

Terada Torahiko, a Physicist and a Haikai Poet

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Abstract: Terada Torahiko is known as a scientific essayist in Japan, but hardly anyone knows he was a haikai poet as well as a physicist. According to him, haikai poetry and physics are two different ways of conceiving Nature, both valid and perhaps complementary to each other. Seeing his research in physics looking for regularities in apparently irregular phenomena in everyday life, we may say his *haikai* spirit is manifest there and that he was pioneering a new science such as the one developed later by Ilya Prigogine. His association of *haikai* haikai poetry and Freudian interpretations of dreams leads us to rethink the relation between science and literature. This paper examines Terada's poetics as well as his research in physics in order to see how one can associate the Two Cultures separated from each other for such a long time.

Akira KOMIYA

Terada Torahiko, a Physicist and a Haikai Poet

Terada Torahiko (1878-1935) is known in Japan as a scientific essayist more than anything else. His essays on science have been quite popular; they are still recommended reading at school. Although written simply and clearly, they are not meant to popularize science but to present a genuinely scientific thinking proper to the author.

What Terada presented there is his particular way of seeing universe that many of the scientists of his time ~~did~~ might not have shared. There, he proved to be a scientist with quite an original point of view, which is found for example in the following paragraph from the essay titled "Six Pieces on Spring" (Haru Rokudai, 1922):

For the moment, we do not know when we will have a bridge between life and matter. Specialists in biology and genetics are running after life in tiny cells. They are even making efforts to find a chain between parents and children in a chromosome. As for physicists and chemists, they are rather seeking life in a system of electrons existing in an atom, the tiniest element of matter. Among them, there are some who believe even in 'personality' in a tiniest component of an atom... It is true many scientists are making incessant efforts to explain life in terms of physics and chemistry, but I know many of the non-scientists hate science without knowing it, and that they will curse the day when a convincing explanation of life in terms of matter comes out. As for myself, I will wait for that day as a happiest day because we will begin then to know the marvel of real life. I am convinced no material explanation of life will kill life; on the contrary, it will open our eyes to the essence of life that is filling the world of matter. (Terada 2:137)

Interestingly enough, he affirmed that no physico-chemical explanation of life that scientists provide could destroy the animistic vision of matter, but on the contrary, could recover it. This view of his must have been shared by few scientists of his time; even today, there must be few who would share it. For or against the modern civilization, they generally believe the mechanistic vision of modern sciences has eliminated the animistic vision of the world.

Indeed, Terada's view according to which the most primary form of human thinking could be revitalized by scientific discoveries on life was quite rare at his time. He advanced the theory Claude Lévi-Strauss put forward in *La pensée sauvage* (1962) or the biological one proposed by Jacques Monod in *Le hasard et la nécessité* (1970). Only from today's point of view, can his view be appreciated.

Many Japanese know of Terada as a physicist who wrote essays for the lay readers. However, hardly any knows he was a *haikai* poet. *Haikai* is a particular way of seeing the world and poetry, out of which was born *haiku*, a shortest form of poetry not only known to the Japanese but also to other peoples. Terada was very fond of writing *haikai* poems.

This means he was not really fond of composing *haiku*. He preferred *renku*, a collective game in which several persons play together to make up a long poem by linking verses one after another. His taste was against the modern tendency in which composing *haiku*, a short poem independent from social and traditional context, was much more appreciated. He preferred remaining loyal to the tradition in which the collective and the interactive were fully respected.

Needless to say, the collective does not mean uniformity. Each participant of the game can feel free, exchanging their points of view under certain rules. There is no winner or loser; there is no planning or preparation, either. The spontaneous and the aleatory count as much as following the rules.

Let us have a look at one of the *renku* Terada made with his friends, Komiya Toyotaka and Matsune Toyoyo. The whole poem being too long to quote, we will see only the first six lines of the work we find in "Astringent persimmons" (Shibugaki, 1927):

Matsune: From tomorrow on, I'll be going far into the north,
wet in the spring rain
Komiya: Yet there remains snow on the mountain in the west
Terada: I've already come to a village to see winter daphnes frozen
Matsune: The conduits in the garden have no entrance as usual
Komiya: An owl on a tree is calling at the moon of dawn
Terada: Happy though with fermented soybeans on the porridge
in this chilly morning. (Terada 11: 220)

The collective work continues, but the quoted part is enough for us to see how it works. Each composer, on receiving the previous verse, has to make another one, succeeding and renewing the

atmosphere. It is like movie scenes that develop continuously in which sequences are expected to be as natural as possible. As a matter of fact, he explained it by way of comparison with movies in his essay "The Art of Movies" (Eiga Geijutsu, 1932).

Now, what was *haikai* to him? Toward the end of his life, he affirmed that it was the essence of Japanese vision of Nature comparable to physics he considered as Western vision of Nature. Although they were two different approaches to Nature, he found something in common between them and appreciated them both.

The fundamental difference he found between the two is expressed in "Haiku no Seishin" (Spirit of Haiku, 1935) in the following manner: "Different from the Westerners, the Japanese have not treated Nature as object. Japanese way of viewing Nature is not scientific nor is it materialistic. The Japanese have conceived the world as an organic whole in which human beings are not separated from Nature at all" (Terada 12: 133). He saw the Westerners treated Nature as an object whereas the Japanese immersed themselves in it. Both ways were valid to him and he practiced them both.

Now, if he was a physicist, his vision of Nature must have been westernized at least to a certain degree. If he kept holding the traditional vision of Nature as a poet of *haikai*, how did he manage the two visions without falling into contradiction? Was his mind split between the two? Or did he find a suitable way to combine them?

~~Before answering~~ To find an answer for this question, let us have a look at Terada's physics. First, we have to say that his physics was "old-fashioned" because he did not seem to take into account the drastic conceptual change brought about by Einstein's relativity theory and quantum physics. His familiarity with the classical physics based on the objectification of Nature may have prevented him from having an up-to-date notion of physics.

This being said, we also have to say that he was as an eminent physicist in his time, not only in Japan, but even in the West. He wrote more than 200 papers in English, some of which were published in the prestigious journal *Nature*. He was a qualified scientist.

Terada began to take interest in physics when he was a high school student. Almost at the same moment, he was initiated to the world of *haikai* poetry. There in Kumamoto High School, he met a teacher of physics named Tamaru Takuro who introduced him to the world of science, and a teacher named Natsume Kinnosuke, the future well-known writer named Soseki, who revealed him the world of English literature and *haikai* poetry. His encounter of the two eminent teachers left a lasting mark on his life.

What attracted him the most of physics was its systematic view of Nature that he found in *haikai* poetry in another form. Although different from each other, those two fascinated him alike just because of their being systematic. We can easily accept that physics is systematic, but it is not so easy to see the same nature in the world of *haikai*.

As we said earlier, Terada was not enthusiastic about the theoretical advancement of physics of his time. It is surprising he was little attracted by Einstein's relativity theory or quantum physics. What interested him of physics was rather to find convincing explanations of quotidian phenomena such as weather changes, people's crushing against each other at a train station in a rush hour, etc. In those phenomena that appear irregular and unexpected at first sight, he was eager to discover regularity and constancy.

His physics research work can be divided in two periods: those made before his stay in Germany from 1908 to 1912, and after that period. The general tendency of the first period can be summed up in terms of "fluctuation" and "undulation." His doctoral thesis titled "Acoustical Investigation of the Japanese Bamboo Pipe, Shakuhati" (1908) just reflected the tendency. There he tried to formulate the apparently irregular sounds the traditional musical instrument produces, the sounds that does not correspond to the scale of Western music.

The aesthetic sensation and the emotion he expressed in *haikai* poetry receiving the stimuli from the outer world were the very motive power of his scientific investigations of the first period. He worked on the same kind of phenomena from two different angles, out of which he produced scientific achievements and *haikai* poems respectively.

As for the second period after his stay in Germany where he tried to update his inquiry of physics, his vision of Nature still continued to be manifest although we notice that it became more theoretical. The first major work he achieved after Germany was on x-ray diffraction and crystal structure, which shows his interest in aesthetic phenomena in the natural world as well as his zeal to catch up with the Western physics of his time.

X-ray diffraction was in vogue as a scientific topic in Germany at that time. He was certainly influenced by the trend. However, he did not share with his German colleagues the interest in analyzing

x-ray to conclude that it was a kind of electromagnetic wave. His interest remained more with the beautiful structure of crystal that one could discover through x-ray diffraction.

This does not necessarily mean his studies of x-ray diffraction proved to be inferior to those of others physicists. He published two articles on the subject in *Nature*, no. 91 (April 1913 135-136 and May 1913 213), almost at the same moment the Braggs, the Nobel Prize laureates Father and Son, published theirs on the same topic in the same magazine. The reason that the Braggs became winners of the prize while Terada's name as a physicist is largely unknown today is that the latter did not continue pursuing the same subject matter to the end, nor did he take interest in expressing his view in mathematical formulae as the former did.

Indeed, Terada's interest in scientific topics varied as easily as meteorological phenomena or seasonal alternations. This changeability is understandable to those who know the fundamental themes of *haikai* poetry are meteorological or seasonal. His interest moved in fact from the question of x-ray diffraction to the question of flow of black ink into water, or the one of geometric formation of sugar candy called *confeito*. Quotidian phenomena as such were definitely his favorite. He could have developed his theoretical studies in the western way, but he had not enough interest in doing so. To one of his disciples, he said "[y]ou don't necessarily have to follow the Western way of science; there must be a physics appropriate to the Japanese" (Uda 1936).

Now, what idea of science did Terada have in mind? What did science mean to him? The answers can be found in his works written just after he came back from Germany such as "On contingencies" (Guzen, 1915) or "On scientific laws" (Hosoku ni tsuite, 1915). The first one, "On contingencies," was virtually a translation of a chapter of Henri Poincaré's essay *Science et Méthode* (1908). The fact he translated it shows his high appreciation of the French mathematician's view on science, especially on the question of law and contingency. As we saw above, Terada's special interest was in finding regularity and constancy in apparently contingent phenomena that belonged to everyday life. He must have found a theoretical ground for his studies in Poincaré's essay on contingency.

Terada seems to have been convinced by Poincaré's attempt to distinguish between the phenomena out of which one could draw a scientific law, and the contingent ones out of which one could not do it in the same way. The distinction seems to have given him a hint on the question of half-contingent, half-regular phenomena that he was eager to understand in terms of scientific laws. The questions he tried to elucidate such as the flow of black ink into water or the geometric formation of sugar candy called *confeito* corresponded to that type of half-contingent phenomena.

Terada may have felt deep sympathy with Poincaré also because this French genius explained science in terms of beauty. In the essay a part of which Terada translated, Poincaré said as follows: "Scientists do not study nature because it is useful; they study it because it is pleasant. Scientific researches are pleasant because nature is just beautiful" (Poincaré 15).

The other article, "On scientific laws," is an extension of Terada's consideration on the contingent. There, he advanced his view on physics ~~more~~ audaciously to assert what is called 'scientific law' is abstraction of our concrete experiences and that it cannot be any more than mathematical approximation of reality that consists in averaging its changes full of contingencies and irregularities. The following is a passage from the essay where he put the idea forward:

Even if we humans demand Nature to be simple, She does not care at all. We can establish a law when She presents events with minimal complexity and changes, or on the contrary, events with enough complexity for us to consider them as 'contingent' as Poincaré pointed out. In most of the cases, we just average Her complexity and changes to make an abstraction of what She is. (Terada 1:185)

By saying this, he seems to be implying that the scientific approach to Nature is insufficient. Considering the fact he practiced *haikai* poetry as another approach to Nature, we can imagine he conceived the two disciplines, physics and *haikai*, as complementarity to each other.

As for the averaging of natural phenomena he found as a fundamental character of science, it appears as a continuous theme in his posterior essays as well. In the essay titled "Six Pieces on Spring" written in 1922, we find the following passage:

There is no relation between 'spring' as a season and 'spring' as a series of meteorological phenomena. Those occupied with making a calendar do not care about the average temperature of March in Tokyo. Seasons are a relative notion; we only have to know spring in the north hemisphere is autumn in the south hemisphere. Besides, spring does not exist everywhere; it exists only in some restricted areas on the earth. Everyone knows it, but does not necessarily realize it.

What is called the weather in Tokyo is a result of the averaging of meteorological changes. The averaging is justified because there is a cycle to it. Of course, the cycle changes every year. That is why we have to

average the changes. What is important here is not to believe the average to be most probable or nearest to reality. I say so because many people wrongly believe that they have the days with the average meteorology conditions more frequently than others. As a matter of fact, they have very few days with such conditions. (Terada 2:130)

Here we see his insistent distinction between the average and the real, by which he warned us not to believe in the average as if it were real.

Now, Apparently irregular and chaotic phenomena whose regularity and constancy Terada was seeking for are of scientific interest today. They interest especially those scientists specializing in fractal or chaos. Reading Ilya Prigogine and Isabelle Stengers' *La Nouvelle Alliance* (1978), we cannot but think of Terada as one of those trying to open a new dimension to science. In the Nobel Lecture in 1977, the Russian thermo-dynamist expressed his view in the following manner:

The inclusion of thermodynamic elements leads to a reformulation of (classical or quantum) dynamics. This is a most surprising feature. Since the beginning of this century we were prepared to find new theoretical structures in the microworld of elementary particles or in the macroworld of cosmological dimensions. We see now that even for phenomena on our own level the incorporation of thermodynamic elements leads to new theoretical structures. This is the price we have to pay for a formulation of theoretical methods in which time appears with its full meaning associated with irreversibility or even with "history", and not merely as a geometrical parameter associated with motion. (Prigogine)

Let us pay special attention to Prigogine's reference to the notions of "time," "irreversibility" and "history" as important factors for scientific explanations of the world. This indicates that today's science, at least his, is making a bridge between the Two Cultures, one that was the subject of Charles. P. Snow's writing in 1957 (Snow). As for our Japanese scientist, he was aiming at the same to overcome the split by way of introducing the notion of time and history in science. In the essay titled "On scientific laws" written as early as 1915, we find his insistence on including "the historical" for a scientist to establish a scientific law (Terada, vol.1 185), which coincides with Prigogine's view.

You may wonder from where Terada had such an idea? What inspired him the most so that he could think of "irreversibility of time" and "the historical"? We would like to say it came not only from the tradition of *haikai*, but also from the reading of Western philosophers such as Henri Bergson and Ernst Mach (Yajima 278–292). As a matter of fact, he was much inspired by those two Western philosophers who were his contemporaries.

Concerning the influence of Bergson, we can see it in Terada's essay titled "The idea of time, entropy and probability" (*Jikan no kannen to entoropi narabini purobabiriti*, 1917). There, referring to the French philosopher's criticism of the scientific notion of time based on reversibility and repeatability, he insisted on the irreversibility of time by introducing the thermodynamic notion of "entropy." To him, physics in the future had to start from the notion of entropy. The quotation that follows is just a small part of the essay that makes echo with Prigogine's thermodynamics put forward much later than his time:

I mentioned the irreversibility of time, but I have to add to it that time is not equally universal. For there are systems with irregularity and disorder on the level of elements. If all the systems were 'divine' like pendulums, time could be reversible, but our universe is rather irregular and disordered so that it could not be described in terms of limited definitions and mathematical formulae. Certain scientists seem to believe in the possibility of predicting the future following the 'unchangeable' model of the present, but in reality, it is impossible except for some cases with certain conditions. That is why we need to think of probability and irreversibility of time. I believe our notion of the present and the past derives from there, the irreversibility. (Terada 1:248)

As for Mach's influence, we can see it in Terada's lack of faith in the physics of his time. In the abovementioned essay titled "On scientific laws," he said no system in the universe was independent from others, referring to Ernst Mach. To Terada as well as Mach, what scientists were doing was picking up some of the system of universe as if these were independent from the rest. Neither of them was convinced of such physics.

Some may say the vision of universal causality by which Terada or Mach saw all the systems interrelated with one another may rather be a product of Buddhist influence. Other may doubt such interpretation (Batz 183-199). Both might be true, but it is more important to see Terada was a scientist at the crossing point of East and West. If he was trying to make a bridge between sciences and humanities as we saw, he was also trying to make a bridge between East and West.

To conclude the article, I would like to introduce Terada's explanation of *haikai* poetry in terms of Freudian theory. He knew Freud and psychoanalysis through books introduced to Japan in the early 20th

century. Like many other Japanese of his time, he thought it was a new science that could elucidate the secret of our mind.

He used it to explain the logic of *renku*, the game of linked verses he enjoyed with his friends. Let us remember that *renku* is a play that consists in linking verses one after another, to make up a world of poetry. It is important to say that in the play, the aim is not to make up a coherent whole, for there is neither planning for totality nor intention of totality. The only necessary condition for the play to go on is the appropriateness of each link between two consequent verses. One has to see if the link between the first verse and the second, or the second and the third, is natural and beautiful. There is no need for the third to be consequent to the first.

In the case of the verses quoted at the beginning of this article, Matsune, the first player, begins the play with the following verse, probably evoked by the "spring rain" falling around softly: "From tomorrow on, I'll be going far into the north, wet in the spring rain." To this, the second player Komiya makes contrast by introducing "snow" and "the west" against the first player's "rain" and "the north," and thus he situates the time between winter and spring: "Yet there remains snow on the mountain in the west." Now, the third player Terada, receiving the second one's "snow," puts forward the notion of winter focusing on "winter daphne frozen." At the same time, he turns the focus from distant scenery to flowers nearby: "I've already come to a village to see winter daphne frozen." Time has passed because the first player said he was going to "the north" the following day, and that the third one already finds himself in a "village." And if the first one was seeing the "spring rain" while the third one "winter daphne frozen," it is because places have also changed from the starting place, probably a capital, to a "village" in the north. There is no logical sequence between the first verse and the third one; there is on the contrary a leap and a change from the one to the other.

Terada explained this way of developing *renku* in Freudian terms. In an essay titled 'Outline of the essential of *Haikai*' (Haikai no Honshitsu-teki Gairon, 1932), he said as follows:

The links between verses of *haikai* are unconscious, or at least semi-conscious. They must be similar then to the links between objects that appear in a dream. From the point of view of our conscious logic, what happens in a dream is impossible. But psychoanalysis is able to translate it from the unconscious to the conscious, so that we can see a kind of necessity, of logic, in there. Behind the sceneries that appear in a dream with apparent incoherence, Freud discovered a sort of coherence that reveals the secret part of our mind. There is a sort of play between 'the imaginary and the real' there just as in *renku*. (Terada 12:91)

What he suggested is that there was a "scientific" way to understand *renku*, and consequently the spirit of *haikai*, and that "science" he found to be useful was not physics but Freudian interpretations of dreams. This implies Terada was conceiving a third bridge, a bridge between the conscious and the unconscious. Being a scientist and a poet at the same time, he proved himself to be an integral human being.

Note: The author of this article passed away before he finished writing it. Hitoshi Oshima, a friend close to him, finished it at his place.

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