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一九七五年七月五日

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"LEOPARD"

MARUZEN

25th Pugwash Symposium

A New Design towards Complete Nuclear Disarmament  
(the Social Function of Scientists and Engineers)

Kyoto, JAPAN, 28 August - 1 September 1975

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Thoughts of Nuclear Disarmament

— Restructuring of Pugwash Movement —

Hideki YUKAWA

The 25th Pugwash Symposium is opening. Though it is small in scale with a limited number of participants, we may be able to make this conference very significant. In order to achieve this we must first reflect on the fundamental spirit of the Russell-Einstein Manifesto of 20 years ago. It was novel first because it called for an international conference to be held by scientists "for the survival of mankind". Scientists had issued appeals before that time, but these were for a part of, rather than for all of mankind. The second point, which is inseparably related to this difference between the previous appeals and the Manifesto, is that while the former were against certain wars from certain points of view, the latter denounced and aimed at the abolishment of all wars because there was the possibility for any war to develop into nuclear war, and thus lead to the destruction of mankind. The problem here is that the advent of nuclear weapons is forcing us to reconsider our basic outlook on the future of mankind. Of course if we go into detailed discussions on the definition of a war, there can be various opinions concerning it; likewise, there can be objections to

the details of the expressions of the Russell-Einstein Manifesto. However, there could be no objections to the abolishment of warfare as a basic goal and to the necessity of abolishing nuclear weapons, which can lead mankind into destruction.

In response to the Manifesto, the Pugwash conferences and symposiums have been held many times since 1957. The fact that, as years pass, the number of participants to the conference is increasing would have pleased us in another time, but we find ourselves in no position to praise ourselves when we look back on the 20 years of the Pugwash Movement. We are, rather, inclined to grieve over our lack of efficacy. This is because we have not only failed to stop nuclear arms races but the two major nuclear powers — the United States and the Soviet Union — have been continually reinforcing their nuclear armament both in quality and quantity for the past 20 years.

In the meantime, the resolution for general and complete disarmament, which was proposed by all the UN member nations (82 nations), was adopted by unanimous support in the 14th General Assembly of the United Nations in 1959. In 1961, the United States and the Soviet Union took the initiative, following the line set by this resolution, by announcing the Joint Statement of Agreed Principles for Disarmament Negotiations whereby they requested the cooperation of other nations regarding multilateral disarmament. Similarly, the main

topic at the Pugwash Conference was the question of disarmament almost every year around this time. In every case the ultimate goal was general and complete disarmament, and it was clear to everyone that the first step to be taken for its achievement had to be nuclear disarmament. However, in reality, nuclear armament has been reinforced both in quality and quantity instead of being reduced, and this trend continues to this day.

We welcomed the conclusion of the Partial Test-Ban Treaty in 1963 as the first step toward nuclear disarmament. However, contrary to our expectation, underground nuclear weapon tests have been continued, thereby serving to reinforce the power of nuclear weapons. The Treaty on the Non-Proliferation of Nuclear Weapons, which was signed by many countries in 1970, is being ratified by an increasing number of countries. Though we are fully aware that it is inevitably an unfair treaty, we, Dr. Tomonaga and I, especially, have been repeatedly urging the Japanese Government to an early ratification since it is meaningful for the prevention of the so-called "horizontal proliferation" of nuclear weapons. Among the various arguments raised concerning the ratification of this non-proliferation treaty in Japan, one of the strongest arguments against the ratification is that the security of a non-nuclear weapon state like Japan is not ensured. Another is that not enough efforts have been made by the nuclear weapon states, particularly the United States

and the Soviet Union, for nuclear disarmament. These will be the major topics of discussion at this symposium. Anyhow, the so-called "vertical proliferation" is undoubtedly more important than the horizontal proliferation. Behind the signing or ratification by many of the non-nuclear weapon states of this unfair and disadvantageous treaty, is the judgement that by so doing they can lay a great obligation on the nuclear weapon states regarding nuclear disarmament.

The situation where nuclear armament continues to be reinforced while the necessity for nuclear disarmament is recognized as a guideline, shows that there are fundamental mistakes in our approach. One of the most typical mistakes is the concept of nuclear deterrence. The concept is that no nuclear war will occur if the nuclear armament of the two superpowers, the United States and the Soviet Union, are kept in an equilibrium in the sense that nuclear state A's initial nuclear attack on nuclear state B can be countered by B's second strike, which can give A the same degree of damage as B has received from A, and vice versa. The idea is that this kind of equilibrium of nuclear armament will deter either state from attacking the other. It seems at first conceivable that if both states take this view their nuclear armament will arrive at a static state at some point. Even if such a state should appear to have been achieved for a certain period, such a state would be extremely unstable. The two states that do not know each other com-

pletely and that cannot predict each other's future state with 100 percent certainty, will each try to advance its own armament above the level expected to be achieved by the other state. Therefore, both will constantly receive a positive feedback, which means that the nuclear armament of both states is directed toward infinity. This is the complete opposite of nuclear disarmament, which is in principle directed toward zero. Therefore, if one admits nuclear disarmament be necessary, one should first of all abandon the concept of nuclear deterrence. The measures to achieve nuclear disarmament must be nothing else but a process of repeated negative feedback.

Furthermore, the pursuit of equilibrium involving positive feedback on the part of the nuclear superpowers will justify the retention or the reinforcement of nuclear armament on the part of the other states. While the nuclear superpowers insist that they are compelled to reinforce their own security, what justification do they have for stopping the lesser nuclear weapon states or non-nuclear weapon states from insisting for greater rights on the reinforcement of their own nuclear armament ?

A fallacy that prevails today is related to the point mentioned above. It is the concept of "security under the nuclear umbrella", which is the idea that the security of a non-nuclear weapon state is ensured by its being under the nuclear umbrella of a certain nuclear superpower. This

concept is basically wrong, since the real security of non-nuclear weapon states can never be attained under the policy of nuclear deterrence, which will never serve to retain a stable equilibrium of nuclear armament free from positive feedback. The only thing that we can expect here is the pledge of the nuclear weapon states that they will never make a nuclear attack on non-nuclear weapon states. It may be also useful to prevent the horizontal proliferation of nuclear weapons. I shall not go further into this question since it will be discussed at the Symposium.

Not only statesmen of many countries but also quite a few of the scientists participating even in Pugwash have not freed themselves from the concept of nuclear deterrence or that of the nuclear umbrella despite the essentially self-contradictory properties that these undoubtedly contain. This seems essentially to be due to their basic viewpoint regarding nuclear weapons, which is to regard the nuclear weapon relativized as one of the many necessary evils in human society. In the long history of mankind weapons or the development of weapons have been closely related to technological development. There have been among scientists and technologists quite a few who have held the view that weapons, as well as being by-products of technology, have served for the development of the latter, and thus that they have been indirectly serving for the achievement of a greater social welfare. Such a view has been reinforced by the tra-

ditional attitude that some of the wars can be justified as wars for the sake of justice. The advent of nuclear weapons has, at a stroke, made this kind of views out of date. Such partial and relative value judgements as are involved in deciding which are the interests of the state and which are the wars for justice have been surpassed by the necessity of recognizing nuclear weapons as the absolute evil as they are the potential destroyers of the entire human race. The Russell-Einstein Manifesto was issued on the basis of this very recognition that nuclear weapons are an absolute evil and that nuclear wars should never be brought about. At the early Pugwash conferences the recognition seemed to be shared by the majority of the attendants. However, the situation has changed with time. As technical discussions from so-called realistic points of view have become more and more detailed on the one hand, less and less value has been attached to the basic recognition, consciously or unconsciously, concerning nuclear weapons and wars.

In this connection, there has been considerable influence from the traditional attitudes toward science and technology in general. Especially, in the field of pure sciences it has been considered desirable for their development not to involve any judgement other than that between truth and falsehood. Similarly, in the field of applied sciences, scientists and technologists have been solely concerned with whether achieving a certain matter for a certain purpose is

technologically possible or not; it has come to be generally viewed that scientists and technologists need not judge the value of the purpose itself. In short, after the development of modern sciences the general tendency has been to try to separate science and morality as much as possible, but of course scientists and technologists have not always been able to ignore morality. Especially in the case of medicine they have been following some kind of moral code or other ever since the time of Hippocrates. However, the wider the gap that separated a science from the studies directly related to human life such as medicine has been, the more distant has been the relationship between that science and morality. For example it has been usually considered that in the pure physical sciences a true-or-false judgement is ultimately the only criterion since the objects of physical studies are inanimate, and that also in applied fields the researchers need not evaluate the purpose of a research themselves.

We physicists know from our experience that the above attitude has been fundamentally attacked by the advent of nuclear weapons. Since then scientists in other fields have learned from many actual examples that even when their researches do not deal with human beings they should not put aside the judgement between right and wrong with respect to the purposes of their researches, or that even when the purpose is justified, they should not neglect the consid-

eration of harmful by-products and the danger that might arise with the undertaking. It is especially the case with biology. It is now known that human beings and other living things share extremely common properties both physically and functionally on a molecular level. Therefore, as is the case with medicine, biologists can no longer ignore the moral questions involved even when they immediately deal with non-human life. Particularly in the field of genetic engineering, the problems raised by the researchers themselves are still more serious than in the case of atomic physics in the sense that even though the study is called "engineering", it cannot be separated from the main stream of biology that seeks the detailed knowledge about the fundamental mechanism of heredity common to human beings and other life, with respect to the methods employed. It would be natural, therefore, that an agreement has not been easily reached among the researchers regarding the extent to which a restriction should be imposed on such studies. It is a question that is most directly related to the essence of modern science. It is also difficult to evaluate the purposes of many studies in applied biology. In chemistry and mathematics there are many problems that await a priori judgement on the relative weight between the positive value attached to goals and the negative effects that accompany their achievement. To take an example from mathematics, one of the problems is the way computers are to be used. No one will be able to deny that

at the present stage of scientific development, unlike the 19th or early 20th centuries, the instances where we once again need to consider moral questions have suddenly increased. It means that the age of academism in the old sense of the word is over. For some problems it is hard to get a consensus. In the case of the question of nuclear weapons, which presented itself comparatively early and in a dramatic way, the judgement from a moral point of view is easiest. No sane scientists will dare to protest openly to the judgement that nuclear weapons are an absolute evil.

The Pugwash Conference, as you all know, was started for the definite purpose of abolishing nuclear weapons. The purpose should not have changed in these 20 years. Even though it seems that the purpose has disappeared from the surface in the meantime, I wish to believe that the purpose has always been recognized in the hearts of the people who participate in this conference. I believe that it is only when the purpose is confirmed once again at this Synposium, which has as its main themes nuclear disarmament and morals in science, that executive measures will truly have realistic meanings for nuclear disarmament.