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Is this a good idea? Bioprinting a human being?

May 16, 2011

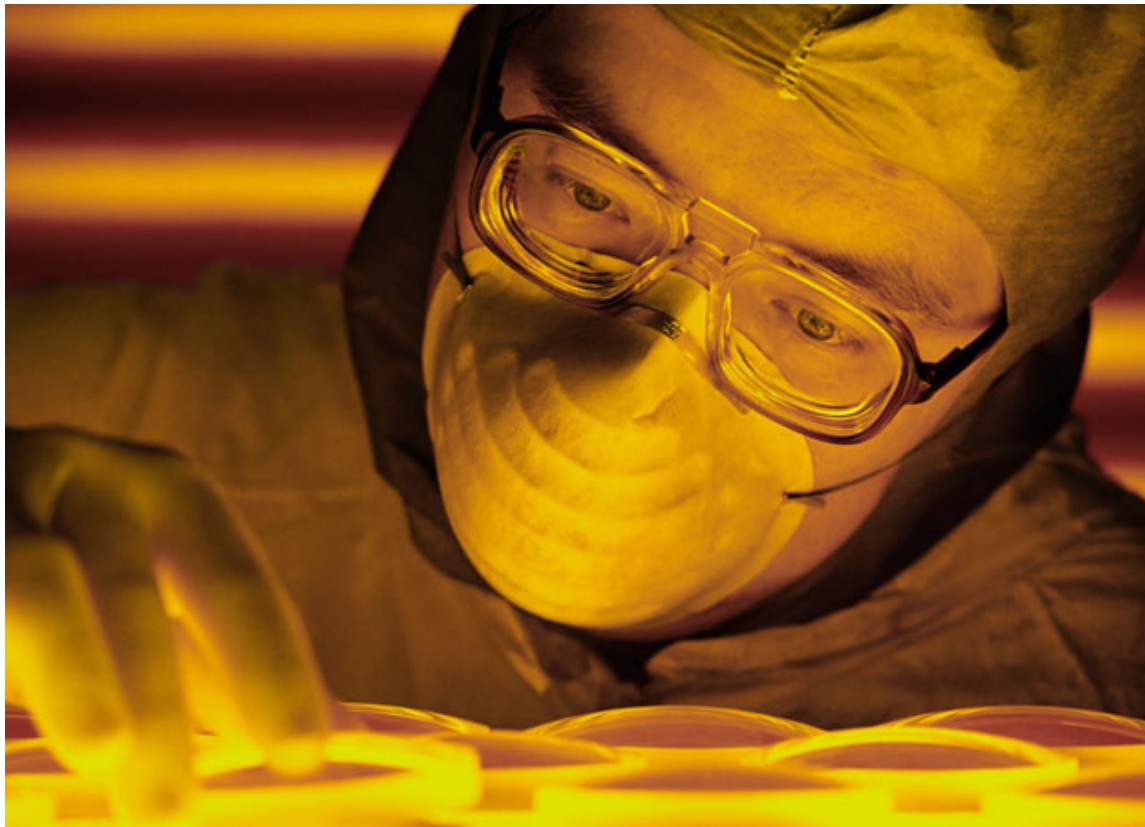
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In this age of media overload, it's all too easy to get in the habit of just skimming the tsunami of data that continually washes over our beleaguered frontal lobes. And that's unfortunate, in a way, because sometimes the most interesting, revelatory, paradigm-rocking information is buried in the x-teenth paragraph.

A good example is this [Washington Post article](#) about bioprinting -- that is, the use of 3-D printing, which stacks layers of biological material to create objects, to fashion replacement organs for humans. The author, Bonnie Berkowitz, reports that researchers already have printed skin and vertebral tissue that has been tested successfully in animals, and that the printed replacement spinal disks and knee cartilage could be ready for human trials in the next two to five years. Printing more complex organs such as kidneys or hearts is much further away, she writes, mostly due to the challenge of replicating their intricate internal vascular networks. If you're a fellow obsessive Googler of science news, of course, you already knew all this, since medical visionaries have been buzzing about bioprinting for years, as this [2004 ABC News article](#) and this [2007 ScienceDaily article](#) detail. In fact, as this [Wired article](#) reported last year, researchers at the San Diego-based biotech company [Organovo](#) already have developed a way to print veins using cultures of cells from patients' own bodies -- a giant step toward solving the problem of creating a working, vascularized replacement organ.



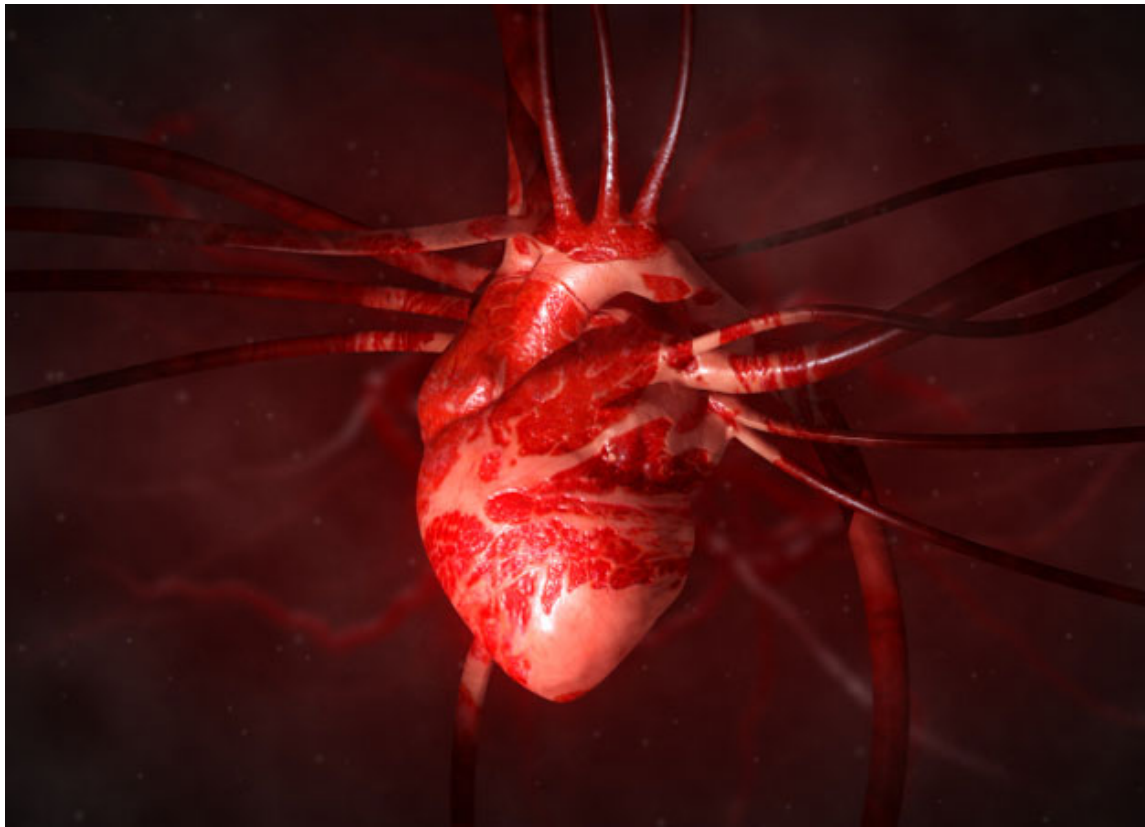
But near the end of the Post article, I found a tantalizing tidbit offered by developmental biologist and tissue engineer **Vladimir Mironov**, who has **advocated** for the creation of a massive, Manhattan Project or Apollo-scale national effort to create bioprinted organs for transplantation. (Until he recently **parted ways** under somewhat mysterious circumstances with Medical University of South Carolina-Charleston, Mironov also was leading another visionary quest -- a project to create **test-tube meat**, a subject that I've written about in this blog.) Once again, however, I digress. Here's what he said:

If one can bioprint functional human organ constructs, then bioprinting a whole human--or whatever will be the name for such a creature--is just a logical extension.

Bioprinting a complete, living, functional *Homo sapiens*? Now, that's what I would call an innovation. In fact, it might just be the most mind-bogglingly astonishing concept that wasn't dreamed up by my favorite Swiftian fabulists at the **Weekly World News**. But unlike, say, Batboy or the Alien giving advice to Barack Obama, this is something that actually might happen. Here's an excerpt from **a piece** that Mironov wrote for *The Futurist* back in 2003:

Once we learn how to produce isolated body parts, we could eventually be able to build a whole body. Organ printing does not require embryonic stem cells. Both mature differentiated and immature adult stem cells could be used. Human-printing technology would eliminate the need to wait 18 years in order to get a fully developed adult: Humans could theoretically be printed on demand and be functionally ready in days or weeks.

Mironov noted that reverse-engineering and manufacturing a working human brain might be the most challenging part of the project, since we still have an awful lot to learn about how the brain actually functions. He raised the possibility of getting around that problem in the short term by substituting **biochips** -- essentially, extremely tiny chemical computers -- for the synthesized brain tissue that eventually would be developed.



Assuming that it does indeed become possible, building future generations of humans layer by layer -- instead of just producing them in the, ah, conventional fashion -- would have a gigantic impact upon the future of our species. Rather than just passing along all our traits, we could redesign our descendants from the ground floor to be healthier, stronger and possibly smarter than us. It's probably the easiest approach to the Transhumanism that futurists have been dreaming about for a while, and unlike many of their previous visions, it doesn't require painful reconstructive surgery to improve the human form.

We also could speed up evolution and front-load them with adaptations to cope with the troubling future impacts of climate change. After all, they've got to be ready for it in 50-100 years, which doesn't give evolution enough time to work on its own. (Remember that it took the Neanderthals who-knows-how-long to gradually develop larger sinuses to keep their brains warmer during the Ice Age, as this [**Scientific American** article](#) describes.) And future moms-to-be wouldn't have to deprive themselves of Americanos and apple martinis, as they do now.



As most of my favorite radical new ideas do, bioprinting humans would have a few downsides as well. If continually having to replace those six-color printer cartridges drives you nuts, I'm guessing that printing an entire human might really break your piggy bank. Okay, that was just a joke. As Mironov noted in his 2003 essay, what we're talking about here would do for propagation of the human race what **Johann Gutenberg's** invention of the printing press did for mass communication and the spread of ideas in the 15th Century. To people of that time, moveable type was viral video on steroids. It dramatically altered the economy and the class structure and helped create new religions, governments and art forms. But it also unleashed ideas that some considered immoral or too unsettling to the status quo, and made it exceedingly difficult to control the future. Nobody could have predicted that it would lead to Kurt Vonnegut, Jr.'s **The Sirens of Titan** --or to the moronically violent nihilism of **The Anarchist's Cookbook**.

So what do you think? Is bioprinting human beings a good idea? Express your opinion below.

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