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EDITORIAL DESK

Editor's Desk

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Research and related developments are often trifurcated into science, engineering, and technology, but the boundaries among them are often unclear. Some may find it difficult to pinpoint the differences among these three, especially the latter two. Convergence of opinions on their definitions is hard. In general, we can say that science is about the discovery of the world around us, engineering is the creation of what did not exist before, and technology is the practical implementation of what is known and understood. Scientists take a bite out of something and leave it at that. Engineers chew it thoroughly. And technologists digest it. An example would help.

Laser is a great invention (or a discovery with some stretch of imagination) rooted in serious physics. At the time it was first built, the laser was thought to be a solution looking for a problem. It required more than two decades of engineering to perfect the laser technique and to explore its numerous applications. What kind of a laser is suitable for what application? How does one get the required intensity and wavelength? How does one make the laser instrument small and portable? Such problems needed to be solved. After all this engineering, the laser technology slowly trickled in and created a torrent of applications, from a laser pointer to laser manufacturing. The science behind lasers was celebrated with a few Nobel Prizes. Today, the laser technology is used and enjoyed by all. The engineering efforts remain hidden as details in between. Creativity abounds in all three, but it is easily evident only in science and technology. A recent example underscores this point.

The way the world handled the COVID-19 pandemic during the last 18 months depended on science, engineering, and technology, albeit in unequal measure. After the virus was identified, the science needed to extract RNA, reverse-transcribe it into DNA, and then sequence the genome of the coronavirus, SARS-CoV2, was well-known and routine. New engineering was required to detect the viral RNA fast and accurately. It all happened quietly while engineers worked out the details. The same was true with detecting the spike protein. The science was known, but engineering tweaks were needed to improve the speed and accuracy. And then the technology stepped in to build test kits and made them accessible to the public at large. Repurposed drugs to treat symptoms and complications of COVID-19 had a similar development. Vaccine development has been different. Making vaccines using inactivated viruses has been around for decades. But vaccines needed a living medium for gradual weakening. Making vaccine for a newly found virus was a big deal. Each looked like a new project. The advances in the last 18 months have been something else. As Greg Lemke of the Salk Institute put it "every new vaccine is the same project." (Responding to COVID-19, Technology Quarterly of *The Economist*, March 27th, 2021). The science of mRNA as a vaccine began in 1980s, but it needed a combination of more science and substantive engineering until it culminated in a viable technology, which played a key role in vaccinating a good part of the world.

The focus of this issue—*landfills*—also embraces science, engineering, and technology, just as any other endeavour. Scientific studies have revealed that landfill leachate causes antibiotic resistance, and gaseous emissions contribute to greenhouse gases. Much engineering is needed not only to mitigate the ill effects of solid waste but also to extract fuel from it. Technological developments ensure that the cost of creating engineered landfills is commensurate with gains from reduced harm on the environment and health. Readers may consciously look for aspects of science, engineering, and technology as they read the review articles in this issue, deftly guest-edited by Krishna Reddy and Sivakumar Babu.

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