ones available. Others have been completely lost, and some of us are working hard to keep others that are precariously situated from meeting similar fates. We regularly swap eggs/fish to try and keep the gene pool varied, but I do wonder how we're effecting the genetic viability over many generations.

Similarly, on the one hand, the .gov organizations in these countries can be very heavy-handed in the 'trafficking' of these species. Rightfully so, I might add, as the environments are rather marginal (sometimes, in a pool less than a few meters across and less than a quarter meter in depth), and well-intentioned hobbyists could inadvertently destroy/fish out the habitat, but part of me thinks that instead of implementing a ban, organize it so a certain number of fish can be taken while monitoring conditions to be distributed into the captive programs. The Devil's Hole Pupfish, for example would definitely benefit from a few specialists working with it for captive breeding.

Brand: Thank you for what you're doing.

Your idea of people adopting endangered creatures sounds promising. Mike Archer in Australia (working on de-extincting thylacines and gastric-brooding frogs) notes that no species that humans have taken on as pets or as non-commercial game animals have gone extinct.

You're right to worry about the "extinction vortex" that small populations get into, where each generation can suffer from increased inbreeding and genetic drift. At Revive & Restore we're researching with black-footed ferrets to see if biotech can help bring about "genetic rescue" for the species. We might be able to detect and reverse homozygosity of deleterious genes, for example, or even revive "extinct alleles" from the DNA of museum specimens. If it works, it might work with some of your fishes.

Should we start with Threatened Species?

by retoworks

Shouldn't we first try to transplant elephants and rhinos to Texas, and Siberian tigers to Canada, and Rwandan gorillas to central America? It has been politically incorrect to risk "invasive species", and in the 1970s we thought this would backfire. But if we are going to revive extinct species, it seems we've given up on the habitat specialization anyway, and perhaps should save species while they still have genetic diversity by relocating them to stable and law enforced environments.

Brand: What you're describing is usually referred to as "rewilding." The [idea](#) surfaced in a big way around 2005, encountered ferocious "pre-emptive constraint of vision," got buried, and now is reviving wholesomely, partly in context of de-extinction. The main thing happening is that conservation biologists increasingly are focussing on ecosystem health and ecological function of species. Thus they (and the public) had no problem replacing America's east coast peregrine falcons---who all perished from DDT and such---with a hybrid mix of falcons from elsewhere. Likewise the Bolson land tortoise is being reintroduced in the Southwest.

I think you'll see versions of what you propose turning up increasingly. It will help the public take ecosystem health seriously and focus less on species "purity."

Which Species, and Why?

by Penguinisto

This leads to a follow-on question: What criteria does one give when determining whether a species should be revived or not?

Personally, not every species should be revived, no matter how cute it may or may not be, or its perceived usefulness, or some misguided idea that all species must be saved no matter what (in spite of species having gone extinct since the dawn of time with no help from mankind whatsoever, and many of whom would have prevented mankind from rising up had they not gone extinct, etc...) Now if it's clearly mankind's fault that one dies off, sure - let's see if we can bring it back. Otherwise, well...

Brand: The IUCN has given a lot of thought (and [writing](#)) to criteria for protecting endangered species. They are now developing similar material for de-extincting species. At Revive & Restore we've got some opening [thoughts](#) on the subject.

One consideration is habitat. There would be no point for now in bringing back the extinct Chinese river dolphin because there are no healthy Chinese

rivers near the coast to receive them, but there is plenty of habitat for woolly mammoths, passenger pigeons, great auks, Carolina parakeets, and Tasmanian tigers (thylacine). But Tasmanian tigers would be difficult because they are genetically remote from living species. I think they will be brought back eventually—they're a fine apex predator for Tasmania—but not until a lot of technique has been discovered and refined.

There is no thought or possibility of bringing back all extinct species. Fossils older than 500,000 years have no readable DNA—so forget dinosaurs. Nearly all of the extinctions that happened in the last 10,000 years were caused by us, directly or indirectly. And they have recoverable DNA.

Potential Risks of Invasive Species

by Serenissima

If particular species have gone extinct, then I would assume their environment could no longer support them. If we manage to bring back those species, and introduce them into environments that could support them, it seems that we have the potential to unbalance that ecosystem by introducing an invasive species which has no natural predator there. How would you manage this risk?

Brand: The whole process of alien invasive species is pretty well studied now, including how to head it off. No species returned to its former habitat will behave like an alien (cane toads in Australia, brown tree snakes in Guam) because they aren't alien. Returning passenger pigeons to the eastern deciduous forest would be slotting an animal back into the gap it left when we killed it off. Ditto the great auk in the north Atlantic.

In the unlikely event of the restored animals proving unwelcome for some reason, we know exactly how easy it is to back them off or kill them off because we did it before. Their vulnerability to human overhunting is part of who they are.

Reintroductions are pretty common in conservation now. Wolves were returned to Yellowstone Park after being absent for 100 years. They did fine, and the park improved ecologically with their return.

Bubble Mammoth

by fibonacci8

How long is a revived creature going to last in an environment full of toxins and biological hazards against which it has dubious amounts of defense?

Brand: Nature is more robust and rich than many give it credit for. Life abounds out there. Adaptation, even to climate change, is increasing its pace. The main challenge that revived species face is other creatures competing and preying and infecting, not human impacts so much.

You are right, though, to call attention to biological hazards—exotic diseases that have been inadvertently introduced by traveling humans and cargo. Chytrid fungus in frogs, white-nose syndrome in bats, avian malaria mosquitoes in Hawaii, sylvatic plague in black-footed ferrets. We're organizing a conference next spring to see if there might be genetic solutions for some of those problems.

It's not a universal situation. Mammoths should be fine. But the beloved 'o'o bird in Hawaii should not be brought back until the avian malaria problem is solved.

What then?

by OldGoatDJ

We are currently having problems preserving species with populations of only a few hundred members, (Ridley sea turtles, Right Whales, etc). What will happen when we develop a species with only 1 or 2 members? Will these deextincted species have priority over the existing near extinct species? It appears that the goal is to create more 'almost extinct' species.

Brand: Genetic variability certainly is essential for a healthy population. So you don't bring back just two animals, and you don't rebuild their genomes from just one or two museum specimens or fossils. Passenger pigeons, for example, can draw on the DNA from 1,500 specimens. In reality, DNA from a dozen or so would give plenty of variety for the population to work with. You're also drawing on the genetic variability in the genomes of the close-relatives. You can edit genes from various mammoth genome files into the living genomes of various Asian elephants.

Plenty of animals, plenty of alleles, plenty of SNPs—single-nucleotide polymorphisms.

The goal is enhancing biodiversity. Restore healthy wild populations of endangered species. Restore healthy wild populations of some extinct species. Use the most advanced genetic tools not just for human health but for ecological health as well.

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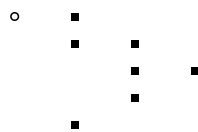
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- o [Best Quote Ever on the nuclear power issue: \(Score:3\)](#)

by [Mike Van Pelt \(32582\)](#)

In a TED Talk debate by Stuart Brand and someone who was taking the "All we need is sunny days when the wind is blowing energy" type person, Stuart Brand made the statement:

"I am not so much pro-nuclear as I am pro-arithmetic."

This, big-time. Industrial-technological civilization is not compatible with "energy only on sunny days when the wind is blowing". The numbers just do not add up for the energy storage schemes proposed.

Aritmetic denialism seems to rule the day among most of the people who claim to



- [Nuclear, GMO \(Score:2\)](#)

by [ArcadeMan \(2766669\)](#)

I'm not opposed to nuclear because in theory it's a perfect energy source. In practice, however, it's built and maintained by humans, so it's not safe. Even a perfect nuclear plant wouldn't be earthquake proof, etc.

In theory I'm not opposed to naturally-occurring GMOs, but in practice humans have been doing forced cross-breeding between things like plants and spiders. That's not natural and we can't really predict what the consequences will be because such things would never happen in nature.

- [1 hidden comment](#)

- [Re: \(Score:2\)](#)

by [ArcadeMan \(2766669\)](#)

That's [scorpions](#) [mnn.com], not spiders. But my point is still valid.

- -

- [Re: \(Score:2\)](#)

by [ArcadeMan \(2766669\)](#)

GMO doesn't mean I.P. rights, that's an entire different story.

- -

- [Re: \(Score:2\)](#)

by [VortexCortex \(1117377\)](#)

Yes, well, that's like saying changes in concentrations of atmospheric elements are a totally different thing than climate change. Pray tell: How is a story different when it involves the same players and the same stage at the same time?

- -

- [Re: \(Score:2\)](#)

by [DriveDog \(822962\)](#)

Pretty much nailed it. In theory, we can build fail-safe reactors, but it wasn't done. It's nearly impossible to overestimate a life-cycle cost for a reactor, given that there'll be many decades of stuff to deal with even after it's shut down. In the US, the Nuclear Regulatory Commission hasn't fulfilled its original mission faithfully. Why would we expect it to do otherwise now? Properly licensed, designed, built, regulated, and inspected reactors are very expensive. Economically, particularly taking into

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- [Re: \(Score:3\)](#)

by [mspohr \(589790\)](#)

Actually, there are all kinds of inter-species exchanges of DNA going on all of the time. Bacteria and viruses are important vectors for this. This happens literally billions of times a day. I don't think it's a good argument to say that inter-species DNA transfer is "not natural" or would never happen since it does happen all of the time. Evolution has a way of sorting out things... survival of the fittest and all of that. Nature comes up with it's own GMO organisms more rapidly than any lab and they are t

- -

- [Re: \(Score:3\)](#)

by [doconnor \(134648\)](#)

The only practical alternative to nuclear in many places is fossil fuel power generation which even when working perfectly is not safe for the environment.

Its a lot easier to predict when you know what gene you are transferring then old fashion selective breeding which we have practiced for 10s of thousands to years and managed to change [this](#) [alphacoders.com] into [this](#) [wikipedia.org].

- -

- [Re: \(Score:2\)](#)

by [doom \(14564\)](#)

I'm not opposed to nuclear because in theory it's a perfect energy source. In practice, however, it's built and maintained by humans, so it's not safe. Even a perfect nuclear plant wouldn't be earthquake proof, etc.

This is a fine example of a sentiment that seems wise and reasonable but is actually completely divorced from reality. By any practical standard, nuclear power has a very good track record-- it also has a few of dramatically well-publicized failures that people fixate on, even though it's ave

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- [Everything I know about nuclear is wrong? \(Score:2, Flamebait\)](#)

by [fredrated \(639554\)](#)

So nuclear waste can be safely flushed down the toilet? Who knew?

- [1 hidden comment](#)
- [Re: \(Score:2\)](#)

by [bzipitidoo \(647217\)](#)

He's in favor of nuclear power? I would be too, except for certain kinds of problems.

Yes, nuclear power can be generated safely. That is, we can keep the risks to acceptably low levels. We also have vastly improved designs we can employ, and there are huge quantities of thorium we could use in a different kind of reactor. We may eventually figure a way to economically generate power from fusion rather than fission. Getting rid of radioactive material in a reactor designed for that could make the envi

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- [Re: \(Score:2\)](#)

by [doom \(14564\)](#)

The problem is, as I keep saying, the human factor. Mistakes have horrible consequences because we can't easily clean up the mess from an accident. If we didn't have to wait centuries before contaminated land was again safe to inhabit because we could clean up after a disaster, it would be different. How long will it take for the Gulf of Mexico to fully recover from the BP oil spill? Decades, it seems. But that's better than the prospects of recovery from a nuclear accident.

You don't *really* have to wait

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- [Re: \(Score:2\)](#)

by [bzipitidoo \(647217\)](#)

Using number of deaths as a measure of danger is misleading. By a measure like that, Hurricane Andrew was a lesser disaster than some bus crashes. Hydroelectric power could be considered extremely dangerous, thanks to the Banqiao Dam.

A better measure could be the economic damage. Fukushima is estimated to cost \$500 billion. The Banqiao Dam failure is part of the damage caused by Typhoon Nina, which is estimated at \$1.2 billion in 1975 dollars. Bhopal is a bit more difficult to fix a cost, but damage

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- [Re: \(Score:2\)](#)

by [doom \(14564\)](#)

Using number of deaths as a measure of danger is misleading.

Ha, ha, you caught me. We pro-nuclear people are always making up silly principles like a concern for human life.

By a measure like that, Hurricane Andrew was a lesser disaster than some bus crashes. Hydroelectric power could be considered extremely dangerous, thanks to the Banqiao Dam.

Right, and a conclusion like that would violate the prime directive, "nuclear power is always wrong".

A better measure could be the economic damage

Okay, now I

-
- [Re: \(Score:2\)](#)

by [bzipitidoo \(647217\)](#)

silly principles like a concern for human life.

Now, now, just because life isn't infinitely valuable doesn't mean it's cheap. We like to feel that life is priceless, but that's a conceit. We could make roads much safer, reducing fatalities to almost none by reducing speed limits everywhere to 20 mph, but we have not. We can have middle ground on this. We can accept principles such as weregild that have influenced our laws for centuries.

As for this call to average the economic damage over industries, I think nuclear power is worth using, if the onl

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- [Re: \(Score:2\)](#)

by [doom \(14564\)](#)

As for this call to average the economic damage over industries, I think nuclear power is worth using, if the only alternative is coal.

Damn right. We get something like 20% of our power from nuclear and 40% from coal... wouldn't it be cool if we reversed those two numbers? It's weird that a notion like that is even controversial.

Nuclear is better than coal. But coal is not the only other option. That's another fallacious point I often see in favor of nuclear,

Nope, not a fallacious point: the idea tha

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