



Manufacturing Greatness

Can technology make us the people we've always dreamed we could be?

By Linda Rodriguez

By the time Wolfgang Amadeus Mozart was five years old, he could read and write music. Chances are, your kindergartner isn't blessed with the same natural abilities. But is it possible — with the help of some innovative technologies — that he or she could be a mini Mozart anyway?

Tod Machover, a composer and professor of music and media at the Massachusetts Institute of Technology Media Lab, has created a program that allows five-year-olds — and people of any age, for that matter — to sidestep the difficult processes of learning to read music and understanding tone, pitch, harmony, and melody, and go straight to the fun part of creating music. The software, called Hyperscore, uses a mouse-based visual interface that employs a visual language of lines and colors to allow users to draw and paint music. The program is already available commercially and in schools across the globe.

"It's an attempt to create an environment where people start from scratch and make their own music," Machover explains. No, he says, kids using Hyperscore don't usually become prodigies overnight. But he insists that's not really the point.

If the last century is any measure, the up-

per limit of human achievement is continually rising, blowing past the previous world record in a Usain Bolt-shaped blur. And to some degree, it seems to be technology like Hyperscore that's fostering this jump in human ability. So as these kinds of technology help individuals surpass what talent and hard work alone can accomplish, could someone become great without ever really being that good?

The answer, Machover says, is not exactly. "I think most people, given the opportunity and the right context and maybe the right tools, have far more ability to express themselves and to do original things than (1) they're given credit for and (2) than they realize themselves," he says. "One goal should be to help anyone who has a natural inclination to a certain kind of thing go as far as they can."

And that's exactly what Machover and his graduate researchers at MIT are trying to do. Machover's lab is littered with dissected parts of instruments, things that once were instruments, and things that are on their way to becoming instruments. Near the front door stands an upright piano of sorts — the entire underside of the keyboard is a thicket of copper wiring attached to what looks like a battery — that was created as part of a thesis by Craig Lewiston, a former

PhD candidate in the lab. The piano employs haptic guidance — physically moving a finger or a hand into place — to reinforce what a student's brain is learning. The keys of the piano are rigged with electromagnets that can be turned on or off, depending on which note is called for. The player wears gloves that are outfitted with magnets in the tips and draw his or her fingers to the correct keys.

"It's a very common technique. ... Violin teachers, piano teachers, tennis teachers, golf teachers — all at some time use physical guidance," Lewiston explains, adding that his goal was to automate that guidance. And it works: In experiments, subjects who used this system learned simple keyboard sequences faster than those who didn't. While it's just a working prototype for now, Lewiston sees this system ultimately having applications in physical- and cognitive-rehabilitation programs as well, such as those used in treating stroke victims. But he doesn't see it devaluing human talent.

"People are afraid that technology like this will destroy notions of talent, that anybody

can learn how to [be great]. I think that's a bit ridiculous, frankly," Lewiston says. He believes there's a more realistic comparison for this kind of learning technology: training wheels. Much in the way training wheels aid a child who's first learning to ride a two-wheeler, this technology is there to coax you along until, eventually, you're doing the work all on your wobbly own. But, of course, no one ever won the Tour de France on training wheels. Ultimately, Lewiston says, it takes a great deal of practice to become good at anything.

Which brings us back to Mozart. "When you talk about innate talent, jeez, clearly it's hard to find too many examples of people who had more," says Machover, a Juilliard-educated musician himself. "[But Mozart's] father worked him like a dog and was very, very clever about teaching him the keyboard and how music worked from a very young age. So make no mistake, that was not pure innate talent."

Still, a high tide raises all boats, and Machover's technologies would help flood the banks. "You want everybody's talent to

be developed to the fullest extent," he says. "Even Mozart's — you want to find a way that, through the tool, the experience, and the culture, the person has every possibility to go further than he or she ever expected. But you want that for everybody."

A similar discussion is taking place in the world of sports. More and more, technology plays a critical role in athletic competition, and no one knows that better than Tim Wei, PhD, a professor of fluid mechanics and the acting dean of the School of Engineering at Rensselaer Polytechnic Institute in Troy, New York. For the past few years, Wei has worked with USA Swimming, an organization that trains U.S. Olympians, using sophisticated flow-diagnostic equipment to figure out why some swimmers are faster than others. Wei has developed tools such as sophisticated digital-imaging equipment that can capture, in real time, the flow of water around a swimmer's body and measure the force that propels the swimmer. With the feedback Wei gets from these measurements, he has helped great swimmers, Ariana Kukors and Megan Jendrick



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among them, shave seconds off their times. But he argues that such performance improvements are an innate part of athletics — and always have been.

“I think bottom line is ... athletes are getting bigger, stronger, faster,” Wei says. “That seems to be a natural evolution.”

Of course, some would question whether it is “natural.” Wei believes it is, in the sense that sports technology is using scientific methods and a better understanding of the human body to improve athlete performance and achieve maximum results. He relates this boost to the revolutionizing of the high jump in 1968, when Olympic athlete Dick Fosbury jumped over the bar backward, now a standard technique known as the Fosbury flop. Because of this improvement, the bar had to literally be raised.

One of the big questions that arose in connection to the 2008 Olympics, however, wasn't about bodily adjustments but concerned the effect of technologically enhanced gear, such as slick new suits utilized by the U.S. swim team. But even that kind of technology, Wei insists, doesn't replace inherent talent.

“If you put one of those suits on me, yeah, I may go faster, but would I be able to take on Michael Phelps?” he asks skeptically. “You really have to be at an elite level to start with.”

Wei points out that as athletics have evolved throughout the ages, so has sports equipment; it was only in recent history, for instance, that men in swim competitions first donned caps, which improve performance by significantly reducing drag. But, he says, the technology emerging today isn't going to level the playing field between the Andy Roddicks and the average Joes. While advancements in tennis-racket technology have enabled top players to serve at triple-digit speeds — numbers that were unheard of with wooden rackets — that doesn't mean anyone who picks up a racket can achieve a 100-mile-per-hour serve. “You don't suddenly have everybody being elite tennis players because of it,” Wei says.

Despite their disparate fields, Wei and Machover agree that technology likely won't wipe out talent anytime in the near future. But it can empower a larger population of piano players, tennis enthusiasts, and the like. Machover says that he isn't helping people become prodigies; he's helping them

become active amateurs. And raising the bar for everyone — from virtuosos to those who sing in the car with the windows rolled up — is nothing but beneficial. The good will continue to get better, and the general populace's ability to appreciate the good will improve too.

“Right now, we have a culture where if there were a Mozart, you're not sure that

some large percentage of people would recognize it or know the difference, really,” Machover says with a laugh. “So there's a real advantage in just having as many people as possible be open-minded and aware and pushing themselves as far as possible.” **AW**

LINDA RODRIGUEZ is a freelance journalist who has recently moved from Boston to London. She does not play an instrument but thinks if magnetic keyboards had been around when she was a kid, she might have gotten past “Heart and Soul.”

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