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Pragmatism and the Ethics of Technology

One of the conspicuous characteristics of the pragmatic concept of knowledge and technology is the emphasis on their creative character. However, when it comes to ethical issues related to the development of knowledge and technology, this character seems to pose a fundamental problem. As a creative process, the development of knowledge and technology necessarily shows the characteristics of unpredictability and uncertainty, so it seems to be difficult to attribute the concept of responsibility to such a process.

Taking their creative character seriously, how are ethics of knowledge and technology possible? This is the question I would like to address in the following.

1. Philosophy as applied ethics; the Deweyan approach towards the ethics of technology

1) Dewey's definition of philosophy

In 1919, John Dewey delivered a lecture entitled *Reconstruction in Philosophy* at the University of Tokyo. In the first part of this lecture he formulated the origin and the role of philosophy, describing and analyzing the initial phase of western philosophy. According to Dewey, as human beings, we have two points of view with which to respond to the various problems in our lives. One is a traditional point of view, which is deeply rooted in social habits and loyalties. It is also surcharged with the moral aims for which human beings live and the moral rules by which

they live. The other is a positivistic point of view, which is closely connected to the development of a variety of knowledge and technologies. Whenever the latter point of view develops, and its results are brought into our society, various conflicts emerge between these two points of view.

We can find the first typical conflict of this kind in Ancient Greece when Socrates and the Sophists were active. According to Dewey, this structure of problems continues to be the origin and the driving force of western philosophy, although the factors of conflicts vary in each historical situation. Dewey said: "If I am right in my main thesis that the origin of philosophy lay in an attempt to reconcile the two different types of mental products, then the key is in our hands as to the main traits of subsequent philosophy so far as that was not of a negative and heterodox kind" (Dewey 1988a, p. 89).

If we see our contemporary situation in the 20th century and the 21st century from Dewey's point of view, we can immediately identify problems that can be interpreted as a typical case of the philosophical problem in the sense Dewey defined.

These are the problems of so-called "applied ethics."

Today, everywhere problems related to the development of technology are discussed, we find people talk about ethics, e.g., environmental ethics, bioethics, information ethics, and engineering ethics.

While various problems are discussed in these fields of ethics, I think most of them show the following common structure. Because technological innovations bring us new possibilities of action, which cannot be easily evaluated by and dealt with using traditional ethical rules and principles, this situation demands that we take a new approach to ethics that gives us a guide to make judgments, and helps us to solve concrete problems caused by such new possibilities.

For example, with the development of reproduction technologies, we are forced to answer the question of whether, or to what extent, we can admit technological intervention into the process of reproduction. Or, when it is technologically possible to produce clones of human beings experimentally, why should we not produce them?

Another example can be taken from problems discussed in engineering ethics. Before launching a space shuttle, engineers are forced to make the launch decision upon considering many complex and uncertain factors. Decision-making in such a big project is so exceptional that special

norms or guidelines are needed by the people who make such important judgments. What ethics help engineers avoid disastrous accidents?

In this way we find that the task of contemporary applied ethics is similar to the task of solving a conflict between a traditional value system and the development of new technologies, which Dewey commonly finds in the history of western philosophy. If we follow Dewey's thesis that the main aim of philosophy is to become an organ for solving such conflicts (Dewey 1988a, p. 94), we could say that problems belonging to applied ethics can be regarded as *the* philosophical problem of the contemporary world.

2) Transformation of applied ethics from Dewey's point of view

What kind of perspective can we have when we bring Dewey's view of philosophy into contemporary discussions of applied ethics?

I think we can indicate at least one point immediately.

Many problems are discussed in discussions in the contemporary fields of applied ethics. However, as to the conception of technology, and especially as to how to conceive a relationship between technology and society, many discussions in this field seem to have a common presupposition that determines and restricts the scope of discussions. In many discussions, it seems to be presupposed that the developmental process of technology begins and ends independently of social and value factors, and that only after a technology has been completed is it related to social and value factors through the process of introduction, diffusion, and use of that technology. That means, in normal ethical discussions, the technology is considered to be a black box.

So long as the definite existence of a new technology is presupposed, and so long as the relationship between technology and society is discussed under this presupposition, problems that appear in the process of introduction, diffusion, and use seem to be unnecessary frictions, which should be avoided as much as possible. Indeed, the main point of discussions lies in the question of how we should change an organization and rules of a society in order to avoid such frictions. Or, the main discussion is on how we should control the process of introducing new technologies in order to avoid rapid and radical changes caused by them.

As to the relation between technology and society, opinions sometimes seem to be radically divided; divided for example between a determinist

view and an instrumentalist view. Between these two positions there is often hard opposition. While in the former view technology is considered to determine how a society is constituted, in the latter view a society determines characteristics of technology. As this conflict is sometimes connected to an evaluative contrast between pessimistic and optimistic views of technology, it appears all the harder. While, taking the optimistic view, one regards technology as a neutral means and considers that one can control and adapt it in accordance with social demands, the pessimistic view sees technology as a deterministic factor that cannot easily be controlled, so one should avoid introducing it as far as possible. In spite of this fundamental opposition, however, it is commonly conceived that technology and society are independent entities, and that they are related only externally. If we conceive ethical questions of how to solve problems caused by new technologies under this presupposition, we cannot but search for a compromise between the two extreme positions.

In sum, in traditional applied ethics, the task of ethics is generally considered to be related only to problems that are external to technology and not internal to it. Ethics without the ethics of technology are applied ethics in the traditional sense.

Don Ihde calls the role of philosophers and/or ethicians under this presupposition, the "Hemingway role," because this role is similar to the role of the ambulance corps to which Hemingway belonged in wartime, and which he described in his novel *For Whom the Bell Tolls* (Ihde 1999). From this understanding of the role of ethics, philosophers begin their work only after the battle has ended, and the conditions for their judgment have been determined, just as in the case of the ambulance corps in a real battlefield. In contrast to this role, Ihde emphasizes the importance of the "R and D role" of philosophers, which has meaning before the battle takes place, and is related to judgments about how to do battle. Philosophers must be involved in the development process of technology, and work together with engineers, especially in the design process.

The task of philosophy, which Dewey identified, can be interpreted exactly as this "R and D role," according to which philosophy can and must evaluate and refine ways of using technology, and contribute to a creative way of solving problems.

Applied ethics, from Dewey's point of view, are ethics in which technology plays a central role. In other words, from the Deweyan

perspective, technology is not to be considered a black box, but an open process to which even philosophy can have some influence.

Indeed, Larry Hickman, who develops Dewey's concept of philosophy, finds a role for philosophy in "reconstructing or tuning up technology," and says the following:

> In the broadest of senses, philosophy is the bearer of this responsibility because it includes as one of its disciplines logic, or the theory of inquiry. But inquiry, or deliberation, enters into every area of human experience where there is a pressing problem to be solved or difficulty to be overcome. This is no less true in the fabrication of shoes than in the construction of space shuttles. Of course, these tasks can be performed either poorly or well. Shoes can be made in the same mechanical way over many decades, or they can continually be redesigned and refined to provide greater cushion and support. And aerospace engineers can make "mechanical" decisions about O-rings that result in lift-off disasters, or they can perform the kind of inventive work that has allowed disabled spacecraft to return safely to Earth. (Hickman 2001, p. 24.)

Here, Hickman contrasts the mechanical way of solving problems with the creative way in which products can and must continually be redesigned and refined. This latter way of solving problems is the point Dewey repeatedly emphasized under the rather misleading title of the "instrumental theory" of knowledge and intelligence, and I think on this point Dewey's philosophy can make an important contribution to contemporary discussions in applied ethics.

a. Ethics as a method of inquiry

Firstly, the term "applied ethics" is misleading, because this is likely to make us think there were pure or basic ethics first, and it was only later that applied ethics could come about. However, according to "instrumental theory" the essential character of ethics is to be found in the process of application in a concrete situation and not in the task of justification that is independent of application. The main task of ethics does not only lie in the formulation and the foundation of rules and norms, but rather in the clarification of the question of how to make and use such rules and norms.

> Morals are not a catalogue of acts nor a set of rules to be applied like drugstore prescription or cook-book recipes. The need in morals is for specific methods of inquiry and of contrivance: methods of inquiry to locate difficulties and evil; methods of contrivance to form plans to be used as working hypotheses in dealing with them. And the pragmatic import of the logic of individualized situations, each having its own irreplaceable good and principle, is to transfer the attention of theory from preoccupation with general conception to the problem of developing effective methods of inquiry. (Dewey 1988a, p. 177.)

The need for morals is nothing but the need for inquiry. What we expect from an ethical discipline is not an explicit rule but a *method* to solve problems in each concrete situation.

Surely we cannot neglect the significance of the task of formulating an explicit rule or norm in various fields of applied ethics. Explicit norms and rules help us to understand and evaluate a concrete situation, and to guide our conduct to solve a problem. However, we should not forget that such norms and rules are *instruments* in the sense considered by Dewey. That means rules remain hypothetical, and must be constantly tested, corrected, and transformed in the process of their application.

If we forget this point, we become "mechanic, rigid, and dogmatic," instead of "free and flexible" (Dewey 1988a, p. 176); as the result of which the possibility of mistakes increases, and we are likely to overlook dangerous factors and make a decisive mistake.

b. Creative interaction between means and ends

Secondly, to regard ethics as a method, and respect its application process in a concrete situation, means to respect the results of applying ethical judgments. However, this does not mean pragmatic ethics are a kind of consequentialism in the narrow sense of the word. Dewey admits, for example, the significance of utilitarianism, but criticizes it severely, as it still presupposes a fixed, final, and supreme end and in it "the acquisitive instincts of man were exaggerated at the expense of the creative" (Dewey 1988a, p. 183). Hickman describes these circumstances in the following way: "Productive pragmatism focuses on outcomes without suffering the defects of popular forms of consequentialism, and it

advances the view, which it claims is derived from technological experience, that the norms of technology are produced as by-products of technological activities themselves, and not introduced from the outside" (Hickman 2001, p. 181).

Not only do instruments and means belong to the process of continuous transformation, but ends and purposes also belong to the same process. An application process is nothing but the process of this interaction between ends and means. In Dewey's view of ends and means we can find a radical criticism of the traditional concept of teleology. "The end is no longer a terminus or limit to be reached. It is the active process of transforming the existent situation" (Dewey 1988a, p. 181).

This sentence is very important, but is not easy to understand. Considering the meaning and the scope of Dewey's criticism, I think this sentence is to be regarded as an expression of a kind of Copernican Revolution in the field of teleology. According to Dewey, it is not because we have a definite end that we transform the existent situation in order to reach it, but because transforming the existent situation itself is an end, we set some end (end-in-view)! This is a little confusing, but only in this way can we understand his problematical sentence: "Growth itself is the only moral 'end'" (Dewey 1988a, p. 181). If it should be something that has intrinsic value, it is a creative transformation itself.

If we follow Dewey's thesis, we cannot presuppose naively accepted values as definite invariable ends, and use them as criteria to evaluate problems caused by the intervention of new technologies. For example, if some new technological form of intervention into a reproduction process or a death process is invented and used, we cannot judge it absolutely on the basis of traditional values of *nature* or *health*. What is natural and what is healthy are dependent on technological capability, and when there are several possibilities of technological interventions, we cannot judge absolutely which is best, but we can only judge that one is better than the other on the basis of each condition of technology and society.

c. Evaluation in the long run

Thirdly, although we admit that an application is necessary for judging ethical rules and values, it does not mean that the judgment can and must be made within a definite time limit. To the contrary, Dewey indicated repeatedly the danger of a hasty judgment. We must be careful not

to "take short views and sacrifice the future to the immediate pressure," and need "careful scrutiny and prolonged development" of means and instruments (Dewey 1988a, p. 154, p. 165).

This lesson of Dewey concerning how to evaluate tools is especially important when it comes to the problem of how to understand the meaning of the instrumental theory of knowledge correctly. If one hears the expression "instrumental theory of knowledge," one is likely to understand that Dewey claims that knowledge must be connected to some utility that has some particular purpose. However, the contrary is the case. Dewey very impressively expresses the essence of the instrumental theory of knowledge in the following way:

> It is one thing to say that all knowledge has an end beyond itself, and another thing, a thing of a contrary kind, to say that an act of knowing has a particular end which it is bound, in advance, to reach. Much less is it true that the instrumental nature of thinking means that it exists for the sake of attaining some private, one-sided advantage upon which one has set one's heart. Any limitation whatever of the end means limitation in the thinking process itself. It signifies that it does not attain its full growth and movement, but is cramped, impeded, interfered with. The only situation in which knowing is fully stimulated is one in which the end is developed in the process of inquiry and testing (Dewey 1988a, p. 164).

In this way, we have reached an image of applied ethics that is very different from how it is usually understood. According to this image, problems in applied ethics, especially problems concerning the ethics of technology, should not be considered problems we encounter in a common project whose purpose and time limit is determined at the outset. When we deal with problems in applied ethics, rather, we must begin an inquiry, producing and developing both means and ends, without presupposing and persisting with a given purpose and time limit. In this sense, the role of philosophy in connection with the development of technology in Dewey's interpretation can be regarded as a kind of "R and D role" in contrast to the "Hemingway role," but it is also necessary to consider that the "R and D role" in Dewey's sense is considerably different from that understood in the usual sense.

3) Creativity of technology and the difficulty of prognosis

Following Dewey's point of view, we have come to understand a positive and creative role of philosophy in the task of applied ethics.

However, it is exactly here that we encounter a difficult problem. If philosophers try to follow the Dewey's point of view, and take the creative character of technology seriously, it seems that they fall into a kind of dilemma.

On the one hand, if philosophers take the creative character of technology into consideration, it is not sufficient for them to take a "Hemingway role," and it is necessary for them to take an "R and D role."

On the other hand, if philosophers take an "'R and D role." and begin to work together with engineers, it seems that philosophers cannot evade the fundamental difficulty of making a prognosis.

Ihde calls the latter difficulty "the philosopher's prognostic antinomy," and describes it in the following way:

> The antinomy can be stated simply: if philosophers are to take any normative role concerning new technologies, they will find from both within the structure of technologies as such, and compounded historically by unexpected uses and unintended consequences, that technologies virtually always exceed or veer away from "intended" design. How, then, can any normative or prognostic role be possible? (Ihde 1999, p. 45.)

Indeed, as Ihde indicates, we have enough evidence showing various unintended consequences brought about by the creative process of technology. The developmental process of Internet, telephone, or automobile is a well-known case that is positively evaluated. As a negative case, we can find many examples that Edward Tenner characterizes with the expression "things seem to be fighting back" (Tenner 1996). Among all of them, disastrous accidents in big projects such as those related to the space shuttle or atomic power remain conspicuous in these cases.

How is an ethical action possible if we admit such uncertain and unintended consequences as essential factors of a technological action? How is the concept of responsibility possible if everything in the future seems

to be so uncertain?

Ihde formulated several heuristic suggestions as "a set of prognostic pragmatics:" 1. Avoid ideological (utopian and dystopian) conclusions. 2. If any negative effects begin to appear, amplify these and investigate immediately, err on the side of early caution. 3. Enhance alternatives through multiple trajectories. 4. Design use experiments with non-expert and different users (Ihde 1999, p. 50f).

Here, I would like to add one more heuristic suggestion, which the Japanese historian of technology, Tetsuro Nakaoka, proposed as an essential principle of the ethics of engineers. Nakaoka regarded the essential character of technology as an "application of 'the unknown'" and indicated that the most important responsibility of engineers is "to detect symptoms that appear from the unknown sources, and respond to them promptly" (Nakaoka 2001; cf. Murata 2003b [chapter 7, this volume]).

As you can see, in these heuristics the emphasis is clearly changed from the accomplishment of various purposes to the avoidance of possible failures, from the quest for certainty to dealing with uncertainty. Perhaps you might have the impression that these heuristics are too negative, as they express neither a definite positive purpose nor an explicit rule that one must follow in order to achieve some purpose. Can we attribute a definite responsibility to actions that follow from these heuristics? If the answer is yes, what kind of responsibility is it?

In order to respond to such doubts or questions, and clarify the significance of these heuristics, we must again consider the significance of Dewey's contribution to the radical transformation of the concepts and background of traditional ethics.

As we have seen, according to Dewey, the essential role of ethics is not to be found in a formulation or a foundation of an explicit end or norm, but rather in a method for concrete inquiry, in which ends and norms must be constantly modified and refined. Above all, the most conspicuous aspect of Dewey's thesis was that if something is inherently valuable, it is a creative transformation itself.

In this Deweyan perspective, the above heuristics have sufficiently ethical meaning, as far as they are helpful to respond to hidden dangers, transform given means and ends, avoid decisive mistakes, and solve concrete problems. That means, in spite of the absence of a definite and given end, we can attribute responsibility to such a creative transforming process by following these heuristics. In this sense, the significance of such heuristics, as we have seen above, can be clarified only under the new background of ethics developed by Dewey. And, it is exactly in this point that we can admit one of the most important contributions of Dewey's philosophy to contemporary discussions on applied ethics.

2. Technology as a problem —implications and scope of Dewey's point of view

In the above discussion, we have confirmed Dewey's important contribution to contemporary applied ethics, especially to the ethics of technology. On the other hand, as to the role and the meaning of knowledge and technology, I think we cannot neglect the ambiguous character that is always attached to the Deweyean perspective. In the following, I would like to focus on this aspect, in order to examine the implications and the scope of Dewey's point of view.

One of the characteristics of Dewey's philosophy is a kind of contextualism. Dewey did not propose his philosophical thesis without taking the contextual condition of its validity into consideration. When he criticized the traditional conceptual scheme of ethics and proposed a new one, he indicated that the validity of the latter is dependent on the historical condition. According to Dewey, the new conceptual scheme of ethics he proposed has become possible only under contemporary conditions brought about by the development of technologies.

For example, when he takes up a critique of the notion dominant in the classic philosophic tradition, i.e., the notion that thought apart from action can warrant complete certitude, he does not forget to point out that such a critique raises a question as to whether the social and material background on which the classical notion seemed plausible has not already been transformed. Dewey said: "It [the critique against the notion in the classic philosophic tradition] raises the question whether mankind has not now achieved a sufficient degree of control of methods of knowing and of the arts of practical action so that a radical change in our conceptions of knowledge and practice is rendered both possible and necessary" (Dewey 1988b, p. 29).

According to Dewey, just because we have reached a new historical stage

caused by the development of science and technology, it is now possible and necessary for us to have a pragmatic concept of knowledge and ethics.

This is a very important self-reflexive perspective, which guarantees the consistency of Dewey's philosophy. However, is Dewey's diagnosis of the contemporary status of knowledge and technology self-evident? Have we really already achieved "a sufficient degree of control of methods" of knowledge and technology in our contemporary world?

As to this point, I think we cannot neglect many other alternative views, which are contrary to Dewey's diagnosis. In the following, in order to examine the implications and the scope of Dewey's view, I would like to broaden our perspective a little further, and take up two other views of our contemporary situation.

1) Heisenberg's ship

In the article "A picture of nature in modern physics" ("*Das Naturbild der heutigen Physik*") Heisenberg emphasizes that the attitude of modern people to nature has been fundamentally changed. According to Heisenberg, this change is important not only for natural scientists but also for philosophers, artists, and others, because it is related to a radical change in our way of being in every realm of our lives.

Firstly, Heisenberg points out that quantum physics has brought about a revolutionary change concerning the theory of knowledge. According to Heisenberg, the picture of nature in quantum physics suggests that the traditional concept of objective reality, and also the concept of knowledge that is closely related to this concept of reality, must be abandoned.

> What we can speak of as a picture of nature in the exact natural science of our time is no longer an image of nature, but rather an image of the relation between us and nature. The old differentiation of the world into an objective process in space and time on the one hand and the mind, in which the process is mirrored, on the other hand, i.e., the Cartesian distinction between *res cogitans* and *res extensa* is not appropriate as a starting point to understand modern natural science. (Heisenberg, 1955, p. 21.)

Here, Heisenberg considers the theory of quantum physics to be a main element that has brought about the new picture of nature, but he

does not say that the new physical theory is the only element. What Heisenberg especially emphasizes is the role of technology. Contemporary technologies bring about a new situation on the earth, in which we cannot find *nature* in the proper sense of the word, but only an artificially changed *nature*. The world on the earth is now constituted not of nature but of artifacts. "For the first time in history, human beings face only themselves on this earth"(Heisenberg 1955, p. 17).

According to J. S. Vico, human beings can understand what they themselves have made better than any other objects. If this thesis of Vico is correct, and if our present world is mostly constituted of what we have made, then we should be able to say that we are in a position to understand the world better than at any other time in history. However, according to Heisenberg, the contrary is the case. In their long history until recently, human beings made progress by changing those aspects of nature that were out of the control of human beings to create a controllable region, and conquer it. But, just when we have realized this purpose, we have fallen into a perplexed position in which we find no way to achieve further progress, and encounter a limits to progress, because the target of progress has disappeared. Far from making the world fully understandable, we find ourselves in a situation without a guide to provide orientation in our lives. Heisenberg compared this difficult situation of ours to that of the captain of the following ship:

> The ship is built by very thick steel and iron. They are so thick that the magnetic needle of a compass points not to the north but to the iron mass of the ship itself. Using such a compass we cannot reach a definite destination. The ship goes around in circles or wherever winds and currents lead it. (Heisenberg 1955, p. 22.)

Heisenberg used this metaphor in the middle of the last century, but I think it is not only still meaningful now, but it has become much more significant today.

Just as various environmental problems have clearly demonstrated in the last decades, the problems and the dangers we are now encountering come not from a wild and uncivilized nature that is independent of us, but rather from what we have made ourselves. In spite of all the accomplishments that have made our lives safe and stable, or rather just because

of all the accomplishments that have made our lives safe and stable, we have created many problems and dangers that we cannot easily conquer and control. Not nature but we, human beings, are now the origin of dangers and problems. If the origin of problems and dangers we are now encountering is to be considered ourselves, we can never get rid of difficulties, as it seems that the more we try to get rid of difficulties, the more difficulties we produce correspondingly. How can we then get rid of this perplexed situation? How can we find a new orientation in this situation?

Dewey gave us a very clever answer exactly to this question. As we have already seen, Dewey emphasized that new norms and new values come not from outside the relation between human beings and nature but rather from within it. That means only through the process of technological activities can we have a new orientation.

On the other hand, if the origin and the cause of problems we encounter include technology itself, we cannot but consider that Dewey's view of technology as an instrument for solving problems is rather one-sided. If we take Heisenberg's metaphor seriously and admit that the process of problem solving is necessarily a process of problem making, we must always consider the fundamental ambiguous and ambivalent character of technology. The growth that the development of technology brings us is not only a growth of stability and safety, but at the same time is also a growth of instability and danger.

I think it is only through this way of viewing technology that the heuristics we have seen above can have proper meaning in our world.

2) Hans Jonas' concept of new responsibility

When it comes to the problem of technology and ethics, it is Hans Jonas who clearly put the problem in a new dimension. According to Jonas, because we have overwhelming power from technology, and because our contemporary technological actions bring about results that exceed the traditional concept of the results of actions in multiple ways, the scope of the responsibility of human beings for their actions must be expanded correspondingly. Now, the possible object of responsibility cannot be restricted to within the realm of contemporary human beings, but must extend to future generations, and also to non-human beings that are threatened by the new power of technology. As a result, we will have new ethics.

> Let me repeat: the duty we talk about has become apparent only with the threat to the subject thereof. Previously, it would have been senseless to talk about such things. What is in jeopardy raises its voice. That which had always been the most elementary of the givens, taken for granted as the background of all acting and never requiring action itself—that there are men, that there is life, that there is a world for both—this suddenly stands forth, as if lit up by lightning, in its stark peril through human deed. In this very light the new responsibility appears. Born of danger, its first urging is necessarily an ethics of preservation and prevention, not of progress and perfection. (Jonas 1987, p. 139.)

In these sentences we can find some points with which we can supplement the Deweyan approach.

Jonas clearly sees contemporary technology not only as a problem solver but as a problem maker. On the other hand, precisely because technology brings us into a dangerous situation, it brings about new possible values to guide our technological actions. In this sense, we could also find here a kind of creative interaction between means and ends, but the interaction we find here has a character that is very different from that of Dewey.

What is most interesting in Jonas' view is that the object that is brought into a dangerous situation, and gets a moral meaning, is the background and the presupposition of all actions. The condition that there are human beings, and that there is life and a world for both, has never been put into question when ethical problems have been posed. Indeed, if there were no human beings, there would be no ethics either. However, it is exactly these self-evident conditions of ethics that are now brought into danger by the development of technologies.

That means contemporary technologies bring about a situation in which objects belonging to a different ontological level are made thematic and related in an ethical inquiry.

In fact, the central core of the various problems discussed in contemporary applied ethics shows this character. For example, nuclear waste from atomic reactors or the influence of genetic engineering and gene therapy are typical cases. In the case of nuclear waste, the time scale of

its change belongs to scales associated with natural history, not the history of human beings. It is entirely beyond the sight of human actions in the usual sense. In the case of genetic engineering and gene therapy, the technological actions concerning the transformation of genes belong not only to the level of normal actions of human beings but also belong to the level of the evolution of life, whose scale is beyond the scale of the normal actions of human beings.

Because of these circumstances in which different ontological levels intersect each other, the results of contemporary technological actions are so difficult to evaluate, and become fundamentally ambiguous. According to Jonas, it is exactly in these circumstances that new problems of ethics emerge. In this way, we can again find here the reverse of Dewey's perspective.

According to Dewey, because we have too little power to control the world, we are in an unstable and dangerous situation, and must make and use technological tools to get out of it. However, the contrary is the case in the contemporary situation. Because we have too much power, we are in an unstable and dangerous situation, and from this point of view we need new ethics.

We live now in a world of fundamental unpredictability and fundamental uncertainty from which we can never escape. In these circumstances, the principal question related to technology changes from the question of how to control and conquer uncertainty to one of how to live with inevitable uncertainty. How can we continue to live in a fundamentally unstable and dangerous world? This is the basic question in the background, on the basis of which we must always deal with various problems of the ethics of technology in the contemporary world. And, I think only from this perspective can we understand the true meaning of the "R and D role" of philosophers and the heuristics we have seen above.

Now, through these discussions, we seem to have come to a rather different view of technology and ethics from that of Dewey. However, as for the spirit of Dewey's pragmatism, I think we are not so far away. It was precisely Dewey who radically criticized the quest for certainty, and emphasized the necessity for patience and strength of nerve to remain in the real experiential world, in which dangers and uncertainties never disappear, and not to fly to a metaphysical world, in which alone perfect

stability and certainty can be realized.