Sketch of a historical essay for enabling comparison of Modern Science and Indigenous Knowledge

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1.

It is very difficult to compare Modern Science (MS) with Indigenous Knowledge (IK). This is because we encounter various problems that are considered unsolvable. For example, conceptually specifying what MS would or should be is a difficult problem on which philosophers of science have not reached agreement. Similarly, there are various problems in the study of IK as well. It is not so difficult, in a historical review of scholars' way of thinking about IK, for example, to see the aftereffects of the argument that arose in the philosophy of science (although, obviously, its main target is MS). Omura (2013) has indicated that the way of perceiving IK has changed from viewing it as "an uncivilized science" to considering it as "a paradigm of the understanding of the world with a value equivalent to MS." In such change of a view, we can see the influence of the paradigm theory for which philosophers of science influenced by Kuhn have advocated, and also the influence of the criticisms of a Whig interpretation of history. That is, although we may have intended to concern ourselves with the argument about IK, it may be said that we are in an argument over what type of philosophy of science to adopt, and that we have committed ourselves before we realize it. This condition makes the pursuit considerably difficult for those who are equally interested in both MS and IK—at least for me, as I am close to the traditional position of scientific realism.[1]

Some readers may have the impression that the abovementioned MS has only a narrower meaning than one generally recognized in the present. That impression is indeed my intention. If the possibility of comparing MS and IK is not felt as a serious problem, that is, because those who feel they are compatible presuppose from the beginning that there are common features between them. To be sure, for some scholars the intentional (i.e., conceptual) meaning of the concept of MS has considerably changed over the past 50 years. Sociology of scientific knowledge affected by the paradigm theory

[1] A brief word on my philosophical background: my philosophical position is closest to that of a group of philosophers of science in France in the first half of the 20th century. This group did not have so much international influence as to be highly conspicuous, but it would include Leon Brunschvicg, Gaston Bachelard, Ferdinand Gonseth, Jean Cavaillès, and Albert Lautman. In the postwar period, this position was carried forward by Gilles-Gaston Granger, Jean-Toussaint Desanti, Jules Vuillemin, and others.

of Kuhn, came to aim at the knowledge provided by MS from about 1970s onwards (e.g., David Bloor). In this context at least, it appears that the formula "MS = Techno-Science" (TS) came to be believed as an obvious thing. After the 1980s, the extension of the concept "MS" in this direction was radicalized more and more, in particular by the arguments of the Actor–Network Theory (ANT) represented by Bruno Latour. The intention of the concept "MS" has now swelled so much that the formula "MS = Techno-Science Network" (TSN) is established. The constitutional elements of the extended concept of MS include not only things that are within the classical concept of MS but also various things that do not appear to be concerned with a scientific theory: that is, "laboratory tools," "craftsman making laboratory tools," "air-conditioning system of the laboratory," "transmission system," "study team in pursuit of an experiment," "economic circumstances regarding the budget to maintain a study team," "the political situation concerning a budget, and personnel affairs," and so on. Although difficulties surely remain, it becomes possible to compare the extended concept of MS with IK, because the extended concept of MS, i.e., TSN and IK correspond to each other insofar as both of them are closely related with the socio-economic and belief systems of human beings, which is an important component of that system. Therefore, if we take at least a position like ANT, the prospect that we can symmetrically treat MS and IK will be realized, though Latour did not expressly indicate this.

However, such an easy prospect treats the problem of comparing MS and IK as simpler than it is. MS surely has a layer that can be understood as a TSN, but this does not necessarily mean that MS can be completely and actually identified with TSN. Rather, in fact, the layer that enables us to understand MS as TSN has been newly discovered, but this fact does not lead to the conclusion that we can ignore the progress of a classical argument about MS by the philosophy of science. If we can identify MS as TSN, we conclude that the various layers of understanding MS may be reduced to the simple layer of TSN. However, if we dispassionately consider the question, we notice that such a reduction is quite meaningless. With regard to the problem of making comparisons between MS and IK, this tempts us to believe that the understanding of MS as reduced to (and identified with) TSN is insufficient. It appears that even in the present, when some of us have come to identify MS with TSN, it is still necessary to demonstrate that the essential features of MS that have been clarified (and now still are being clarified) by the argument over the philosophy of science are functioning, at least, somewhat independently from the layer of MS that would be equivalent to TSN.

It is a considerable task for me to directly demonstrate this, because some people consider TSN as self-evident does not appear to make sense, since no one disputes the existence of TSN. Instead, to understand the complicated relationship among MS, IK, and TSN, I would like to demonstrate an historical fiction here. Although this historical fiction is surely a fabrication, it is not necessarily an entire lie. I would like to say that, at least, it has been concerned with the practical truth, since it makes comprehending the truth possible to those readers who have a certain vision. Such a trial, you could imagine easily, is encouraged by the practice of epistemology that can be ascertained in Foucault's *Madness and Civilization*.

2.

First, we start with the assumption that knowledge, information, cultures, institutions, and technologies are "natural kinds" just as much as animals and plants. Therefore, they are incessantly changing, whether this change is progression or retrogression. In other words, I am requesting that my audience (readers) take a position of quite extreme "naturalism" here. There are some benefits to adopting such a position. Among these, some of the obvious ones are as follows. For example, to consider "Greek culture," it is no longer necessary to identify the "essence" that Greek culture might have. Moreover, this position allows us to easily imagine that there are certain types of patterns that have a spatiotemporal unity in the midst of change and that interact with each other.[2] For the purposes of comparing MS and IK, this allows us to regard both of them as among the "natural kinds," or, in other words, as things that have been generated within a historical and geographical continuity.

It may appear that such a description is epistemologically and ontologically ambiguous. And indeed, such is the case. In other words, we do not know how to confirm that the viewpoint that understands IK and MS as "natural kinds" is true (i.e., an epistemological problem). In addition, it is not clear in what way they exist as such "natural kinds" (i.e., an ontological problem). Therefore, this understanding is intended to be a fiction. For the moment, I do not believe that I would like to make it any more than this. I would probably have to take quite a long voyage to create this into more than a fiction. However, I want to be satisfied that readers are motivated to go on the trip along with me now.

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[2] This position is mostly in agreement with Deleuze's ontological position as interpreted by Manuel Delanda. See the argument, in particular, about "individual singularity" and "universal singularity" in Delanda 2003.

Even so, it is necessary to answer at least the following question: when considering that "technology" is one of the "natural kinds," should we consider that the spatiotemporal whole that is itself called "technology" (i.e., the technology genus) is one of the "natural kinds" or not? The answer is no. It is an "individual technique" that is included within a "natural kind." It has, at least, an identical unity that is recognized, and it is transmitted and shared by engineers in its application. Such an identity here is not so rigid, but is based on the criterion derived from the following functional aspects. That is, when a certain unity is creating the parts of a certain interaction, something identical to the unity must have the ability to be substituted for the parts. For example, as long as technology creates something that functions as the tip of an arrow when combined with a bow, the technology will be considered as one that makes an arrowhead. Two or more technical types are included in one technology genus, as long as they can crossbreed with other types of technology, and if some of them can exchange and succeed each other. For example, the technology that creates bows and arrows was generated by crossbreeding the technology that creates an arrowhead with the technology that creates a bow. Therefore, the "technology" as "genus" will be the virtuality of fluid genealogy, and, borrowing the expression of Manuel Delanda, it will be an *abstract diagram* that is characterized by "universal singularity."[3]

3.

The facts of concern to us that have been confirmed by various research endeavors of archeology, history, and geography are as follows. Human beings have performed economic activity, containing not only the production activities of hunting and extraction, but also trade and physical distribution, before arranging linguistic institutions, legal systems, and political institutions that are based on it. In addition, human beings have possessed and handed down various technological knowledge used for these activities. The phonetic sign should historically precede the character symbols, because the latter is a result of abstraction of the former. Therefore, utterance behavior that makes it possible to undertake an economic activity historically occurred first, prior to writing behavior that enables one to start a legal system; the reverse is not possible. If the contrary were true, the character symbol string that records the generating of a phonetic sign might exist historically. That is, technology is, first, one of the "natural kinds" that must be considered in the continuous history of evolution and

[3] The philosophical argument regarding this "abstract diagram" is indispensable to the problem of a "natural kind." See Delanda 2012.

should start from such a historical time point, and more surely it is a genus called "technology" that consists of various "natural kinds" belonging to the technology genus. In other words, technology clearly has an archeological ancestor.

Let us move to the topic of a social system. In recorded history and before the present modern state organization, various configurations of monarchical systems have existed everywhere since a long time. However, simultaneously, as anthropologists have revealed, small-scale subsistence systems have also continued to historically coexist and exist even now, in spite of the existence of large-scale monarchical societies and modern state organizations. What is common to various social systems, whether they are a monarchical system, a modern state organization, or a small-scale subsistence system, is that they require reproduction of that social system. On the other hand, it is possible that the difference between them is the mechanism used for its reproduction. That is, each social system, which can create various configurations, is one of the "natural kinds" reproduced by itself. The social system is deeply connected with the mechanism (probably the minimum components of such a system are reservation of food, reproduction of people, and rest) of reproduction of human beings who are, obviously, an important constituent of the social system. Moreover, if a social system is minimally understood as a specific human group's reproduction system, it will be observable not only in human beings but also in many animal species that occupy various evolutionary and ecological positions, as clarified by ecologists. If that is right, the social system must have an ancestor in evolutionary biology, as long as it can be understood, at least, from the perspective of the reproduction of human groups.

From the viewpoint of the present, the range of meaning of the word "economy" includes not only the things involved in the reproduction of a social system but also the trade that consists of barter, the exchanges that are mediated by money, and even the capital that increases by itself. However, if "economy" is considered historically and archeologically, it is not necessarily right that the understanding articulated above has been valid from the beginning. Obviously, because trade cannot be seen in the social systems of animal species, we can consider the economy independent of trade that contains only the meaning of reproduction. In the ancient Greece era, "oikos," the word that provides the etymological basis for the word "economy," mainly meant the domestic economy that manages the reproduction of a family unit. To be sure, from the viewpoint of the domestic economy trade can be understood as what contributes to the minimum economy needed for the reproduction of a family unit. However, for the minimum

economic system things that are essential for trade, such as a route, market, and technology of exchange, will be made secondary. In that sense, we can consider that trade has been independent of the domestic economy, which is mainly concerned with reproduction. Similarly, we must be able to consider trade independently of money-based economies, because it is only recently that the institution of exchange based on money has spread around the world. Moreover, there is one more jump step between a money-based economy and pure accumulation of capital. The existence of such a jump can be detected in the serious conflict between physiocracy and mercantilism, and also in the strange fact that the gold standard has been believed in spite of its non-basis for a long time. As discussed later, one of the most important things is, after all, the shift to a money-based economy from barter. It must be recognized at this time that the subsequent step was prepared beforehand. Here we consider a trade network (a place, route, relationship, and the variety of institutions that conduct trade) as a "natural kind" in the same way that a social system can be considered as one of the "natural kinds." Then, we consider a trade network that undergoes, historically or geographically, generation and extinction as one of the "natural kinds" independent of the money-based economy that will eventually include accumulation of capital.

4.

Here we reconfirm the distinction between "natural kind" and "genus." Above, I supposed that we could consider a social system, a trade network, and a money-based economy as "natural kinds." Then, it is strictly each of these various social systems that belong to the category of "natural kinds," and not the "genus" that consists of these various social systems. That may confuse you a little. I intend to say that concrete social systems that have been progressively transforming but have stabilized spatiotemporally to some extent, for example the polis named Athens of ancient Greece, are members of the category of the "natural kind." If the extension of the concept "natural kind" is realized, you may think that eventually the distinction between individuals and species will be lost, and you would be right. The essential difference between an individual and kind is unnecessary. What is traditionally called an individual is something that is demanded by disregard for a system being maintained spatiotemporally. Supposing that all things are always in the linkage of an interaction and reaction spatiotemporally, both the identity observed in the species and individuals is understood only as a comparative delay and anticipation of the spatiotemporal affection that components of them may receive, that is, they must be discriminated only

in terms of their different speed of change. The individual called me occurs and changes at a relatively delayed, slower pace in contrast with the constant change of matter that constitutes a body. Change of a system and elements that constitute a system do not need to be uniform in speed. Rather, if the speed must be fixed, then the meaning of a whole or a unity is eternally lost. Therefore, in conclusion, the polis of ancient Greece is an individual, and simultaneously a "natural kind," which has the identity of changing relatively slowly by reproduction through the change of constituent elements in it (i.e., the human groups that are maintaining it). It may not be necessary to repeat that species themselves are nothing but individual-like things. However, the genus is not necessarily an individual-like thing just because the species are. Although species, social systems, and each technology all exist in a certain specific space-time, the genus does not have the identity that is based on such a historical series of actualities (energeia). Rather, the genus is something like a line of force inherent in the genealogy or a virtual diagram that consists of universal singularity as described above. According to M. Delanda, the genus is akin to the "abstract animal" that can become both the kind called a horse or a human being. Each of a social system, technology, and trade network represents one system as species = individual, and has the identity, which changes relatively slowly through the interaction of the elements that constitute it.

Let us then consider relations between these three "natural kinds." Since human social systems and technology are constitutionally able to have very deep relations, they can be almost indivisible in some cases. In almost all the social systems that exist, technology forms a part of it. Moreover, the technology side, for its maintenance, also depends on its association with a social system. In this sense, we may conclude that a social system and technology have a relation of symbiosis and co-evolution. Let us assume that, in a certain primitive social system, a systematization of the technology was advanced, aiming at accommodating properties of the surrounding environment and acquiring specific products for more efficient reproduction. Then, the relation of coevolution is realized between a social system and technology: technology will be refined and subdivided so that it may respond to the request of the social system, and on the other hand human beings who master, develop, and transmit such technology as it becomes progressively more complicated are reproduced with the social system. Moreover, a trade network develops by absorbing the surplus products produced in the highly developed social-technical coevolutionary system, and as a reaction to that, on the other hand, a trade network urges an acceleration of manufacturing technology for the social-technical system. Furthermore, a trade network encourages development of a

new social system, in which trade is essential for subsistence (for instance, ancient Phoenicia), and then, by a coevolution coupled with the new social system, a trade network enables further stable development. By aggregates of a social system and technology being formed in plurality, at a fixed distance, a relationship with a new difference occurs between the two aggregates (this distance is relative to the frequency and speed of connection realizable at the time). Further, by consuming this difference as potential, the trade network gradually progresses after the formation of social systems.

5.

Although many other factors should be taken into consideration to continue such a talk, some of them have already been highlighted by Deleuze and Guattari. To consider modern state society, we have to consider a monopoly of a "War Machine" by a state system, as they may highlight. Anyway, the affairs confirmed so far are as follows: each "natural kind" of a social system, technology, and trade network has formed mutual couplings and then has coevolved. Therefore, when seen from the present, they appear to be a single unity, but they were historically independent systems. And it was not necessarily determined beforehand that their combination would be the same as the present.

What is common between monarchical systems and modern state society is the following: to establish them, it is necessary to dissolve various small-scale social systems that the argument up to this point has premised and that the mechanism of reproduction has maintained itself. That is, it needs to compulsorily integrate what was previously a complete social system as part of a bigger monarchical or state system. Therefore, the birth of many monarchical societies is indelibly linked with the story of a foreign campaign. Therefore, as a result of the foreign campaign, a partial trade network is broken off from a bigger existing trade network and rearranged within the scope of the monarchical system. Further, the partial trade network deteriorates and is taken into the monarchical system as what enables concentration of the product of the culture into a central part of the bigger system. Furthermore, the same consideration is applicable to technology, because the relationship with a state apparatus always comes to be problematic.

What we have shown by the above considerations is as follows. First, technology, social systems, and trade networks have been equally "natural kinds" with the history of evolution since prehistory. And, in the course of human history, through coevolution,

they gradually become intricately involved with each other and, eventually, no longer separable. Second, in the story mentioned above, MS has not appeared anywhere. Although the problem of whether we can consider MS as a "natural kind" and how to characterize the evolutionary history of MS persists, it will be clear that MS is a newer "natural kind" than the three "natural kinds," which I have so far described, if we can consider MS as a "natural kind."

Scholars are not necessarily in agreement as to where we can place the historical beginning of MS. However, we can at least see its continuity from the early stages of Greek philosophy, and especially the continuity from Greek mathematics that Pythagoras represents and from Parmenides' criticism. Although there may be no agreement as to where we can recognize the beginning of MS, most researchers may agree that it is after the time of Galileo, that is, at the end of the Renaissance and beginning of the first stage of modernity, that the influence of MS comes to the surface. What is important here is not to insist on finding the beginning of MS, but rather to confirm that MS obviously emerged only after social systems, technology, and trade networks had sufficiently developed. The appearance of MS presupposes the coupling of those other "natural kinds," and not the reverse.

6.

The problems of how to understand an essential characteristic of MS and how to elaborate such an understanding should be considered only after we have passed through a specific examination of the history of science. However, based on the results established up to now and to clarify the difference between MS and social systems, technology, and trade networks, I would like to present one possible answer in a large frame: it is "abstraction." Since specifying the concept of "abstraction" is a serious problem philosophically, it is difficult to answer this problem in itself. For example, the problem will evoke the traditional controversy between empiricism and rationalism. I would like to limit myself to giving the minimum determination of "abstraction" as follows: "abstraction" is an action that extracts an important pattern from what has been observed in experience. Simultaneously, an "abstraction" is the pattern itself that has been separated from the concreteness of experience and has been regrasped as itself. Each philosophical position becomes clear by responding to a series of problems individually as follows: whether an idealization intervenes between pattern sampling and regrasping as itself; if it does not do so, whether the pattern is inherent in things that are experienced, or whether the pattern is a thing showing the inclination in the

heart of the human being who experiences it; on the contrary, supposing that an idealization intervenes, how can the intervention be justified? Therefore, I would like you to understand this minimum determination, which I have shown here as being very elementary, before such a philosophical divergence. Anyway, without the "doubleness" of "reality" and "theory" that is caused by "abstraction," "accordance" between them does not occur either. In addition, if there is no possibility of "accordance/discordance" between them, there will be no "prediction" by or "modification" of theory either. Furthermore, the possibility of the evaluation "true/false" itself will not arise. Therefore, the possibility of "discordance" between "theories" ("levels of abstraction"[4]) and "reality" is fundamentally included in "abstraction." This "discordance" may be understood as a different expression of what Popper called "falsifiability." More positively, following a view held by the scientific epistemology of France in the first half of the 20th century, it concludes that MS is autonomous generation by the eternal process of self-revision and self-conquest that makes the ineluctability of this "discordance" a motive power.[5]

The auto-generative system of MS that makes the "discordance" between "theories" and "reality" a motive power is closed by itself. No social system, technology, or trade system can directly participate in the autonomous system. Therefore, in the analysis of this autonomous system, the combination of modern science and these external things does not become a true problem. It is so, even though "modern science" obviously presupposes the history of these "natural kinds." This closedness is one of the essential features of MS. However, when we examine MS once again from the perspective of natural history, we can notice that it is deterministically concerned with a different phase, as it mixes with other natural kinds. It is technology that mediates between MS and other natural kinds mentioned above. Or it is rather individuation of an abstraction by the technology that has been affected by MS.

7.

Examples of the relationship of an abstraction (theory/reality) and individual examples of technology are as follows: recording of music to a compact disk and a Fourier transform, a liquid crystal television and vector field analysis, a telephone call by a mobile phone, and electromagnetic field theory. In these, the abstraction is individuated through the technology for realizing the individual element. It is necessary to arrange the relation between technology and individual elements. A Fourier transform is a type

[4] See Floridi & Sanders 2004 and Floridi 2004.
[5] See Cavaillès 1947.

of expression for function conversion, used to change a complicated periodic function into the sum of simple periodic functions. The wave motion sampled from sound is changed and coded by this means, and a digital recording on a compact disk is attained. In this process, technology is concerned in two or more instances; the means of applying a Fourier transform to an actual sound source, the means of recording it on a compact disk, and the means of reproducing such a compact disk. In the above case, it is the sum of these three instances that is called the technology for realizing an individual element. Through this whole, an abstraction called a Fourier transform is embedded into an individual element called a compact disk as the process of applying a Fourier transform to a sound source. That an abstraction is embedded into an individual element means that the individual element could not maintain the identity as itself, if it were not for an abstraction. Therefore, even if it is a technical product, what is not embedding an abstraction is not regarded as the individuation of an abstraction. For example, consider a canoe. Even if hydrodynamics is able to identify behavior of a canoe as its subject, the technology that individuates a canoe is not embedding hydrodynamics into a canoe. If we can think in this way, the risk of considering all technology to be technical individuation of an abstraction will disappear (some delicate borderline cases will remain, of course). And this abstraction individuated technologically is mediated by the individual technical element, and it will create the same result anywhere in the world, if that theoretical condition is fulfilled. It is the omnipresence and universality of an abstraction that makes this possible, and we can consider that such omnipresence and universality are the greatest features of the technical elements, into which MS is embedded.

To be sure, the distributivity (or acceptability) of an application is realized in the repeatability of an individual technical element. However, when it includes "calculation," or, more generally, when it includes a "control," even if it is some type of easy thing, it becomes indispensable to place above the process of manufacturing the individual element some "abstract notion." For example, the human being without the abstract concept of any numbers cannot make an abacus from wood. Even if it is difficult to imagine a human being without the abstract notion of a number, to imagine a human being without the abstract notion of a Turing machine may be easy. Although the human being may be able to make an abacus by following another's example simply after watching that person, he could not make a CPU from the beginning by following another's example. This difference comes from the individuation of an abstraction, and the abstraction that is inherent in an individual technical element does not pose the

problem. In mere technology, distributivity is guaranteed by the loose symmetry between the application and a manufacture. On the contrary, in the technical individuation of an abstraction, such symmetry hardly exists, and the distributivity is principally recognized only in the application (or a simple job like a combination of modular). And the omnipresent nature contained within the manufacture of an individual technical element is guaranteed by the universality of an abstraction, independently of distributivity. The economic merit of the technical individuation of an abstraction (for example, as an industrial commodity) arises from this point.

Let us try to relate this individuation of an abstraction to the understanding that every experiment is theory-laden. It will turn out then that the role that technical individuation of such an abstraction has played in the progress of modern science is quite large. For example, measurements by an optical telescope, based on optical theory, supported the development of astronomy. Similarly, measurements made by the electron microscope, based on electronic theory, supported the development of quantum mechanics or chemistry. Thus, the technical individuation of an abstraction made clear the necessity for an "experiment" of modern science, that is, it created a new disagreement, which the doubleness of "theories" and "reality" makes possible, and that in turn made it possible to adjust or change theory. However, it is not possible to reduce such a situation to the simple stereotyped relation that technology made science possible. MS enabled technical individuation of an abstraction, and the power that makes such a thing possible was included in technology. Therefore, such a thing was realized, and MS made it possible to begin to recursively reveal the disagreement between "theories" and "reality" that MS contains within it, through its technical individuation. And by this means, MS demands further self-revision and self-conquest.

8.

I would like now to make further observations about the concept of "money-based economy," which is also a product of both a certain kind of "abstraction" of trade networks and its technical individuation. In this sense, it is imagined that a "money-based economy" is equipped with some characteristics just like the features of MS. For example, "money-based economy" individuates as money the time difference between people with money and those who do not have it. Thus, the relation between production and production of production, and the relation between production and consumption become, respectively, asymmetric. Moreover, the "money-based economy" is connected with the economic value that arises from the asymmetry between

manufacture and application that is included in a technical individuation of an abstraction. Then, finally, we can recognize the realization of a "TSN" similar to the present one. And we can suppose that the social system made it possible to re-systematize a center and a limb of itself, in other words, the state apparatus as a whole and its imperfect partial systems, by being connected with, at least, these two asymmetries. A closed autonomous social system already like a subsistence system is disassembled there. And then modern state society, where reproduction becomes possible only when connected with a more common state apparatus, is realized.

Therefore, in a time such as the present age, for IK to sustain, it must be indivisibly connected with the reproduction of a social system that is interacting with IK. This is because to separate IK from reproduction of a social system and unify it as a "TSN" is an important strategy of a state apparatus for disassembling the social system with which IK was once connected and then is reorganized within a connection to the modern global society. Such a situation in IK may be akin to that of biological species that can continue to exist only together within their own ecological environment.

9.

Therefore, to compare IK with MS, it is indispensable not to directly compare the two, but to symmetrically compare the modern state system, which depends on the "TSN" for reproduction (and also the money-based economy) that integrates MS into itself, and the existing local subsistence system that inseparably interacts with IK for autonomous reproduction. Moreover, we have to elucidate both mechanisms of these systems reproducing themselves (Mr. Omura calls this "Mundi-Machina"). This is one conclusion of today's argument. In addition, I would like to emphasize the following once again: when we want to understand the side of "abstraction" that TSN includes as its essential feature, the traditional but ongoing study of MS by the philosophy of science will be indirectly but certainly concerned. The difference between a TSN and an older, natural kind of mere technology will become ambiguous if we do not recognize this point, and moreover the difference between the small-scale subsistence system, which is more closely connected with the technology such as an older "natural kind," and modern state society, which incorporates a TSN as an indispensable element for its reproduction, will also become ambiguous.

Having elucidated the fundamental mechanism (or, at least, having outlined it), we must examine some concrete subjects. I end my discussion by raising some of these

concrete subjects for consideration.

- Are a migration and reorganization of knowledge (MS or IK) to both sides possible? In particular, is it possible on the TSN side to transplant some of IK as a significant thing (as what demands a certain partial or overall modification) inside TSN?
- On the other hand, some fragments of a TSN can be transplanted into a certain subsistence system that contains IK with the mechanism of reproduction being maintained. If this is possible, how does it happen?
- If the abovementioned situations are possible, to what extent are they possible and where is the limit?
- Is it possible to realize reproduction of a new kind of social system, which reuses the fragmentary effect that is separated from the TSN (for example, as Mr. Yamazaki showed an ideology such as the feeling of appreciation in a donation between donor and recipient)?
- Is it possible to strengthen reproduction of the existing subsistence system by a fragment of a TSN or its effect?

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