

Dinner speech on 4th November 2015 by Hiroyuki Yoshikawa

The 61st Pugwash Conference on Science and World Affairs, 1-5 November at Nagasaki

Dear Pugwashites, Distinguished guests, Ladies and Gentlemen,

It is an honour and pleasure that I have an opportunity to speak at dinner of Pugwash Conference 2015 at Nagasaki. Frankly, I am a new comer to the Pugwash conference, but today, I will talk my thought about the necessary role of scientists in Pugwash.

The topic I would speak is big threats that confront human beings presently. And cooperation of scientists necessary for fighting against them will be discussed. By scientists I mean all fields which include social sciences and humanities.

Let me start with taking up three categories of big threats to closely connected to science which exist in front of human beings to be overcome urgently. The first is the possible recent aggravation of natural disaster caused by geological changes within the earth, such as earthquake, tsunami, eruption (volcano), flood, drought, and storm: now their aggravations are observed worldwide. The second is the global warming or change of meteorology. And the last is the nuclear weapon. This sequence, from the first to the last corresponds to the amount of respective scientific knowledge necessary for fighting against the threat.

These three are all horrible threats to human beings, but have different character. Consequently, means to overcome them must be different each other.

When we look at the threats due to geological changes, we may remember long history of human beings attacked by them, and at the same time the processes how they conquered the cause of those threats. We may call them “evils”, who gave threats and actually attacked human beings. Present threats due to the unexpected geological changes, such as earthquake belong to this category. Presently intensifying natural disasters are caused by enlarging geological changes. It is the result of enlargement of some evils which have been observed in the past.

Those evils were strong and almost destroy humankind, but it fought against evils and successfully conquered them. Humans were weak but enough wise to beat them. A typical example is the Black Death, or the pest. After fighting for a long time under the wrong hypotheses, medical specialists finally identified a particular bacterium as the cause of the

disease, and stopped the infection. This fight was not only successful but also created new knowledge, namely a discipline- 'microbiology'- which has developed subsequently into modern life science. Knowledge acquired through fights against storm and earthquake has converged into Meteorology and Seismology and further, derived engineering knowledge such as architectural engineering and civil engineering which are necessary to build durable buildings.

By conquering different evils in history, humans accumulated huge amount of knowledge and systematised it as scientific knowledge which is educated through generations and can be used anytime.

Present problems are the change of the scale or dimension of disaster; bigger earthquakes, harder tornados, and higher tsunamis, and so on, which devastate human society especially in the excessively artificialized areas. We have already started to revise the safety standards for constructions for the swelling disaster. In short, we already know how to develop our knowledge to confront the present threats of first category.

Now, let us go into the second category. That is the global warming in modern age. Of course it is a kind of natural threats. But this is absolutely different from the past threats we have discussed just before.

The historical past threats were brought by some Evils who existed visibly. They were diastrophism, abnormal wind, seabed slip and bacterium. Those evils were definitely due to natural phenomena which were outside and sometime uncontrollable, but whenever humans realise and identify the outside evils, they could technologically eliminate or avoid them.

On the contrary, we cannot find any visible outside enemy when we struggle against the global warming. In 1970s, scientists in meteorology had discovered the cause of average temperature rise of the earth surface. It was due to the increase of carbon-dioxide content of the air.

At this stage, we could say that the evil which attacked humans by rising the global temperature was the increase of carbon- dioxide. However, where is the enemy we should fight against? Scientists have also discovered the evidence that the increase of carbon dioxide is the exhaustion which was emitted as the result of human activity.

There is no visible enemy outside of human circle. Evil does not exist outside, but does come from our own activities. Even more, we can never identify the suspect who is responsible for the increase of carbon dioxide, because the total increase is result of accumulation of small amount of gas exhausted separately by diversified and countless individual activities of humans. Unfortunately we must recognise that new type of threats is emerging, which may be called the modern evil. This is quite different from the past one.

There are many modern evils other than the global warming. They include the loss of biodiversity, emergence of new infectious disease, bovine spongiform encephalitis, increase of severity of accident by artefacts, and digital criminals. In spite of the diverse causes of these threats, there is a common feature among them. It is that those causes are the results of human activities, especially excessive pursuit of economic wealth, in many cases using scientific knowledge.

In case of those modern evils, the traditional method of overcoming threats is surely powerless, and nations have not yet been successful to derive systematic method applicable to fight against them with and actually forced to struggle to confront them. But there is an exceptional case which we must learn from. It is the global warming.

There have been many research works on global warming. In the 1950s, and as the accuracy of measurements of constituent of the air and temperature distribution is improved, those measured data urged scientists to warn the society or government that the increase of carbon dioxide in the air would cause harmful effects such as elevation of the sea level, change of ecological systems etc, and finally threatening the existence of human beings. The society, however, did not listen to scientists.

It was a conference in 1985 in Villach Austria where society first listened to the scientists. This was the International Conference on the Assessment of the Role of Carbon Dioxide jointly organized by WMO, UNEP, and ICSU. In the opening address of this Conference, the chairperson, Dr J. Bruce, mentioned that the Conference had two important missions concerning global warming. The first was to issue a consensus statement of the participants on global warming based on the presently available scientific knowledge, and the second was to make sound recommendations to society for action, well-grounded on the scientific evidence. It is remarkable that both missions were successfully carried out in this conference, and

actually gave an impact to society. The statement was taken up by United Nations Commission, and cited in a book "Our Common Future".

The subsequent process was very fast. The Intergovernmental Panel on Climate Change by scientists started and The Framework Convention on Climate Change was concluded under The United Nations. We may say that an official mechanism was appeared here, by which international consultation about tough problems became possible with the advice of scientists. Actually, as a result of consultations, effective actions to suppress global warming through international cooperation have been started.

Then, the decision made by United Nations to create negotiation system between Nations aiming at establishing an international agreement how to cut the emission. Conference of Parties have been organised periodically where nations are given a place for discussion. It is still difficult to get conclusion, but we can have a hope of an international agreement. I am ready to tell you that specialists started to tackle other threats of this category using the similar method.

Here, we must stress that the reason of the constructive discussion at Conference of Parties is based upon the scientific data about global warming which is continuously supplied by a lucid process conducted by a scientists' group: IPCC (Intergovernmental Panel on Climate Change).

We now speak the subject of the third category of threats, nuclear weapon. But just before going into this topic, I would like to mention my own worry.

I am not a physicist but an engineering scientist, and have studied the theory of design. So I have no chance to be involved into the Pugwash activity so far. But now, I remember that the manifesto by Russell and Einstein in 1955 gave me a great shock. The shock had broken the spell of atomic bomb that was an invisible but inevitable barrier for me, a young man who was going to decide the profession: to be a scientist or not.

It is now 60 years since then, and when I read the manifesto again I found that the spirit of the manifesto remains absolutely correct and still I learn a lot from the sentences how scientists should act in future.

My worry is exactly the fact that I learn a lot from the Manifesto still after 60 years. This implies that there are still many proposals within the sentences, which were not realised after 60 years. Those proposals were not written explicitly but potentially and we can read them.

Returning to the two categories of threats I mentioned before, they were conquered by the cooperation between scientists and society. In the first category, scientists had offered systematic useful knowledge to society. In the second category, society could develop a useful strategy with the aid by scientific academies, not only natural science but also economics, sociology etc., which made earnest dialogues after their discovery of the emergence of an evil, although it took more than 30 years after discovery.

I think many of you have noticed that the issue of scientists' advice to government and society is intensively discussed in international arena recently. It is due to the fact that many of the political or societal decisions cannot be conducted without scientific evidences. Especially, in case of subjects which influence risks of human health, the scientific advice is essential. Some countries have successful history of scientific advice to head of state, and many others started to implement own advice system. Moreover, open forums have been organised to discuss the system internationally among scientific advisors.

In the Russell-Einstein Manifesto, there is a grievous message that scientists should work more. It says that "We have found that the men who know most are the most gloomy". As scientists belong to the people who know most, they must act. All scientists, not only of nuclear science but of other diversified fields are responsible to be involved in the action.

In spite of the this message in Russel-Einstein Manifesto, the human endeavour toward the reduction of nuclear weapon has been mainly conducted politically without scientific evidence. We learned that the consensus driven neutral advices by scientists with scientific evidences have been essential to conquer the big evils. We learned it from experiences in other categories.

Then, what are the scientific evidences necessary for the reduction of nuclear weapon, and abolition of war?

This is the most difficult question asked of us, scientists. In the first category, the threats were dealt with by single discipline of science. For the second category, several disciplines were necessary. However, in the third category, we need a new aspect composed of all scientific

disciplines. By all scientific disciplines, I mean natural sciences, technological sciences, medical sciences, social sciences, and humanities, and perhaps society itself. The new aspects may be as follows: integration of disciplines, design-oriented theories, evolution of knowledge, equal – footing knowledge between creator and user, and so on. Advice to actors in society is expected to be given by science academies where scientists collaborate to derive consensus advice based on evidence. Consensus is an important point. If society is flooded with diversified advice proposed by individual scientists, an actor may be puzzled. Moreover, some conflicts between groups in society will be escalated by arbitrary use of advice which is convenient for them.

We, scientists, are not well trained in collaboration overarching different disciplines, but I would say, that it is the time for us scientists to work together to derive the useful evidence for the action to construct the peaceful future.