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Address by Dr. Rafael Yuste from The Brain Initiative at the opening of the General Debate

His Highness Sheik Tamin bin Hamad, Al Thani, Emir of the State Qatar, President Cuevas, Undersecretary Voronkov, Ambassador Filip, representatives of people of the parliaments of the world, ladies and gentlemen, As-salamu alaykum!

The topic of this assembly is education as key to peace, justice and the rule of law. The argument is that education could lead to more peaceful, happier, and prosperous societies. There is a proven link between education and peace, in a way, education is a smarter way to peace. In fact, as the Emir said yesterday, education is more than that: it is a basic Human Right.

I have been asked to discuss the future of education. My goal is to bring the voice of science to this debate and help put it in the larger context, to inspire the debate in the broadest terms.

I am an educator, a professor of Neuroscience at Columbia University in New York, but above all I am a scientist, and I represent today a network of people that extends through space and time. We scientist belong to no country, we work together for humankind. We can tell you what kind of future is coming, so that you, as public officials, can adapt our societies to best benefit from that future.

So I am a firm believer in education and, as I study the brain, I could spend the next 20 minutes telling you what we know, or the little we know, in neuroscience of about how we learn. But when I think about its future, my responsibility is to tell you that something much bigger is coming, something that will not only affect education deeply at its root, but something which will have a wide impact across all human activities. In fact, I think we are heading towards a transformative moment in our history, where we are going to redefine what it means to be human, and transform our species, hopefully for the better.

What am I talking about? I am talking about deciphering how the brain works and accessing its circuits, through the merging of Neurotechnologies and Artificial intelligence.

Why do I say that? Let's take education as our example. A neuroscientist like me looks at the effect of education as learning generated by low-level reformatting of the brain circuits, using teaching methods that we have accumulated from past times by trial and error. But there reason we educate like this is because we don't really understand how the brain works, otherwise we could do it better and more effectively. Why do I say that we don't understand how the brain works? Look at Neurology or Psychiatry, as another example. I am sure that every one of you has either family members or friends who suffer from Alzheimer's, schizophrenia, epilepsy, Parkinson, autism, mental retardation, stroke, trauma, depression, anxiety, etc.… And you know painfully well that there is essentially no cure for these disease, and the reason is because we don't understand how the brain works. It is difficult to fix a machine if you don't understand how it works.

But understanding how the brain works will not only revolutionize education and let us properly treat these brain diseases, it will enable to understand our minds. And this is all we are: our thoughts, memories, emotions, imaginations, social interactions, conflicts... It's all in here, inside our skulls. Humans are a mental species, and our mental activity is a consequence of the function of brain circuits. When we understand how the brain works we will understand ourselves for the first time.

So why is this important now? Because it's happening and cannot be stopped. There is a revolution going on in neuroscience. In the last four years: large scale BRAIN initiatives have started in the US, EU, China, Japan, South Korea, Australia, Canada and Israel, generating a race to invest in neuroscience, involving hundreds of laboratories and billion of $ in funding. What are these Brain Projects doing? Building better tools to be able to read the activity of brains and change the activity of brains. These tools are absolutely necessary to be able to decipher brain circuits, so we can understand what's wrong with these patients and fix their problems. These tools will also help us understand who we are and how do we actually learn.

But on top of this revolution in neurotechnologies, there is another revolution, in artificial intelligence, that by using the algorithms that are inspired by the brain, is enabling us to decipher brain information, and to connect our minds to the net, either with hard prosthesis, like electrodes in brain computer interfaces, or non invasively, though our devices and screens, such as our smart phones or Google Glasses. I don't need to convince you that there is a revolution in AI, with another race by companies and governments, to become dominant in these technologies. Just last year, two different algorithms performed better than humans at face recognition and these algorithms are changing our lives. Correspondingly, tech companies are in fact one of the motors of the world economy.

Neurotechnology and AI could changing the rules of the game, because they enable us to decipher and manipulate our minds, which is who we are. As it has happened before in human history, technology and science offer us new, groundbreaking and powerful tools – and tools, I would argue are essentially neutral, they can be used for good or for bad. But I would also argue that it is up to us as society to ensure that these tools, these new neurotechnologies are used for the benefit of humanity.

In particular there are 5 areas of serious concerns that worry us. I represent a group of 25 experts, the Morningside Group, including participants from all the national brain initiatives I mentioned, and also scientific and medical researchers, clinical doctors, ethicists, legal experts and AI engineers from around the world. We think that misuse and lack of regulation in these technologies will lead to problems in 5 areas.

The first is in our personal identify, since the more we are connected to the net through brain computer interfaces or devices, the more we dilute our own identity, our self. The dependency that what we are witnessing now on our devices is an appetizer of what's to come: as we increase the bandwidth of our connection to the net, by using non invasive brain computer interfaces, we will become increasing dissolved in it.

The second, a related concern, has to do with free will: if we use external algorithms and information to make decisions, we are relinquishing our own agency. Who is making the decision? If we are already dependent on the next to navigate a foreign city, assisted by a GPS system, what will happen when we have a life GPS that advices us as to what we should be doing at any moment.

Our third concern is mental privacy. If brain data is accessible and can be deciphered, then our mental processes, our thoughts, will be accessible from the outside. Moreover, even thoughts we are not aware of, or subconscious, could be deciphered. We think brain data should be protected with the same legislative rigor a body organs. In fact, our brain data is an organ, not a physical organ, but a mental organ, and it should be forbidden to commerce with it, as it represents who we are.

The fourth concern has to do with the use of these technologies for cognitive augmentation, including augmented learning. Here I am talking about sophisticated non invasive brain computer interfaces, that will not be cheap and could enable some groups of the society in some countries to augment their mental and physical abilities, by enabling them to access external algorithms and robotic for daily life. We think that guaranteeing the principle of justice in the development and deployment of these technologies should ensure equality of access and that the use of these technologies for military application should be severely regulated.

The final area of concern is to guarantee protection against biases, since algorithms use in AI often have implicit biases so these technologies could inadvertently implant these biases into our brain processing. It will be terrible to undo our historical march towards equality and justice by spreading biases with the new technology.

The merging of neurotechnoogy and AI is generating these profound, fundamental problems, to the point that we think one should deal with them, not just at the national legislative level, but at the global level of human rights. In fact, these concerns in a way put on the table the more profound question: Who do we want to be as a species? And perhaps the best definition of who we want to be is found in the Universal Declaration of Human Rights. But when the 48 Declaration was approved, 70 years ago, no one thoughT that our personal identity, free will or mental privacy could be threatened, or that we may augment our cognitive processing through brain technology. Now, before these technologies have been developed in an unregulated environment, is the time to add new human rights, these NeuroRights, to this document that we all hold so dear, as a route map of the society we want to be.

In closing, looking towards the future of education, we can all agree that we are entering a very exciting time in our history. And despite what might have sounded like a pessimistic view laid out thus far, I believe the double revolutions in Neurotechnology and AI could be a new Renaissance, since understanding the brain will let us understand who we really are from the inside, perhaps fro the first time, and this could lead to a new humanism. There will be major implications with positive outcomes for education, science, medicine, law, economy, society and also international relations since the root of all conflict is often misunderstanding.

But at the same time, my colleagues and I urge you to think hard about what type of humanity we want to be, and to move us in that direction using the rule of law. Keep abreast of the progress in science and technology, and be prepared to respond, by not just considering legislation in your individual countries but also expanding the Universal Declaration to include Neurorights. As science and technologies are ahead of society, the principles and rules by which we govern each other should also be updated. We encourage you to take this message back home, to your communities, to your home parliaments, to the UN and other international organizations represented here, to embrace this cause as your own. We scientists will be delighted to work with you: as I told you, we work for humankind, this is our job.