

Innovation Beyond Radical Evolution

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Health care throughout the late 20th century centered on the treatment of chronic diseases (i.e. heart disease, cancer, diabetes). Around the turn of the century, however, the world witnessed an increase of infectious diseases such as SARs, Mad Cow Disease, West Nile, and the mutated strains of the Avian Flu. While Michael Goldblatt noted a link between cross border commerce, climate change, and the increase of infectious disease globally, it is the *velocity* of mutations within these infectious diseases that he finds so alarming. Just as one vaccine is developed to treat a disease, a simple mutation resets the process, as is evidenced by on-going HIV efforts to find a cure. Goldblatt added that Functional Genetics looks to address the host of the virus, as the virus depends upon the host for its survival. By eliminating the host instead of the virus itself, the lifesource for the mutated virus is removed--a universal solution to a gamut of known and yet-to-be-known infectious diseases.

Goldblatt elaborated on his experiences during his tenure as Director of Sciences at the Defense Advanced Research Project Agency (DARPA). Among the many studies performed during his time there, those focusing on the enhancement of the human performance were of perhaps the most interesting. He highlighted efforts in boosting mitochondria (the part of the cell that acts as an energy source) resulting in prolonged endurance for those involved in drawn out covert military operations. Their goal was to recreate a unit of 'Lance Armstrongs', whose muscle biopsies display higher functioning mitochondria. Goldblatt shared a story of how they stumbled upon an interesting development when they learned of a Scottish horse trainer that had a remarkable track record in producing winners consistently. Upon investigation it was discovered that the trainer's secret was that he fed his horses large amounts of blueberries. The skin of blueberries is very rich in a substance called quercetin which increases mitochondrial function considerably. Goldblatt added that quercetin has since been commercially introduced to the over-the-counter market, and its popularity is on the rise.

After sharing several other interesting developments regarding human performance enhancement, Goldblatt discussed the latest advances in Regenerative Medicine. An expected \$11.5 billion industry by year 2010, and a \$500 billion industry by 2040 according to 2006 Department of Health estimates, regenerative medicine aims to cure deficiencies by forcing the body to restore its own health rather than relying on traditional medicine to only treat symptoms. It was noted that CBS Sunday Morning recently ran a piece called "Growing New Body Parts," which shows a few examples of regenerative medicine in action, all of which originally were developed through DARPA. On a related matter, Goldblatt added that the cutting edge of today's advancements center on "fetmo second lasers," which offer the possibility of non-invasive surgery pinpointing affected areas through 3D imaging and restoring full health as an out-patient procedure without a single incision.

Goldblatt's personal interest in biotechnological advancements originated in an effort to find a way for his daughter, who has a severe form of cerebral palsy, to communicate effectively with her world. His mission was to develop a brain/machine interface, one which would allow neural transmissions to be translated into practical tasks. But the brain machine interface offers much more, according to Goldblatt. Instead of acting on one's thoughts, he believes that the brain machine interface will allow thoughts to act.

The interview concluded with a brief look into synthetic biology, which involves redesigning living machines from naturally occurring and "off-the-shelf" chemical ingredients, resulting in organisms that are self replicating and even evolving. Synthetic biology could be the answer to a menu of growing problems around the world, from climate control to energy consumption and overall survival. Microbes account for half of the earth's biomass, yet exploration into simple genetics has only just begun. By altering the genetic code to eliminate harmful or non-productive agents, one can optimize the human condition. In the wrong hands, though, synthetic biology could result in severe malfeasance.