

Science breakthrough reflections

Out of the Box

Tony Chan Fan-cheong is president of the Hong Kong University of Science and Technology. He has spent his life pursuing his dreams relating to teaching and research, and has unique views on education, scientific and technological development, and nurturing the young.



A FRIEND RECENTLY sent me a short video on Facebook which contains 12 predictions of new science breakthroughs for 2017. The video was made by Hashem Al-Ghaili, a Yemeni millennial who lives in Germany, and his Facebook page has more than seven million followers (www.facebook.com/ScienceNaturePage/).

Among his predictions are: CRISPR human trial for curing rare blindness in humans; the first ever human head transplant; SpaceX and Blue Origin will transport humans to space; 80 percent of internet users will access the internet via mobile; creation of the first artificial pancreas; 20 three-parent babies will be born; Samsung will release the first foldable smartphones using OLED; HIV vaccine Phase Three trial on humans; all Google facilities will start running on renewable energy; Uber self-driving truck Otto hitting the road, and a robot cook that can create more than 2,000 recipes will be available for purchase.

These predictions may seem over the top, but they are all based on reliable published sources. Here I would like to share my thoughts and observations on a few of them.

First, there is CRISPR, a revolutionary technique of gene editing. Many in the scientific community consider it to have great potential to revolutionize medicine. CRISPR has many parents, the most famous are microbiologist Emmanuelle Charpentier (director at the Max Planck Institute in Germany), structural biologist Jennifer Doudna (professor at University of California, Berkeley) and Chinese American bioengineer Feng Zhang (associate professor at MIT). They are considered to be favorites for a future Nobel Prize.

Interestingly, MIT and UC Berkeley were engaged in a lawsuit over patents involved in the discovery of CRISPR, which MIT won last week. The ruling means the two schools' discoveries don't overlap; while Charpentier and Doudna invented CRISPR, Zhang was the first to put the technique into use in plant, animal, and human cells.

Charpentier was a speaker at HKUST last April, and I met Doudna and Zhang at the WEF in Davos. Doudna and Charpentier were runner-up for *Time* Person of the Year in 2016 alongside other CRISPR researchers. They are all relatively young – and being young and willing to take risk is often the key to scientific breakthroughs.

As noted by an editor of the journal *Cell*, “the early heroes of CRISPR were not on a quest to edit the human genome – or even to study human disease. Their motivations were a mix of personal curiosity, military exigency, and industrial application.”

Notice that none of the three has a medical degree, which highlights the often overlooked fact that many medical advances are made possible by frontier research in basic science. We must be cautious not to place too much emphasis on “technology transfer” or “targeted research” and forget the importance of curiosity-driven research.

Both SpaceX and Blue Origin were deemed impossible only a few years ago.

Their founders, Elon Musk and Jeff Bezos, have been interested in space from their teens. Musk studied physics at the University of Pennsylvania, and Bezos studied computer science and electrical engineering at Princeton.

Serendipitously, both became extremely successful entrepreneurs and founded Tesla and Amazon respectively, and both have invested hundreds of millions of their own money in basically a private version of NASA.

One can say that they make their money to pursue their dreams. Many youngsters in Hong Kong are doing this backward: they pursue money and do not have a dream! And often they end up with not much of either.

Third, the road from basic scientific discovery to commercial success is long and lined with casualties.

For example, HKUST's Ching Tang discovered OLED in the 1980s at Kodak, but while OLED has now become commercially viable, Kodak is long gone. History tells us that nobody can rest on their laurels – the world of technology changes too fast for that. Hong Kong should reflect on how to avoid risking the same fate as Kodak.

Finally, among the predictions, the United States dominated – only one of 12 did not come from the United States. Can such breakthroughs happen in China or Hong Kong say, in the next decade?

Musk, Sergey Brin (Google) and Zhang are US immigrants. Could they have succeeded if they had remained in their native lands?

This is a soul-searching question for all of us.

