

What will happen if we don't nurture the next generation of scientists?

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May 21, 2018

Professor Lewis Kay, appointed to the University of Toronto's departments of chemistry, biochemistry and molecular genetics, is a senior scientist at SickKids hospital, and the winner of a 2017 Canada Gairdner International Award and the 2018 NSERC Herzberg Gold medal.

We are at war – a war that cannot be overestimated and the outcome of which will determine our future. It is a war that can only be won with definitive action, and mobilization of some of our most important and precious resources. The battlefields are distinct from what you might imagine – for they involve high-tech laboratories, highly educated and well-trained scientists, and incredible fire power that emanates not from instruments of destruction but from instruments of construction, from the human mind.

We are fighting a war against microbes that mutate too quickly for our antibiotics to keep pace; against neuro-degenerative diseases that are becoming more prevalent with an ever-aging population; and against diseases that are caused by excesses in our lifestyles.

We are fighting to ensure the integrity of foods and drinking water in developing countries. We need to address the challenge of climate change, of future pandemics and of the possibility of polluting our world to the point of no return.

We are fighting many wars. How can we possibly win?

The answer is simple. It starts with a commitment to education and by recognizing that curiosity-driven research holds the key to answering the world's toughest questions – even when we don't know exactly where the research is going and cannot predict or guarantee its outcome. Because the history of science has proven that ultimately advances made in seemingly unrelated areas and on topics that don't appear to have any practical applications will shed light on the seminal problems of society.

Think of your smartphone. It wouldn't exist if scientists hadn't have been free to think about the nature of matter and free to play with semi-conductors back in the day.

Take magnetic resonance imaging (MRI), a common medical-imaging technique used in radiology to form pictures of the human anatomy. The underpinnings behind MRI began with the development of quantum physics in the 1920s and seminal experiments in the 1930s; it wasn't until 40 years later that the first amazingly detailed view of the body appeared.

My own experiments build on the same principles. I have spent my career developing nuclear magnetic resonance spectroscopy to study biological molecules. I have used this technology to study the properties of proteins, to see how they change their shapes and move in ways that

influence the things they do within the human body, including causing disease.

Our research accomplishments are a tribute to the outstanding trainees that have revolved through my laboratory, teaching me much more than I have them and, in so doing, pushing our discovery-based science in directions that I could hardly have imagined, towards applications that I could not have envisioned even a few years ago.

I have no idea how the technology will evolve – we can't predict the future. What is clear is that we must continue to nurture the next generation of scientists and those who are engaged in discovery-based work. The government of Canada should be applauded for its historic recent budget, focusing on science funding that recognizes this need.

The Natural Sciences and Engineering Research Council of Canada (NSERC) has always championed the importance of basic, fundamental science. This year, NSERC, Canada's federal funding agency for university-based research and student training in natural sciences and engineering, is celebrating its 40th birthday. It is more important than ever to thank the government of Canada for its continued support. Now is not the time to stop, nor to be satisfied with our progress. We know that it is only by funding critical scientific endeavors that scientists will be able to continue to tackle the world's most complex problems.

NSERC's wealth will ensure our collective health and the vitality of the next generation of scientists upon which our future depends. If we continue to invest wisely in science, remain committed to the young scientists coming through the ranks, and provide support for open-ended, curiosity-based discovery, none of the wars mentioned above will be insurmountable.