Discussion[*]

Paul Richard Gallagher, Marcia McNutt, Giorgio Parisi, and Wolfango Plastino

Wolfango Plastino: *The current health emergency has underscored the need for more integrated international cooperation. How will a stronger multilateralism help us face the global crisis caused by Covid-19 and more specifically, its political, economic and social consequences?*

Marcia McNutt: First of all, this was a fabulous opening statement, and I would like to elaborate on some of the themes that we've already heard. I think multinationalism is essential on a number of fronts, and let me enumerate a few of them from my perspective as a scientist. The first is epidemiology. We find unfolding before us an unintended scientific experiment. Populations around the globe, with different age and genetic demographics, who are under different public health systems, with different degrees of exposure to pre-existing conditions, and different cultural norms that determine their willingness or resistance to adopt public safety precautions, are all experiencing the very same health emergency. This is a classic example of a multivariate problem for which we have the hope of actually having an overdetermined system. As scientists, we owe it to the public to make national statistics freely available from all our countries on infection rates, on deaths, who is dying, who is getting infected, how badly are they being impacted, and to analyse them globally, in order to understand how best to confront this global scourge. We can't do this on an individual nation basis, but we can do this multinationally.

The second example I want to cite is medicine. Vaccines, treatments, and other therapies are being developed all over the world. We understand deep in our hearts that the ideal humanitarian

solution is to use these treatments to protect the most vulnerable first. But that's going to require international cooperation.

The third example I want to give is ecology. Zoonotic diseases are becoming more common, they're becoming more deadly, and they're becoming more global in their impact. International cooperation, and understanding the factors that lead to diseases crossing boundaries and acquiring remarkable virulence, is absolutely essential. What are the relative roles of habitat destruction, humans encroaching on the urban-wildland interface, the practice of consuming wild as opposed to farm animals and other factors in leading to the rise of these zoonotic diseases? We have to cooperate internationally if we are going to become more resilient to these kinds of crises.

And then the last example I want to give, which is quite different from the others, is supply chains. Let me start with just a personal story. During the early days of the pandemic, when the US was suffering from shortages of all sorts of personal protective equipment, a scientific colleague of mine from Hong Kong, Zhao Wutang, sent me a large crate filled with thousands of surgical masks. Those masks supplied my local hospital, my entire extended family, and all of my neighbours with the protection we all needed to stay safe during the first few months of the pandemic, until supplies could be established here in the US. But I know that not everyone was so fortunate. We learned, sadly, from the Covid-19 crisis that the just-in-time efficiency of global supply chains was badly suited to global emergencies. We need new paradigms. Engineering works very differently from science. Science is all about discovery. Engineering knows that there are many solutions to problems, and so they optimize which solutions they take depending on the needs of the user. If the user wants the safest solution, that's the one they get. If they want the most cost-efficient solution, that's the one they get. Right now, we don't have supply chain solutions that are suited to crises. And we need to prioritize that.

Now although I've focused on the role of science, engineering and medicine, these challenges benefit cooperation and collaboration across governments, non-governments and communities. And I'd like to acknowledge the role of international scientific organizations in all this, such as the G20 Science Summit 2021, which Italy will host next year, the International Science Council, and the InterAcademy Partnership. They all help to coordinate international science efforts. In fact, the InterAcademy Partnership has a secretariat hosted in Trieste with support from Italy, and I want to thank the Italian government for that. There's also a secretariat in the US which is hosted by our academy. They

have all provided resources to help governments decide on policies regarding Covid-19 and many other issues, and so these organizations have remained strong and vital.

Paul Richard Gallagher: I'd just add a few thoughts onto what I've already said. This mask that I've just taken off – you talk about international cooperation – was actually provided to the Vatican by the Korean Embassy to the Holy See. They've been very attentive, like many other embassies have been, to our well-being. They want to keep us alive, which is not a bad thing.

I think we have to be quite honest, and say that the state of relations between countries and regions of the world, continents of the world, is not that great. It's true that we've had an unprecedented period of peace following on the Second World War. But even today there are many, many, many conflicts taking a very high price for humankind. And so I think that this is an opportunity to renew some of our structures and our organizations; there is urgent need for this, because some of the problems we are facing today could exacerbate those situations. Environmental considerations do not respect borders, nor do pandemics. And there is always the danger, then, that people, if they feel that their neighbours are not taking these problems seriously or are not acting in an appropriate way, might take matters into their own hands.

So it is urgent that relations improve, not only with dialogue but with the use of the multilateral system, and we are very much in favour of reform of the multinational system as well. Many things need to be changed at every level. But at the same time, its very existence is vital at this time. And as I said, this needs to be based on a renewed appreciation of our humanity and renewed commitment to solidarity amidst peoples and cultures and countries to face the common problems that we are facing. And in all of this, I think that diplomacy has its role, that it is more necessary than ever; there needs to be as much "jaw, jaw," and as little "war, war," as possible, and we move forward in that way. I think it's a way of also generating a certain optimism and combatting the pessimism to which I referred, and which is undoubtedly present amongst many of us before the enormity of the problems we are facing. But if we do get people working together, we do get people talking together, and talking about the things that matter most, then I think that we can move forward with a certain degree of confidence.

Giorgio Parisi: Multilateralism is the future. We live in a world with finite resources, and we are bound to work together. It is dramatically true that with the global crisis weaker countries become

poorer, and inequalities increase. During Covid-19, some countries have been touched in a very heavy way, and I'm very sorry to hear about Peru, where the number of deaths this year has nearly doubled with respect to the previous year. This is a real humanitarian disaster, like the Spanish flu, but I have the feeling that other countries don't care about what is happening in Peru.

The Covid-19 crisis will not end if the virus is not eliminated in every country, as was done with smallpox. Vaccination should be a fundamental human right, for this and other illnesses, and this aim, as has been stressed by the international Gavi organization, may be reached only by a strong international combined effort. International collaboration is ultra-fundamental, in order to construct a global pandemic preparedness for future pandemics, and this can be done only within a multilateral approach. We know that there will be a new pandemic in the future, and we must be prepared. The role of the WHO should be strongly increased; for example, we need a global reserve of personal protective equipment, ventilators, tools for sanitizing, whatever may be useful. We cannot let any country be left alone, without these extremely useful objects to help save lives. I wish to add that a global institute of health, something that is organized like the NIH, the National Institute of Health of the United States, would be a crucial step to address all the scientific problems that are related to pandemics and preparedness.

Wolfango Plastino: *What does the coronavirus emergency teach about dealing with environmental threats?*

Giorgio Parisi: The environment is crucial to us in many, many respects. As has already been said by His Excellency Gallagher, global warming is a terrible crisis, and unfortunately we have only started to face it. For the moment, we have only the most feeble signals, but in the future things will become much, much worse. I hope that the Covid-19 crisis has taught all of us that global problems should be solved at the global level. No country (as His Excellency also said) can be saved by its lone efforts.

Let me just mention two of the many ways in which the present environmental threats have influenced the Covid crisis: air pollution strongly increases pulmonary and circulatory illnesses. These illnesses played a crucial role as co-morbidities and increased the death toll of Covid. We also have to remember that animals are a crucial part of the environment; not only is respect for animals our moral duty, but disrespect of animals also has serious health

consequences, as we saw already long ago during the MERS-CoV disease. We know that Covid emerged from a market, where the animals were kept in an unhealthy way. We have just heard, in the recent news, that Covid has been transmitted from humans to minks, and back from minks to humans. This is an extremely worrying phenomenon, because we should avoid the formation of a mammal reservoir of the virus. There are so many points of connection between the environmental aspect and the Covid crisis, that I will leave them to other people to go into greater detail.

Marcia McNutt: I will try not to repeat any of the points that President Parisi has made, which are of course so very important. Let me just say that environmental threats, whether it's Covid-19 or climate change, clearly know no boundaries. We can't close our borders to them. We can't call up our military and tell them to shoot the virus out of the sky. We can't negotiate with them diplomatically. We can't legislate them out of existence. And most importantly, we can't solve them anywhere until we solve them everywhere. My own nation is now leading in cases and deaths per capita – not a record we are proud to claim. Despite strong interventions by some nations to control infection rates, no one is going to be safe as long as the US remains a reservoir for the disease. These ubiquitous problems demonstrate that we have to work together, that facts and science matter.

We can see the consequences of ignoring science and facts daily with Covid-19. We are seeing the consequences of ignoring science and facts also regarding climate change, too, unfortunately, especially here in the US. But let me say this. Shame on us as scientists for too long having assumed that all of society would automatically embrace the benefits of science technology and innovation. We must remake the case each and every day for the benefits of science, and be more mindful about how we can anticipate and mitigate the negative impacts of innovation on some components of society, particularly those who are most vulnerable. We have to recommit to that, and decide how we are going to do that consistently and every day.

Paul Richard Gallagher: These two crises have an awful lot in common. We all know that we're going to be incredibly indebted to the teams of scientists who are working on the vaccines which will hopefully save so many lives in the years to come. But if I look at the other element which is indispensable in this situation, I think it is personal responsibility. The scientists can do so much, but if we are not going to contribute to that, it will not be successful.

So I think that when it comes to the environment – and we see many, many initiatives, and certainly as a result of *Laudato si'* five years ago and the Paris Agreement – many, many people have experienced a kind of ecological conversion, an environmental conversion, and are more aware of the world in which they live and its vulnerability. It's the same thing now with Covid-19. We have to be prudent, we have to be responsible in our actions, and in following the leadership. We can't just leave it up to governments and authorities, or to scientists. Everybody has to do their bit here.

And I think that then underlies the need for recommitment to education; we need to help people who do not appreciate these things, or the young as they are moving into their maturity in the world which is environmentally fragile, and which is affected by Covid-19. We need to help them through education, through our programmes, and to help them to assume the responsibilities which will be theirs in the future for themselves and for their loved ones.

Wolfango Plastino: *The key role of dialogue in our society has been stressed several times, along with the need to encourage interdisciplinary debate between scientists, philosophers and theologians. What is the link between science, religious freedom and the common good?*

Paul Richard Gallagher: I think the principal point that I'd like to make here would be that the benefits that science can bring are many and great, but science and scientists need to work in an ethical and a principled environment. There's an old principle going back to the New Testament, where it says that not everything that we can do is necessarily good, just because we can do it. We have to have that dimension to it: the thing must be ethically sound, in order to produce something good. I think that there is this need for interdisciplinary scientific cooperation, and I think that religious freedom is very fundamental because it draws us to consider what are the fundamental rights of the person, the right to life, the right to other things, the fundamental things. But the right to religious freedom is really that inner, interior freedom that all people should benefit from. And I think it therefore provides an element of a litmus test also for the capacities of science as well.

Giorgio Parisi: Roughly speaking, scientists try to understand world as it is, philosophers ask how we understand the world, and theologians try to relate the world with something that transcends

the world. Of course, this may be a caricature of what happens, but just to summarize the situation.

Now, what I would like to stress, is that all these people have different viewpoints on the same world in which we live, and an interdisciplinary dialogue is very important. It has often been said that scientists and philosophers speak to the mind of people, while religion speaks to the heart of the people. As has been stressed by other participants, in the past scientists have forgotten to address many of the problems of many people, and that is something which brings shame on us. We have to remember that we are all men, that we all have the same ethical principles, and that we should work only in the same direction of the common good. Scientific freedom and religious freedom are fundamental human rights, and in the past their suppression has been the source of many events; I sincerely hope that this kind of suppression of human rights will stop in the future.

Marcia McNutt: Scientists can certainly advise citizens on steps that they should take to protect themselves, for example in the case of the Covid-19 pandemic, or steps they could take to mitigate climate change – how they can protect themselves, their loved ones, their neighbours and all others. But sadly, science cannot make people care about how their actions affect strangers, generations yet to be born, citizens of other nations, or people who do not look or think like they do. And yet we do know that we share a common journey with all of them, and our futures are intertwined, intertwined in a way that means that we're all in this together. Religion has always been one of the most powerful forces for motivating people to think beyond their own personal welfare. Science and religion working together for the benefit of preserving a sustainable future for humanity, for us now, for our children, for our grandchildren, for the unforeseeable future is likely our one, our only, and our best hope.

Wolfango Plastino: *Given its disruptive power, artificial intelligence (AI) is one of many emerging technologies at the centre of many debates due to its ethical and social impacts. What are the challenges, opportunities and risks associated with the use of artificial intelligence?*

Marcia McNutt: Artificial intelligence shares so many aspects of many of the things that we've already been discussing. It offers the promise of multiplying our abilities, of taking over routine tasks, doing them much more rapidly and accurately, and replacing

mind-numbing jobs that no one really wants to do, and even of finding possible answers to questions that were not possible to solve before. AI in my view is neither intrinsically good nor bad. And that's true with most science. Science isn't good or bad, science just is. It's knowledge. But how it is applied can either be a benefit overall to society, or it can have negative impact. And because AI is a disruptive technology, it is essential for researchers to work with civil society to encourage the beneficial applications and mitigate possible problems. As H.E. Gallagher already stated earlier, if we leave it only up to market forces to decide how science and technology are to be used, then shame on us for accepting that negative outcomes can happen.

So, examples of some of the questions that scientists working with civil society need to consider in how AI is applied are: How will we confront the issue of finding gainful employment for those whose jobs are lost to AI? This can't be a situation where those who know how to benefit from it do, and those who don't are simply left behind and become unemployed and destitute. How do we protect personal privacy, which may no longer be guaranteed when independent large datasets are combined using AI, thus circumventing the protections that each database had individually, but no longer hold once they are put together? How do we create an ethical framework for when and how AI can replace humans in decision-making, and how can errors be eliminated? This has been discussed extensively, for example, in drones being used in warfare. And as a fourth example, how can we establish a continuing framework within which we can re-examine the social and ethical implications for AI that involves conversations of scientists, engineers, and civil society all working together? Because, honestly, science and technology change our ethics as it permeates society, and we have to keep up with the pace of that change and constantly look at the new applications, and how they are disrupting our society, and make sure that we are building the society we want, not the society that we are being driven into.

Paul Richard Gallagher: I think I can be really quite brief here, because I want to reinforce some of the things President McNutt has just mentioned. I think that in recent years, maybe even recent decades, the question of AI is the issue broached by more engineers and companies of engineers involved in the development of artificial intelligence approaching the Vatican, asking us for guidance, holding dialogues about the ethical and moral questions associated with this technology. That's been very encouraging, and it does show that the very engineers who are responsible for this development

are aware of both the negative and the positive dimensions, and are to some extent fearful of the misuse of AI.

I'd like to reinforce the question that is certainly of concern to us: the whole question of AI in the matter of autonomous weapons, and where decisions are made during conflicts. And we've seen already increasingly the use of drones, which for the most part are still controlled by generals and other people, but there is the prospect that they could be so programmed as to make their own decisions about targets, etc. The other thing is the whole question of employment, the impact of AI on the employment markets, the danger of technological unemployment, and the impact then that that would have on human dignity, and also on security and the development of our societies. In many parts of the world there are already endemic problems of unemployment. When I was a young priest in the city of Liverpool, there were already then – and we're talking about the late 1970s – families in their third generation of unemployment in the parish that I cared for. Now, forty-odd years later, one shudders to think what the situation may be.

But we certainly do have to make this one of our priorities, because work is not just a way of earning a living, or providing for your loved ones. It is also part of what it means to be a human being, and we shouldn't allow that to be forgotten.

Giorgio Parisi: My colleagues have been very clear and have mostly said everything that I want to say. It is clear that we cannot leave the control of AI in the invisible hand of profit. We should carefully design measures that are needed to share the benefits of AI across society. It is clear that when we have an automatic car, or a self-driving car, there will be the problem that taxi drivers are going to disappear. Taxi drivers will lose their jobs very, very rapidly, and this will be a painful process which should be controlled in some way or other.

We need insight from many fields to maximize the social benefit of artificial intelligence and with interdisciplinary research which involves not only hard scientists but soft scientists, psychologists, economists and so on. We have to give opportunities to education, artificial intelligence and information in schools, and generally speak with citizens in order to give them end-to-end control over what's happening. The issue of military use of AI is extremely important and I think it will be extremely urgent to organize an international conference, discussing what steps could be taken to limit the risks of autonomous weapons, and to arrive at full international agreement on this point for all the countries in our world.