OPINION | JUAN ENRIQUEZ

Boston, Cambridge are ground zero for life sciences

BOYDEN PHOTO BY DOMINICK REUTER; LINDQUIST BY JOHN SOARES/WHITEHEAD INSTITUTE; GLOBE STAFF PHOTOS

Top row: Robert Langer, Jack Szostak, and George Church. Bottom: Susan Lindquist and Edward S. Boyden.

MARCH 16, 2015

BOSTON-CAMBRIDGE is ground zero for the development and deployment of many of the bleeding edge life science discoveries and technologies. One corner alone, Vassar and Main Street in Cambridge, will likely generate 1 to 2 percent of the future world

GDP.

ts, patents, and publications that drive new gene code, which in turn alters the evolution of bacteria, plants, animals, and ourselves.

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At MIT, Bob Langer is generating the equivalent of a small country's economy out of a single lab; his more than 1,080 patents have helped launch or enabled more than 300 pharma, chemical, biotech, and medical device companies. At Harvard, George Whitesides' 12 companies have generated a market capitalization of over $20 billion. Harvard Med's resident genius-enfant terrible, George Church, is the brains behind dozens and dozens of successful startups. (All this of course in addition to these folks being at the very top of their academic fields).

In terms of the most basic questions about life itself, Ting Wu takes billions of lines of gene code across all organisms and meticulously compares each and every gene, looking for highly conserved gene code. She is narrowing in on exactly what DNA sequences are essential to all life forms, from bacteria through plants, animals, and even politicians. Mass General's Nobel Prize winner Jack Szostak and Harvard-Smithsonian astrobiologist Dimitar Sasselov study the earliest origins of life, trying to figure out what makes the inorganic live. Meanwhile Harvard Med's David Reich painstakingly sequences the genomes of our common ancestors, in a clean lab that looks like a computer chip factory, to uncover the minute changes between ourselves and our Neanderthals, Denisova, and Heidelbergensis kissing cousins.

The list of folks discovering and changing all aspects of the world around us goes on. Whitehead Institute's Susan Lindquist discovered that the way plants turn genes on and off, depending on their environment and recent ancestors, can also alter our own kids and grandkids. MIT's Angela Belcher merges the organic and inorganic worlds, creating miniature machines the size of viruses. Boston University's Jim Collins is standardizing and industrializing bio-engineering. The Whitehead's David Page explores why men and women are sometimes prone to particular diseases at very different rates. Eric Lander runs one of the greatest gene research facilities in the world, the Broad Institute. Doug Melton desperately tries to find cures for juvenile diabetes, for his own brood, and for humanity. Cliff Tabin is busily understanding what it takes to grow out various body

parts in animals so when ours wear out, or are lost in wars or accidents, we will be able to regrow them. And then there is the brain. MIT's Ed Boyden is rapidly redefining how we study and what we know about the most important of human organs.

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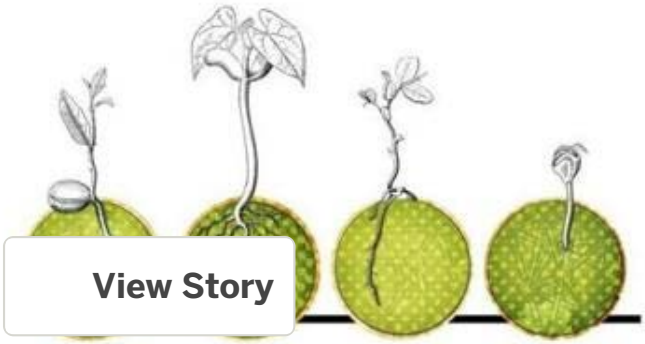

Enriquez: Changing the principles of evolution

It's humans, not nature, who largely determine what lives and dies as well as what gets a chance to evolve and how.

Over the next few months, this column will showcase key New England and global researchers; each of them — in different ways, for different reasons — is building the knowledge and tools to understand how life works and how to alter it. As these secrets are revealed and as the instruments to alter gene code are built, we will be able to cure many diseases, provide our kids with choices we never wrestled with, and perhaps redesign humanity itself.

— JUAN ENRIQUEZ

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