KEYNOTE ADDRESS
BY
HIS ROYAL HIGHNESS
SULTAN NAZRIN MUIZZUDDIN SHAH

AT THE
INTERNATIONAL CONFERENCE ON SCIENCE FOR PEACE

DATE: 15 AUGUST 2016 (MONDAY); TIME: 10.00 AM
VENUE: THE ROYALE CHULAN HOTEL, KUALA LUMPUR

1.   The theme of this conference, "More for Peace, Less for War" is indeed timely as the world we live in is increasingly faced with unprecedented threats to global peace and stability. The past few years have seen a steady escalation of threats to peace, from natural disasters such as tsunamis, tornedoes, earthquakes and droughts; to terrorism, war and other violence; health pandemics; and economic challenges including poverty and inequality. Peace can no longer be taken for granted. It will take much concerted effort to nurture and strengthen global peace. At the least, the basic needs of humanity must be met in an equitable, efficient and sustainable manner, whilst urgent environmental challenges must also be addressed. In this regard, science, technology and innovation can play a very significant role.

2.   As such, I am pleased to note that that this conference aims to facilitate a much-needed discourse among relevant stakeholders on the role of science, technology and innovation in fostering global peace. Scientific and technological innovation has the potential to do immense harm as well as good, however. It is thus imperative that we harness and direct its power into providing practical solutions for human needs and prevent it from feeding human greed for power and wealth. This challenge is becoming increasingly pertinent as the transformational impacts of scientific and technological innovations in various fields continue to unfold, bringing great opportunities but carrying grave risks.

Peace and violence

3.   One of the definitions of peace according to the Merriam-Webster Dictionary is a state of security or order within a community, provided for by law or custom. This peaceful state is in my view closely correlated with levels of human development and human security. The United Nations Development Programme (UNDP) has identified seven essential dimensions of human security — economic, food, health, environmental, personal, community and political security, a similar agenda to that set out in the Sustainable Development Goals. In deliberating here on the role of science in contributing to peace, we would do well to consider explicitly how innovations in science and technology can contribute more effectively towards addressing these areas of human security and development that are such an essential aspect of peace. I am glad to note that most of these areas will be directly or indirectly deliberated upon through the four focus areas of this conference.

4.   But despite important gains in human development in recent decades, particularly in India and China, a worrying trend of increasing violence threatens to undermine these improvements. The Global Peace Index, which ranks 163 states based on 23 quantitative and qualitative indicators, reports a decade of decline in these measures of peace, with further falls in 2016. They attribute this negative trend to higher levels of terrorism and political instability, with only 10 countries in the world currently totally free from conflict according to their indicators. This index also highlights growing global disparities, with those countries that were already less peaceful spiraling into greater violence, while more peaceful countries continue to advance politically, economically and socially.

5.   The heavy economic toll from these high levels of violence on the global economy was estimated at US\$ 13.6 trillion for 2015. This figure includes spending on military and internal security as well as economic losses due to conflict and crime and interpersonal violence. This staggering amount represents an estimated 13.3% of global GDP. Investments in peace-building and peacekeeping initiatives, in contrast, account for only 2% of the cost of losses from conflict. To put this in perspective, a 10% reduction in global violence could produce a 'peace surplus' of US\$ 1.36 trillion. The human costs of rising violence are also appalling, as seen especially in the massive refugee flows around the world. The United Nations Refugee Agency (UNHCR) estimates that 59.5 million people were forcibly displaced in 2014, more than the 40 million displaced during the Second World War. There are countless more so-called economic migrants, fleeing poverty and environmental degradation in their own countries, but like political refugees, facing a very uncertain welcome elsewhere. These unprecedented levels of population movements create further challenges and risks.

6.   It is encouraging to see that environmental issues are being discussed at this conference. This reflects a growing recognition of the urgency of environmental threats and their role in generating or exacerbating conflict. The 2016 Global Risks Report ranks the failure to mitigate and adapt to climate change as the number one risk in the coming years, ahead of weapons of mass destruction, with water crises coming third. Resource scarcity more broadly is another key source of

conflict. As suggested by Ismail Serageldin, then Vice President of the World Bank, back in 1995, *"If the wars of this century were fought over oil, the wars of the next century will be fought over water — unless we change our approach to managing this precious and vital resource."* The Organization for Economic Co-operation and Development (OECD) estimates that 4 billion people could be living in water-scarce areas by 2050, while another recent study [1] suggested that already over 70% of the world's major rivers no longer reach the sea.

7.   At the same time, we must tackle the poverty and inequality that also drive conflict and violence. Science and technology hold the key to the solutions that are urgently necessary in both these areas. There are existing and emerging technologies that could arrest or even reverse environmental degradation, reduce or eliminate exposure to disease, and contribute to raising the levels of human development across its various components. Renewable energy sources such as solar power, for example, can transform the lives of poor urban and rural dwellers if harnessed effectively, while innovative applications of mobile telephony, particularly payment mechanisms, are having immensely positive impacts. In these and multiple other ways, the application of science and technology can help to build peace and stability.

War and the Progress of Science

8.   Innovations in science and technology across the spectrum thus have enormous potential to address at least some of the challenges we currently face. But this potential is also constrained by political and economic realities. It can be misused to generate further violence rather than promote peace. If scientific and technological progress is to contribute to peace and development, it must be managed and directed far more effectively than at present towards these ends.

9.   History has shown us that the progress of science and technology is closely linked with the pursuit of political and military power. Scientific progress was greatly accelerated by the two world wars and during the cold war era, as competing powers raced to be ahead of the game and reinforce their supremacy. World War I gave rise to the first plastics and wireless communication technologies. World War II saw the development of antibiotics, and significant advances in aviation, space and radar technology, as well as nuclear power. The Cold War, on the other hand, was a major driving force for much of the technology that has transformed our own lives today, from satellite and navigation technology to digital and associated technologies including mobile telephony and the internet.

10.   War has provided the impetus for the investment by governments of huge funds into the development of weaponry and military technology. This led to the phenomenon of 'big science', with mega projects such as the Manhattan Project that produced the first nuclear weapon in the 1940s. The scale of the research and development carried out for this project was unprecedented at that time. It involved more than 130,000 people and cost about US$ 2 billion (equivalent to US$ 26 billion in 2015). But instead of harnessing nuclear technology for good purposes, the Manhattan Project directed this power into highly destructive ends. As Einstein observed, regretting his involvement in the project, *"the release of atomic power has changed everything except our way of thinking'*. He further lamented the fact that *'our technology has outstripped our humanity'*. This reminds us how worthless and even counter-productive scientific and technological progress can be unless it is channelled effectively by its human inventors.

11.   We are currently on the cusp of another historical tipping point in science and technology as progress in a number of inter-related fields is accelerating and combining to generate unprecedented advances. These fields include nano- and bio-technology, big data, robotics and artificial intelligence, 3-D printing and more, many of which derived or benefitted from digital technologies that themselves originated in military research. Recent years have seen the advent of driverless cars in the form of Google's Chauffeur; IBM's Jeopardy beating computer, Watson; Baxter, a programmable robot; and the mapping of the genome, among others. This fusing of the physical, digital and biological worlds is impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human.

The Second Machine Age

12.   We are now reaching an inflection point, or bend in the curve, as a result of this 'astonishing progress.' This has been dubbed the dawn of the Second Machine Age by Professors Brynjolfsson and McAfee of the Massachusetts Institute of Technology[2], which will provide as vast and significant a boost to mental power as the earlier Industrial Revolution did for physical power. Profound benefits for humanity will be created as a result, as the production frontier is pushed out to previously unimaginable levels. But the impacts of such a deep transformation are also highly unpredictable and may present equally unimaginable dangers. Just as with nuclear power in Einstein's day, the digital and other cutting-edge technologies of today have the potential to generate both good and bad outcomes. As cautioned by President Obama in a

---

[1] By the World Water Council

[2] Brynjolfsson and McAfee (2014), *The Second Machine Age: Work, Progress and Prosperity in a Time of Brilliant Technologies.*

recent address at Hiroshima, we must govern and regulate these technologies more effectively to ensure that they are used for positive purposes and not destructively as in the past.

13.   Among many other concerns, the spectre of mass unemployment as a consequence of advances in robotics and artificial intellligence is particularly worrying. The growing ability to program machines to conduct certain mental as well as physical tasks such as driving, and continued improvements in their physical abilities, heralds the likely mechanization of all kinds of tasks which we previously thought only humans could do. These include everything from fast food production and retail in the service sector to professional roles requiring considerable high-level training. Robots will soon even be able to deliver some health and legal services, as these are both areas in which large amounts of data can be crunched to generate predictable answers to common queries. Many mechanized tasks will still require human direction and management, and considerable new employment will also be created by the new technologies. But they are also inescapably going to destroy or replace huge numbers of traditional jobs.

14.   The impacts of this are difficult to predict with any certainty, but are likely to be highly disruptive to say the least. Wage labour and the consumption it funds are a fundamental underpinning of the modern capitalist system, while gains for labour in the post - World War II period are also a key part of the social contract on which Western-style democracies are built. This compact is already being threatened by stagnating growth in real wages and rising inequality, but it will be shaken to its core by the mass unemployment among all classes that will be created by advances in robotics and artificial intelligence. Even if the shifting production frontier funds basic incomes for some, these benefits will not be enjoyed equally or universally. One futurist describes the potential *"perfect storm"* that could result, *"where impacts from soaring inequality, 'technological unemployment', and climate change unfold in parallel, and amplify and reinforce each other.*[3]

15.   A perhaps even deeper threat arises from the impacts of advances in digital technologies including mobile telephony and artificial intelligence on human relationships and even human nature. A recent study suggests that the younger generation growing up with text and other digital means of communication actually seem to be losing their ability to hold face-to-face conversations.[4] This undermines the development of their critical faculties, which are honed during the messy back and forth of real conversation and not in the carefully crafted but superficial online 'performances' that many youth now apparently prefer. It also affects their ability to develop empathy, as the emotional reactions of others are masked by the digital format of their communication.

16.   While concerned to emphasize the immense potential benefits and avoid alarmism, these and other futurists are increasingly trying to focus attention on the grave risks that are also created by the transformative processes currently underway. Other emerging challenges include those posed by super intelligent robots that could overcome their human inventors, the misuse of bio- and associated technologies, cyber-crime and terrorism, and the manipulation of the human genome. Some of these represent potentially existential threats. The likelihood of such an eventuality at present has been calculated by the Oxford Futures Institute at only around 10% you'll all be relieved to hear! But a key attribute of our transformative moment is its very unpredictability, with surprise one of the few certainties going forward.

Strategies of Science for Peace

17.   Against such a backdrop, if we are serious about championing peace, it cannot be business as usual. If we are to ensure that these unprecedented science and technological advances of the Second Machine Age are harnessed to promote peace and development, we must transcend conventional boundaries and adopt a more collaborative and values-oriented approach to global governance and its challenges. To achieve this requires transformative thinking, integrated planning and synergistic action. It requires exemplary, uncompromising leadership, and for the whole spectrum of stakeholders to work together towards these goals. This includes policy and decision makers whose role is to direct, fund and regulate scientific and technological progress and innovation; the scientists themselves who push the frontiers of their disciplines in the most productive directions; the industrial developers of digital, robotic, bio-chemical and other products of innovation, who bear a major responsibility for directing and controlling these applications; and users of science and technology who must also be closely involved in the process of developing and regulating its products.

18.   One key aspect of managing the power of progress more effectively is to increase awareness and understanding of the risks and opportunities that are presented by the current accelerating advances. Some futurists emphasize the need to confront these far more explicitly than at present. This can then be followed by deliberate choices and actions instead of the current complacency and widespread sense of helplessness in the face of the profound transformations that are occurring. One suggestion is that we could develop apps that encourage us to switch off after sending a message rather than continue online, to help return us to the crucial face-to-face relationships on which our humanity is built. These and far

[3] Ford (2015), *The Rise of the Robots: Technology and the Threat of Mass Unemployment.*
[4] Turkle (2015), *Reclaiming Conversation: The Power of Talk in a Digital Age.*

more difficult choices will have to be made if we are really to take control of scientific and technological progress and direct it into its most productive uses.

19.   Dialogues such as at this conference can also help by providing the venue at which such issues can be aired and discussed. Organizations such as Science for Peace at the University of Toronto, and the Global Union of Scientists for Peace play important roles in this regard. 'Science diplomacy' of this kind first came about following the misuse of nuclear power during World War II, as scientists sought to become more proactive in the international policy-making arena. Science diplomacy can help to mobilise international scientific interactions via global networks and linkages, helping to enable scientists themselves to consider together some of the urgent problems faced by humanity. The practice has regained prominence in the last decade in response to the escalation of challenges requiring global solutions. It offers one key mechanism for generating debate on the implications of the inflection point we are experiencing and for developing advocacy strategies on how it can be managed effectively.

Concluding Remarks

Ladies and gentlemen,

20.   I want to end with the advice of two leading scientific futurists, who suggest that, *"in the second machine age, we need to think much more deeply about what it is we really want and what we value, both as individuals and as society. Our generation has inherited more opportunities to transform the world than any other. That's a cause for optimism, but only if we're mindful of our choices. Technology is not destiny, we shape our destiny."*[5]

21.   I am sure that this conference will probe deeply into the various challenges that threaten peace. I hope that it will culminate in a clarion call for a greater commitment from the global scientific community to help harness and direct science, technology and innovation towards solving urgent global challenges. In this way we can help forge a stronger global agenda for peace and sustainable development. In closing, I would like to thank the organisers for inviting me to share my thoughts. With that, it gives me great pleasure to declare this conference open.

Thank you.

---

[5] Brynolfsson and McAfee (2015).