

Coming Together, Going Forward



Cartoon gifted by Susan Hockfield, former president of MIT, to her assistant Leslie Price, of a receptionist as the only (very effective) defence of a fortress (Zhang, 2016).

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The lady behind the desk was the only thing protecting a vast fortress. “They have no military, sire – no one’s ever made it past their receptionist,” reveals a soldier of the attacking army (Cheney, 2013). This cartoon, gifted by Susan Hockfield to her assistant Leslie Price (Price, 2016), catches my attention as I walk towards my interview. “It’s actually pretty accurate,” Ms. Price laughs, explaining that Professor Hockfield had needed to be guarded from the many that wished to monopolize her time during her term as president of the Massachusetts Institute of Technology (Price, 2016). I imagine Professor Hockfield as a queen in a castle, with subjects and supplicants eager to meet her and gift her. Ms. Price’s office is full of evidence to support this idea. There, a picture of her, president Obama, and entourage when he came to visit her kingdom. There, a splinter of wood from the now demolished RADAR building, a rare gem presented to her by a professor

following her coronation (Price, 2016). There, there, there, a variety of fascinating treasures.

A variety of mementos from Professor Hockfield’s time as President: pictures celebrating President Obama’s visit and the reinstallation of lights on the great dome and other objects gifted to her (Zhang, 2016).



In Professor Hockfield's office, comfortably arranged and overlooking a beautiful view of her kingdom, the riches continue to overflow. There, a glass pumpkin hand-crafted by the master glass-smith for MIT's 150th anniversary. There, a pile of . . . shovels? But they were no ordinary shovels. She is happy to explain that these shovels commemorated the ground breaking of several key buildings, including the David H. Koch Institute for Integrative Cancer Research and the Massachusetts Green High Performance Computing Center, both buildings that foster collaboration between fields and between schools, something that she believes strongly in (Hockfield, 2016). And, as I see her talk openly and passionately about the buildings that represent part of her life's work, it is clear she is not simply a distant queen. Her smile is genuine, her eyes are bright, and her hands gently caress the shovels as she brings them closer to my eyes.



Shovels commemorating the ground breaking of the David H. Koch Institute for Integrative Cancer Research, the Massachusetts Green High Performance Computing Center, and more (Zhang, 2016).

Now settled in the cozy couches in her office, I begin the interview with an ordinary opener asking about her current projects, and hear the extraordinary number of things she is involved in. She serves on more boards than I can name or remember, including for MIT, for General Electrical, for the Boston Symphony Orchestra, and currently as President-Elect for the American Association for the Advancement of Science (Hockfield, 2016). Yet, her current big project is a book she is writing regarding the convergence of biology and engineering (Hockfield, 2016), and despite all this, she can still make the time to talk to those around her. Indeed, our interview feels more like a conversation, as she smiles warmly and responds readily.

Her passion for collaboration and convergence began with her first big research experience, where she worked in a lab that had scientists from a variety of fields -anatomy, physiology, pharmacology, psychology, biochemistry, and more - all working together on the same problem (Hockfield, 2010). Since then, she's believed that "if you've got a problem you really want to address, you bring everyone in, every possible perspective, then you together try and solve it" (Hockfield, 2010). Oftentimes, problems in one field can be solved or simplified by tools and procedures from other fields, allowing for huge advances in knowledge and innovation. In the twentieth century, following the discovery of the electron, proton, and neutron, the building blocks of our physical world, the convergence of physics and engineering occurred, resulting in a wave of inventions from cars and planes to x-rays and MRI scanners to computers and smartphones (Hockfield, unpublished book). Now that we understand molecular biology and genetics, the building blocks of biology, it's time for biology to shine (Hockfield, 2016). She firmly believes that "biology with engineering is going to be the major technology story of the twenty first century," (Hockfield, 2016).

Professor Hockfield has a lot of evidence to support her claim, mentioning her friend Angela Belcher who also a professor at MIT. Nature has already solved many of the problems that mankind faces, and Professor Belcher seeks to understand and use this knowledge to solve our

problems. For example, she has turned a source of sickness and death into a hope for a greener future by teaching viruses to create batteries. She takes advantage of abilities inherent in viruses, such as self-assembly and evolution, and edits the genes, the instruction manual of the viruses, to tell them how to use their skills to our advantage (Chandler, 2013). The batteries produced through this method are both greener and cheaper, and in the future could allow us to save renewable energy from sunny or windy days for windless nights (Chandler, 2013). Unfortunately, before the green energy dream can be realised, the batteries' life must be extended (Chandler, 2013).

Professor Hockfield also mentions a biological product that has already made a huge impact. Biologics, pharmaceutical products made through biology rather than chemistry, are some of the most important drugs in the world. For 2015 Europe, seven of the eight best selling drugs were biologics (Gameiro, 2016). Ranked third is synthetic human insulin, the first and most well-known biologic engineered. Its invention was incredibly important as animal insulin, the earlier alternative, caused allergic reactions in many people (American Diabetes Association, 2012). Through genetic engineering, we are able to isolate the human genes that produce insulin and place them into a bacteria cell where it can be rapidly replicated and then extracted for use (BBC, 2014). Such a solution would not have been possible without the cooperation of biology and engineering. Indeed, while insulin can be created through chemistry, it is too complex for us to create any significant amount as cheaply or efficiently as we can through biology (Brar, n.d.). This is true for many of the biologics that exist today- without them, many diseases would be without a cure, including some cancers (Gameiro, 2016).



The Koch Institute for Integrative Cancer Research, home to the office of Susan Hockfield and cancer researchers from a variety of fields (LeMessurier).

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At the Koch Institute for Integrative Cancer Research (in which this interview is occurring), scientists, engineers, and more are all working together to fight cancer (Jacks, n.d.). And thanks to the huge pool of knowledge and many unique perspectives, it has seen a lot of success. It's a hot place for research, and Professor Hockfield is paying attention. "Already dozens of companies

have been spun out of the Koch Institute, many with products now in clinical trials: nanoparticles that home in on cancer cells to deliver chemotherapy directly to where it matters most; imaging technologies that allow a surgeon to more accurately spot and remove cancer cells; and strategies to identify infectious agents in a small fraction of the time of current methods, so that the right drug can be prescribed fast enough

to save countless lives" (Hockfield, unpublished book).

The unification of science and engineering is solving, one by one, the problems of the twenty first century. What comes next? The unification of everything? Professor Hockfield hopes so.

Works Cited

- American Diabetes Association. (August 2012). "The History of a Wonderful Thing We Call Insulin." Retrieved November 21, 2016, <http://diabetesstopshere.org/2012/08/21/the-history-of-a-wonderful-thing-we-call-insulin/>
- BBC. (2014). "Genetic engineering." Retrieved November 21, 2016, http://www.bbc.co.uk/bitesize/standard/biology/biotechnology/reprogramming_microbes/revision/2/
- Brar, Deepinder. "The History of Insulin." Retrieved November 21, 2016, <http://www.med.uni-giessen.de/itr/history/inshist.html>
- Chandler, David. (November 2013). "Better batteries through biology?" *MIT News*. Retrieved November 21, 2016, <http://news.mit.edu/2013/better-batteries-through-biology-1113>
- Gameiro, Denise. (August 2016). "Top 10 Best-selling Biologicals of 2015." *Labiotech.eu*. Retrieved November 21, 2016, <http://labiotech.eu/top-10-best-selling-biologicals-blockbusters-2015/>
- Hockfield, Susan. (November, 2016). Personal Interview.
- Hockfield, Susan. "The Age of Living Machines: How the Convergence of Biology and Engineering Will Remake Our World." Unpublished book.
- Hockfield, Susan. (February, 2010). Archived Interview. *American Academy of Achievement*. Retrieved November 21, 2016, <http://www.achievement.org/autodoc/page/hoc0int-1>
- Jacks, Tyler. "About the Koch Institute." *Koch Institute for Integrative Cancer Research*. Retrieved November 21, 2016, <https://ki.mit.edu/approach/about>.
- Price, Leslie. (November, 2016). Informal Chat.

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