

CHAPTER 12

Out of the Academic Echo Chamber: universities embracing innovation from unexpected places

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The sometimes-surprising trends of the last three years, from the rise of populism to the distrust of expertise, have led many to accuse the global elite, and academics in particular, of being out of touch with society and stuck in narrow “echo chambers”. How can we ever hope to understand why millions feel alienated or “left behind” by elites and mistrust experts? If we are serious about maintaining the excellence of our universities and their societal relevance, the answer lies in a new mode of open engagement.

This is a critical time. We are shifting from a somewhat patrician era of university “community outreach” to a new age where we need to have true relationships and partnerships with local communities. We must change the way we interact with our neighbours and in so doing deepen our understanding and broaden our impact.

FOUNDING PRINCIPLES OF EUROPEAN AND AMERICAN UNIVERSITIES

The value of gathering teachers and scholars has been understood from the founding of the first universities in the 11th to 13th centuries. Institutions such as the Universities of Bologna, Oxford, Salamanca, Paris and Cambridge shared the goal of developing scientific and scholarly knowledge and

transmitting it to others. This has been a constant whether the schools had religious or other cultural roots.

In the United States, the European model of the university was readily adopted. The first institutions — Harvard, William and Mary, and the University of Pennsylvania — were founded in the belief of the importance of education to society. The importance of universities to society continued to grow in the 19th century. The industrial revolution increased the need for an educated workforce and the institutional and societal impacts of the American Civil War created the need for new thinking about how these impacts should be addressed.

Several institutions with which I have been associated considered improving the world and educating citizens for the future as an important part of their missions. Lehigh University was founded in 1865 by Asa Packer to “Create an educated workforce to rebuild the nation...” contribute to the “intellectual and moral improvement...” Stanford University was founded in 1891 by Leland and Jane Stanford to create a coeducational, non-denominational, and avowedly practical university, producing “cultured and useful citizens”.

Imperial College London’s roots date back to the 1851 Great Exhibition. Prince Albert, Queen Victoria’s Prince Consort, used some of the profit from that event to purchase 25 to 30 acres of land. Albert said: “I would buy this ground and place on it four Institutions corresponding to the four great sections of the Exhibition.” He also said “I would devote these Institutions to the furtherance of the industrial pursuits of all Nations in these four divisions.” He emphasized the importance of openness: “These Institutions must be open and common to all nations...”

OPENNESS AND THE IMPORTANCE OF THE MOVEMENT OF PEOPLE AND IDEAS ACROSS BORDERS

Openness and the ease of movement of people and ideas across borders have long been important to higher education. Exposing ourselves to new influences can fundamentally change what universities do. But it does not change what universities are for. We educate students to contribute to society. We pursue research at the forefront of discovery. We innovate for the greater good. That was true at Imperial College London and for our peers a century ago, and it is equally true today.

But we must find new ways to meet our traditional roles. Large parts of society feel like they are left behind and that universities are irrelevant to their lives. We need to find ways for even the most elite universities to be open to new people, new ideas and new partners. The universities that will

thrive in the future will be those that are bold in their efforts to be build bridges to their local, regional and national communities.

Universities must be open to people, ideas and innovations from non-traditional places. We see this happening already. World-class universities are uncovering innovation from unexpected sources. They seek ideas from their communities, and work with them to develop those ideas. There is true two-way communications. This is not only a more effective form of “outreach”, it is also a rich source of innovation. This matters to universities, to society and to innovation and enterprise.

RETHINKING ENTERPRISE

We have grown used to, and even expect, universities to be fountains of ideas and innovation. This is as it should be; the fruits of our research discoveries must be shared and developed to benefit society. New diagnostics, technologies, therapies and algorithms come from great universities every day.

The University of Cambridge, MIT, Stanford, ETH Zurich, Imperial and many others are natural hotbeds for world-changing startups by virtue of their clusters of great minds, research and education. Universities, and their leaders, can and must catalyse and direct growth in those innovation ecosystems.

For example, Cambridge Innovation Capital (FT, 2019), part-owned by the University of Cambridge, is investing hundreds of millions of pounds into that city’s science and technology cluster. CIC enjoys “preferred investor” status for intellectual property coming out of the university, but more than half of its investments have no direct connection with the university. In oncology, CIC backs innovators such as the charity Cancer Research UK’s lab, which has developed a “liquid biopsy” test for diagnosing lung cancer from blood samples and startups like Bicycle Therapeutics and Carrick Therapeutics.

A NEW GENERATION OF INNOVATORS

In recent years, we have also unleashed a wave of student entrepreneurs with their own ideas. Universities have supported them with mentoring, incubators, pitch competitions, seed funds and an “ecosystem”. It is exciting to see student-driven ideas like Malav Sanghavi’s ultra-low-cost baby incubator LifeCradle making a difference in the developing world or innovations like Elena Dieckmann’s Aeropowder creating efficient insulation and packaging from waste chicken feathers.

At Imperial, this support and encouragement start on day one. As students register, they gain membership in the Enterprise Lab. Hundreds enter

entrepreneurship competitions, like the Venture Catalyst Challenge or WE Innovate, a program especially for women entrepreneurs. Upon graduation, some stay within the university's ecosystem, for example through sponsorship for Graduate Entrepreneur or Startup Visas, or by growing their enterprises in Imperial College's White City Incubator.

We have rightly come to expect the unexpected. Students with the right combination of financial support and connections are opting to work for small fledgling startups instead of established corporates for their first job. These days one third of Stanford MBAs (Byrne, 2016) start their own company within three years of graduating, a quarter of MIT alumni (Matheson, 2015) have done so, with rapidly growing numbers of UK graduates taking this path. One challenge with this trend is that it is mostly available to graduates whose parents have the means to continue to support them. Others with great ideas need to take on less risky full-time employment. Schemes to support early-stage entrepreneurs is an important need for universities to help fill.

While many entrepreneurs, from London's incubators to Silicon Valley accelerators, are socially conscious and trying to make a difference in the world, their *weltanschauung* is limited by their life experiences. This is one reason why there are hundreds of startups and applications related to pizza delivery, music downloads and assorted others where they fulfil a societal need for people like themselves.

A rare few are breaking out of these "filter bubbles" and leveraging untapped potential. During the UK's economic downturn of 2008-13, Enterprise Ventures (now Mercia Technologies) achieved annual returns of 5-6% (FT, 2014) by deliberately investing in economically disadvantaged areas. It backed hundreds of small and medium-sized enterprises with hundreds of millions of pounds. These include Xeros, an AIM-listed, low-water-use washing machine manufacturer based in the relatively deprived South Yorkshire town of Rotherham. The polymer-bead technology, based on research from the University of Leeds, solves the kind of problem that too few venture capitalists consider, even when it's in their own backyards: how to deal with severe water shortages in places like England (Guardian, 2018) or California (Dimick, 2015). While it's not a unicorn, the economic and societal impact could be even greater, on its local community, and the world. It is certainly more compelling than yet another laundry app. (Pressler, 2014)

INNOVATION ON OUR DOORSTEP

What about those with bright ideas who are neither students, graduates nor researchers in elite universities? Our universities are often situated in communities where the residents have quite a different world view. People whose

worries include paying the rent, avoiding violence and not falling ill are on a different scale to those of our academic stars. They need and deserve our support, and we can benefit greatly from their ideas. Their innovations are grounded in real, practical and important needs.

We see this in London's White City, an historically deprived community where Imperial College is developing a new campus. Imperial's Invention Rooms are providing maker spaces, hack spaces, students and staff to engage with our neighbours in pursuing their ideas. Recent inventions from the Maker Challenge for White City teenagers include fashionable new designs for hearing aids, a lightweight stabproof vest, a foldable skateboard and "sneaker speakers": trainers that can play music and convert kinetic energy into stored energy. The inventor of the sneaker-speaker thought that kids her age spend too much time on their headphones and they should be sharing their music and socializing.

These ideas come from, and can change, everyday lives. Ramona Williams, a local resident with visual impairment, struggled to use a baby buggy at the same time as a cane. She shared her ideas for a multi-functional baby buggy that would warn visually impaired users of hazards. Imperial biomedical engineering students and their tutor, Dr Ian Radcliffe, worked with Ms Williams to bring her ideas to life. The result, a "smart baby buggy", uses a combination of LIDAR — laser technology used in self-driving cars — and ultrasound sensors to warn users of oncoming hazards such as vehicles, pedestrians, curbs and drop-offs through vibrations in the handlebar.

At my former institution, Lehigh University, the Rising Tide Community Loan Fund provides micro and small business loans to entrepreneurs who find it difficult to obtain funds from traditional lenders. Otis McNeil, aged 18, (Rising Tide, 2019) had a vision for an energy conservation company that would work with local utility companies to help low and middle income families to weatherize their homes. But the banks would not support such a young entrepreneur, who, despite his strong contacts and experience, came from a poor neighbourhood. Rising Tide helped McNeil develop a business plan and gave him access to finance to get his startup off the ground. He now has eight employees, a 5,000-square-foot warehouse and a small fleet of trucks behind his profitable enterprise.

Lehigh economists are studying and enhancing the Rising Tide scheme to ensure that it will support all communities locally, including African American, Hispanic and Latino entrepreneurs who have traditionally been underserved in the region. It's another area where unexpected innovation, effective community relations and excellent research come together.

Breaking out of our comfort zone is hard. It requires investment, new partners, a long-term view and a continuous critical look at what we are doing. Universities are capable of doing that; some private sector players less so.

But that change is gradually, inevitably, necessarily coming as innovation's gatekeepers open up.

Renowned Silicon Valley tech accelerator Y Combinator is providing 1,000 low-income people across two US states with \$1,000 a month (Weller, 2017) for five years. Colorado-based Common (FastCompany, 2018) is supporting social enterprises with a universal basic income (UBI) and mentoring. Crowdfunding platforms like Kickstarter and Crowdcube are bringing finance to areas that suffer from a venture capital drought. (UC Berkeley, 2017). In East London's Waltham Forest, Big Issue Invest (Big Issue, n.d.) is opening a multi-million pound hub to help marginalized young people enter the creative industries.

Last year, the UK National Advisory Board for Impact Investing, (NABImpact, n.d.) run by a distinguished group of City financiers, urged the government to invest £2 billion to seed billions more in private sector capital for economically deprived communities. Their focus on "impact investing" for sustainable, inclusive companies that provide a social good while generating healthy financial returns, rightly highlights an untapped locus of innovation. This is not a hypothetical. Massive institutional investors, like Bain Capital and Goldman Sachs, have been experimenting with impact investing for years.

CHANGING UNIVERSITIES, TRANSFORMING SOCIETY

We have the power to reshape what entrepreneurship means, not just in and around our campuses, but throughout society. One area where technological universities and our entrepreneurial partners have a common challenge is in the representation of women.

Fewer than one in 10 venture capital dollars go to companies with a female founder, despite studies indicating that female-founded firms make a higher return on investment (BCG, 2018). In this climate, visionary entrepreneurs are overlooked and markets remain untapped. As women are excluded from networks, the negative cycle perpetuates.

To fix this, women entrepreneurs need support at the earliest stage. This is why Imperial introduced WE Innovate (Imperial, 2018a): a contest and six-month program exclusively for female students, as they develop an early stage business idea, advance their leadership and learn entrepreneurial skills. WE Innovate has backed hundreds of female student entrepreneurs with mentoring, startup contests and exposure to investor networks. Some, like Pae Natwilai, (Imperial, 2017) a design engineer, founded Trik (Trik, n.d.) after developing intuitive tools and software for controlling drones. Pae's company, which is creating new jobs in the UK, has the potential to transform structural inspection in the energy and construction industries.

Investors are making a difference. Women-led businesses are the focus of Merian Ventures and Alexis de Raadt St James has a track record showing that “unintentional familiarity bias in the venture capital industry creates opportunities for investors willing to back female founders”.

The same spirit can be applied outside our own universities. We recently launched a pilot programme, “Agents for Change”, which supports leadership, professional development and networking for women aged 18 to 64 in London’s Hammersmith and Fulham, the borough that includes White City. We connect a diverse group of women with academic and business experts, as well as with each other, as they develop their communication, leadership and influencing skills.

Entrepreneurs are helping us to rethink what our faculty should teach, and how our academics can have a greater impact on society. When these innovators better represent society, their potential impact on universities and the world is amplified.

A RESPONSIBILITY TO ENGAGE: PUBLIC HEALTH

There are areas of public life where universities have a duty to engage at a deeper level, often because few other institutions share our convening power across sectors, and our ability to translate discoveries and innovations into real world uses. Public health is one such area.

Over the last generation, remarkable things have been achieved in global health, as WHO statistics show. Thirty years ago, 350,000 children a year contracted polio; in 2017, just 22 cases were reported (WHO, 2018a). Deaths from malaria have almost halved, from 839,000 in 2000 to 438,000 in 2017 (WHO, 2018b). Deaths from HIV-related causes have also fallen, down by 52% from the peak of the epidemic (WHO, 2018c).

These advances are accreting and accelerating. Global average life expectancy has increased by five years since 2000, the fastest increase since the 1960s. In the same period, we have seen deaths from malaria fall by more than 25 per cent, and HIV has become a disease that can be managed with treatment.

Meanwhile the health gap linking deprivation to poor health, results in the “inverse care law”. In wealthy places, progress in healthcare has made once-terrifying illnesses, such as diphtheria, tetanus, whooping cough and polio, almost nonexistent through vaccinations, excellent clinical facilities and research hospitals. Yet tens of millions of children worldwide cannot access routine vaccinations or decent hospitals.

Social, geographic, political, economic and technological factors limit access to simple treatments. They are on the wrong side of an equation that

medics have spent decades wrestling with: the so-called “inverse care law”, (Lancet, 1971) whereby the availability of good medical care varies inversely with the local population’s need for it.

This same inversion equation applies to almost all technologies: from smartphones to banking, electricity to food storage. But, with the right level of innovation and a new generation of entrepreneurs, this can change. Universities will become central to this process as an important convening power, bringing together public and private sector partners. National initiatives, such as Germany’s High-Tech Strategy (BMBF, n.d.) and the UK’s Industrial Strategy (GOV.UK, n.d.), can enhance this responsible stewardship of technology.

These quiet but profound revolutions have been driven by universities in collaboration with philanthropists, NGOs, governments and the private sector. Much of this progress has come from unexpected places. By necessity, we can’t find answers in the lab. It needs more than traditional fieldwork, but a two-way or, more often, network of multiple conversations.

Universities can change the way we approach the significant challenges to maintain and improve the health of our diverse population. Never before have we had so much opportunity to do so. Technological innovations are breaking down barriers, bringing insights from abundant data and providing advances to areas such as global health, prevention and early intervention, food and nutrition, children’s health and mental health. There is no better place to transform global and local community health than with world-class universities. They have strong collaborations across disciplines, and they produce research and graduates that improve health and wellbeing, through medical interventions and opportunities for prevention.

The new Mohn Centre for Children’s Health and Wellbeing at Imperial’s School of Public Health in White City shows one way we can do that. This state-of-the art hub for health and wellbeing research, education and community engagement is founded on the premise that all children deserve the best chances in life. By preventing chronic disease and infection in the early years of life, future generations have every opportunity to thrive and succeed. The Centre will support pioneering research, education, and community engagement that will improve the diagnosis, prevention and treatment of childhood illness on both a local and global scale.

Again, community participation can lead progress. A White City cohort study, following a group of children from birth into adulthood and old age, is among its first initiatives. By monitoring the health and lifestyle of participants over many years, Imperial will deepen understanding of childhood illness, and how disease in old age is connected to early-life experiences. This will also provide an unrivalled insight into the health of children and young people in White City, and allow for the development of interventions

that address the health challenges they face. Such insights are crucial at a time when economically advanced countries like England face a growing gap in life expectancy (Imperial, 2018b) between the richest and poorest members of society.

FRUGAL INNOVATION, A HEALTHIER WORLD

The WHO estimates that about 80% of global blindness is avoidable. Imaging the retina can diagnose over 50 eye and whole body diseases — including glaucoma and diabetes — but current tools are slow, inaccurate, expensive and underused.

To eliminate blindness, the most important breakthroughs may not come from big science in academic or corporate labs, but from incremental improvements, and frugal innovations. When 90% of the world's blind live in the developing world, affordability of and access to treatments becomes the top priority.

When given the right support, students can spark unexpected and brilliant ideas that their more experienced professors may never have explored. Medical students Simon Rabinowicz and Uddhav Vaghela's invention and startup VUI Diagnostics could dramatically speed up the diagnosis of diseases that lead to sight loss.

Working in Imperial College's Advanced Hackspace, they rethought ophthalmoscopes, commonly used for examining the inside of a patient's eye, which are complicated to use, have a narrow field of view and are part of a cumbersome, slow process of eye analysis. They developed an affordable, simple and accurate plug-and-play retinal imaging tool, inspired by cheap consumer electronics and off-the-shelf features, like Bluetooth connections with smartphones and laptops, rather than specialist medical equipment.

Their tool is much faster than ophthalmoscopy, and can image ten times more of the eye, allowing for greater accuracy. Crucially, the device can be operated by those without clinical training, allowing retinal imaging to come to isolated regions without the need for advanced infrastructure.

REMEMBERING THE INDIVIDUAL

If you talk to the most visionary experts in global public health, they are imagining and working towards a world where health officials can design a malaria elimination strategy that works because it can be adapted to fit the needs of communities at the local level. Or where we can accurately predict — and protect against — the next pandemic. A world where levels of obesity and diabetes are falling, because policy-makers understand which interventions work, and which don't.

Traditional methods are insufficient to realize these ambitions. For example, working with, talking to, and being affected by, the people who live with outbreaks of infectious diseases like Ebola can make abstract problems concrete, and help academics to rethink their approaches.

One particular case that stays with Dr Nathalie MacDermott, a paediatrician, clinician and Ebola expert, is that of a 12-year-old boy in Liberia. “He was a double orphan. Not only had he lost his parents prior to the epidemic, but then his adoptive mother — who was a health care worker — contracted the disease and died. He himself contracted the disease but survived. I remember him clearly — he loved cookies and sausages, and was always asking for one of the two. Yet he developed a maturity beyond his years, and had seen things a 12-year-old never should. He was the only survivor from the treatment unit at that time, and so had watched everyone else around him die.”

Although the medical team knew he had family members from his adoptive family, no one came to collect him. “He was left sitting on a step at the hospital, looking around for someone, but nobody came. There was simply no one to look after him. Not only had he lost his mother and survived Ebola, but he now was abandoned — and he was just one of thousands of cases.”

A staff member took him in and helped track down the youngster’s community, where he was left in the care of a community member, says Dr MacDermott. “I was desperate to know what happened to him, and spent most of the six months in Liberia trying to track him down, and find what happened to him — but I was never able to.”

It changed the way Dr MacDermott thought about her research, which, she now believes, needs to be child-centred. She explains: “The mortality rate in children under one year olds from Ebola was close to 90%. Yet many of the medicines were not tested in this age group for a variety of reasons. We need to think carefully about how we include children in research in epidemics, as this would help us ensure they get the best possible care in the future — and the greatest chance of survival.”

CONCLUSION

Universities were founded to help society, and their contributions to the world over past centuries are enormous. Our citizens are better educated and our workers are better trained. Our research discoveries and our innovative solutions to societal problems would make our founders proud.

The value of education and of universities used to be undisputed. That is no longer the case. Where once universities were considered an integral part

of solutions to societal problems, their relevance is now being questioned. To some they are elitist institutions that do not understand the issues facing people who have not benefited from a university education.

Universities must adapt to these changing times. We need to rebuild trust and credibility. We need to demonstrate our relevance and importance to today's world. To do this requires that we expand our thinking and develop true partnerships with people beyond our staff, students and alumni. We have a tremendous opportunity to seek innovation beyond our rarefied campuses and echo chambers. We are already seeing signs that this is happening. I am optimistic that we will find great new innovations and great new partners in the world beyond our campus gates.

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