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The Memory Theory of Bergson and Brain Physiology -From Dualism to Monism-

Abstract

“The brain is not a place to store memory” is the famous thesis that was proposed in “Matter and Memory” chapter 2. From there, Bergson demonstrates that memory exists from the brain independently and the quality of memory is non-material and spiritual. According to Bergson, the brain is only an instrument of memory power and memory is spirit and reality that exist from the brain independently. He negated the theory of location of memory and argued the brain and memory from the whole theory of the brain. Well, what is the meaning of his memory and brain theory from the view point of contemporary brain physiology? Are his memory and brain theory fit for contemporary brain physiology? I want to conclude the confrontation between the theory of Bergson and contemporary brain physiology comparing the theories of Bergson and Wilder Penfield (1891-1979) who was the most famous brain surgeon in Canada. The conclusion is that dualism is amended to monism by the quantum theory, the idea of Biocosmological Association and my philosophy ‘*Philosophy of Nothingness and Love*’ and that the new road of physiology and medicine is opened.

Keywords: brain, memory, philosophy.

1. THE MEMORY THEORY OF BERGSON

Bergson supposes two kind of memory in “*Matter and Memory*”. One is memory of body¹ and another is independent memory². The former is the memory of lesson, acquired by the repetitions and engraved in the body. Strictly speaking, this is habitude. The memory of psychology and physiology means this memory of body and preserves it in the brain cells. This thought of memory is called as theory of localization. Bergson negates it. But we have to note that the theory of localization is the theory of memory and it is not the theory of localization of brain functions. Most of brain physiologists misunderstand. The brain and memory theory of Bergson that negates the theory of localization of brain functions is non-scientific and ridicule. Henri Hecaén (1912-), who is the typical French nervous psychologist in the world, criticizes that Bergson is only

‘an ignorant watchdog of the whole theorists of the brain’³. But this is a too hurried and simple conclusion, because Bergson treats the motor aphasia⁴ and sensor aphasia⁵ in his “*Matter and Memory*” and admits the theory of localization of language center. Further, from his understanding for the brain physiology⁶, we can approve that he has a deep knowledge of it. He is a whole theorist of the brain but not an ignorant whole theorist.

Well, according to Bergson, this memory of body is material and space. That is not memory but habit. True memory is not the memory that is acquired by repetition but independent memory that is independent of body and registers the past. This is ‘durable memory’⁷ that stores the concrete dating past continually. Further Bergson calls it as pure memory (*souvenir pur*)⁸, too. This memory does not appear in our consciousness in ordinary life but makes an important work in the unconscious world. It is potential memory that we remember in a chance suddenly. This classification of memory is the originality of Bergson. In psychology, there are two kind of memory. One is short term memory and another is long term memory. But as these memories are stored in brain cells, they are fit for memory of body by Bergson. On the other hand, pure memory, independent memory exists in brain cells independently. We cannot find this notion of memory in psychology and brain physiology.

Bergson supposes two kinds of such memory. Still more he supposes two kinds of recognition corresponding to two memories. One is automatic recognition (*reconnaissance automatique*)⁹ that is recognized only by the body instantly and goes to move without any memory. Another is attentive recognition (*reconnaissance attentive*)¹⁰ that works to intensify perception and has attention with memory. In short, memory of body corresponds to automatic recognition and independent memory corresponds to attentive recognition. By these theories of memories and recognitions, he explains various amnesia, aphasia and psychic blindness that cannot be explained by localization of functions. For instance, I treat the case of Lichtheim¹¹. The patient lost memory of word syllables, the spontaneous power of speech by the accident of a fall. Nevertheless, he could repeat correctly the words that man spoke to him. It seems that this case is trans-cortical sensory aphasia as studied by Benson¹². The patient is inclined to speak spoken words repeatedly correctly and repeated non-sense words and error dialogue but with correct grammar. Still more he could not understand what he said. It seems that the cause of this case depends upon the damage of the occipital lobe, or parietal and temporal association area. But we cannot determine it exactly. Next, I treat the case of Arnaud¹³. Probably it would be transcortical motor aphasia¹⁴. The patient who lost the understanding of hearing words recovers the understanding by the clear pronouncing repetitions of syllables. The cause is the damage and malady of the brain and top domain of Broca cortex. The theory of localization of function of contemporary brain physiology cannot explain these cases in details. The reason is as follows, according to the theory of localization, memory loss depends upon the destruction of brain cells. Well, how do the brain cells that are destroyed recover and recall the lost memory? The theory of localization cannot answer it. But Bergson explains it as the malady of recognition that memory does not

realize. Still more, the theory of localization cannot explain the case of psychic blindness, visual agnosia and Wilbrand disease¹⁵. This is the case where, though the patient has not the obstacle of visual ability and preserves the visual memory of the past, he cannot recognize the memory. Though he can remember his town in imagination, he cannot remember it when he really comes to his town. This is the case of obstacle of space perception and space orientation. The reason of this case depends upon the damage and malady of parietal association area¹⁶. According to the theory of Bergson, the cause is not the memory loss but the obstacle of motor diagram¹⁷, automatic recognition that orientates the visual image to body movement.

Further, it is the law of Ribot¹⁸ that strikes the theory of localization decisively. The characteristic of this case is the order of memory loss that first a proper noun is lost, next a common noun is lost, finally a verb is lost. How can man explain the systematic order and progress of the amnesia? How does the brain recover cells that were destroyed and lost? The reason of the regular recovery is more difficult to explain. This case resemble the anomic aphasia¹⁹. According to Benson, it seems that the cause is the damage and the malady of parietal –temporal lobe of dominant hemisphere, but the reason is not determined. Strictly speaking, the localization of malady of anomic aphasia cannot be defined by brain physiology. Still more as the law of Ribot is recognized in an ordinary healthy man, it is not the case of malady. On the other hand, Bergson explains this law by motor diagram that is the base of automatic recognition and attentive recognition. The reason of last memory loss of a verb depends upon this motor diagram. When a verb is being forgotten, effort of body, motor diagram catches the verb. As a verb connects with the movement of the body, it is unforgetful. The memory that is caught by motor diagram realizes from the potential condition by the attentive recognition. The law of Ribot is clearly explained by the theory of Bergson.

Bergson explains such amnesia and demonstrates that the loss of memory does not depend upon the destruction of brain cells but the malady of recognition. From here, the brain is not the place to store memory and the localization of memory is denied. Memory is not preserved in the brain, it is spirit, reality that exists from the brain independently. On the contrary, cerebral is something²⁰ that keeps the function of memory and is only ‘motor instrument of memory’²¹. By these demonstrations, cerebral is the place where spirit and reality are active.

Supra, I explained the memory theory of Bergson. But it was established one hundred thirty years ago. If man compares the condition of that time and the contemporary condition, the brain physiology developed rapidly. We can have far advanced theories of consciousness, memory and mind in the scientific research than at the age of Bergson. Well, what kind of evaluation should be given to his theory from the view point of contemporary brain physiology?

Next, I want to introduce a little the condition of the brain physiology until now and treat about a famous brain surgeon, Wilder Penfield. Then I will confront the theory of Bergson with the theory of Penfield.

2. THE DEVELOPMENT OF THE BRAIN PHYSIOLOGY AND PENFIELD

The modern brain research began to find the linguistic area of P.P. Broca (1824-1880, France) and C. Wernicke (1848-1904, Germany). By this discovery, the localization of the language center was confirmed and the theory of brain localization was established. G.T Fritsch (1838-1929, Germany) and E. Hitzig (1838-1907) stimulated by electricity the cerebral cortex of a dog which brain was exposed and researched the effect. The most decisive experiment was the case of Penfield who stimulated the human brain by electricity. By this, he could indicate the localization of function of motor cortex and somatosensory cortex. Of course, criticisms for this establishment and development of the theory of localization of the brain occurred. For instance, Hughlings Jackson (1835-1911, England) admitted the localization for sensory-motor function but he could not determine the localization for the high level mind function, as it was different from sensory-motor function²². This thought is similar with the thought of Bergson. According to Hughlings Jackson, the expression of language is related to both spheres. Though higher intentional intellectual language is lost in aphasia, automatic emotional language remains. Hughlings Jackson's thought was recognized by Sir H. Head (1861-1940, Great Britain) and succeeded by K. Goldstein, (1878-1965, Germany). Then it blooms as the whole theory of the brain that one can admit, the localization of every function but the cerebral cortex works as a whole²³.

If we review the nervous anatomy of the brain, we found the fact that C. Golgi (1843-1926, Italy) published the method of silver dyeing in 1875. By that, he showed clearly the whole structure of the nervous cells from axon to dendrite. Still more, S.R. Cajal (1852-1934, Spain) researched the fine structure of the nervous system by the method of Golgi. (Golgi and Cajal obtained the Nobel Prize in physiology/medicine in 1906) About these axon and dendrite, Bergson used these words in "*Matter and Memory*"²⁴. P. Flechsig (1847-1929, Germany) supposed the existence of association area and made the 'brain map' of Flechsig by the distinction of velocity of myelination in the 1870's. In the 20th century, K. Brodmann (1868-1918, Germany) divided the brain into fifty-two regions on the cell structure and numbered them. This is known as Brodmann Area and was confirmed by brain surgeries during over fifty years²⁵.

On the research of brain waves, Hans Berger (1873-1941, Germany) discovered brain waves in 1929. By them he tried to grasp the human heart but failed. For neuron level research, the relations among memory, synapse and RNA caught up. The idea of Holger Hydén (1917-2000, Sweden) is typical thought. Through synapse, the impulse that reaches to neuron changes the array pattern of amino acid. Then the RNA of the new array pattern becomes the motive power of occurrence of neuron impulse and transmission. He sought the formation of memory through the formation of RNA²⁶.

Recently, CT scan (Computed Tomography) and Positron ET (Positron Emission Tomography) were invented by the development of scientific technology. By these

machines, we can see the pictures and movement of the living brain. Specifically, on Positron ET, we can see the movement of the living brain by the measurement of local blood flow and local glucose metabolism and confirm the localization of functions of the brain. For instance, if one measures the blood flow of cerebral cortex when one speaks, one can confirm the activity of the somatosensory cortex, the mouth-tongue-throat area of movement field, the movement association field and the auditory cortex²⁷. Mind and imaginary language, when one counts mentally from one to twenty, again do activate the frontal lobe, specially the movement association field but do not activate the Broca area and the Wernicke area. Therefore, we can say that this is the proof of localization of pure spirit phenomenon²⁸.

Above, I treated a little about the development condition of the brain physiology. The results are too many to explain here, but we can understand the basic thought of the brain physiology. In short, if man proceeds to analyze the structure and functions of the brain, man can explain the essence of human spirit mechanically. If we can observe directly the movement of the atoms and molecules of the cortex by a microscope of tens of millions magnification factor and have a corresponding table between the movement of them and the heart, we could recognize the sensing and desiring heart by the movement of the atoms and molecules²⁹. Our thought reduces to the movement of the atoms and molecules. If man can measure the movement of the atoms and molecules, man can estimate the movement of the heart corresponding to the condition of the atoms and molecules. This is mechanic determinism. The brain physiology developed on the determinism. After this, the development of the brain physiology will press human thought and spirit to the framework of the determinism. Are human thought and spirit only the movement of the atoms and molecules of the brain cells? If the answer to this question is true, does man secure human reality, freedom and dignity? It seems that such material condition neglects human spirit and threatens the existence of human being. I think there is the need to put the brake on the material trend. There is really the significance of the theory of Bergson and the greatness of his demonstration that memory is non-material something, spirit and reality through the explanation of aphasia. The proof depends not upon the thought or analogy but the verifications. By them he demonstrated that memory is independent of the brain cells. Well, what evaluation should be given to the theory of Bergson from the contemporary brain physiology perspective. The person who gives the effective suggestion for the answer is Wilder Penfield, whom I talked about supra.

He was a Canadian brain surgeon and a great world medicine scholar³⁰. When he was a student, he studied philosophy, nerve physiology and neuron anatomy. After he acquired a wide knowledge, he entered the field of brain surgery. When he treated epileptic patients, he stimulated the exposed hemi-sphere by electricity to find the epileptic region. At that time the patient was conscious. Penfield stimulated the temporal lobe except the language area that was called 'interpretive cortex'³¹ by low voltage electricity (about 2-3 volts)³². By that, the patient remembered the past experiences and events like the flash back of cinema³³. This

flash back phenomenon - called 'experiential responses'³⁴- appeared only in the temporal lobe. It did not appear in the others regions. At that time, though the cortex where the flash back occurred was excised, the memory was not lost³⁵. This fact denied the adhesion of engram, memory trace with the brain cells. If memory trace adheres to the brain cells, the memory of the cortex that was excised must be lost. In 1951 Penfield himself first believed that there was a part that man should call 'memory cortex' and in the near region that experiential responses appeared by the electric stimulation, the past experiences were preserved³⁶. But later in one of his publication, he made clear that his assumption was an error³⁷. 'The records are not stored in the brain cortex'³⁸ (Please remember the first thesis of Bergson). This was the conclusion reached after hundreds of people who were exposed to the condition were surgically experimented upon. Is this really by accident that Bergson and Penfield both denied the localization of brain cortex memory? The human memory is not a simple thing like engram or memory trace adhering to the brain cells but a far complex thing. According to Penfield, memory is related to temporal lobe, particularly, hippocampus. He supposed that hippocampus stores nervous patterns (that is not memory itself) which preserve the flow of consciousness. If this is not true, hippocampus would play a role importantly in the mechanism of reactivity of records³⁹.

Such experiential responses indicate that the memory we lost has not disappeared⁴⁰. The damage to the hippocampus and the temporal lobe disturbs the formation of new memory but the old memory is preserved. The preservation of this old memory is similar to the notion of pure memory of Bergson. The pure memory is potential memory and reality, spirit that has never disappeared. I think that the pure memory, independent memory, is not contradictory to the experimental fact of Penfield.

If man further compares Bergson with Penfield, he would be astonished by the commonality and similarity. In the theory of recognition, Bergson distinguished the automatic recognition and the attentive recognition. In this distinction, the automatic recognition corresponds to sensory-motor mechanism⁴¹ and the attentive recognition corresponds to pure memory. In short, the automatic recognition connects to the body, that is sensory-motor mechanism, and it reacts the body towards the movement. On the other hand, the attentive recognition calls pure memory and it realizes memory towards memory image. The automatic recognition manifests sensory-motor mechanism and body, on the other hand the attentive recognition manifests consciousness, memory, heart and personality. It should be noted that Penfield explained human brain by two systems. One is the automatic sensory-motor mechanism⁴² and the other is the highest brain-mechanism⁴³ that connects to the heart directly. The automatic sensory-motor mechanism is the system that receives the heart order and accomplishes the order and aim reflexively. On the contrary, the highest brain-mechanism is the system that connects to the heart directly and informs the message to accomplish the heart order to the other systems. These two systems exist independently. From the view point of traditional philosophy, Penfield stands on dualism and insists on the independence of body and consciousness, heart. The proof is the automatism⁴⁴.

The automatism is the case when the patient keeps moving unconsciously. It occurs possibly to the epileptic patient that has a focus in the temporal lobe. When the electricity flows in the temporal lobe, a fit of upper brain stem occurs and the patient becomes an automatic man without heart. For instance, the patient wanders unconsciously from place to place. When the epilepsy occurs in the patient while he plays the piano, he keeps playing⁴⁵. These are the cases where the patients are only using the reflection and skill. If man uses the expression of Bergson, he repeats the body memory that is acquired by habits. The case of the automatism proves the independence of heart and body⁴⁶.

Well, what kind of relation exists between heart and body? Bergson used the metaphor of clothes and nail⁴⁷. On the other hand, Penfield used the metaphor where the heart is the programmer and the brain is the computer⁴⁸. Heart makes the programs and inputs them into the brain. Then the brain as computer receives the program and moves automatically according to the order of the heart. In short, the brain is the mediate organ between the heart and the outside world, the organ of sending messages and the instrument of the heart⁴⁹. Here remember the relation between memory and brain of Bergson. According to Bergson, the brain is defined as 'motor instrument of memory power'. On the other hand, Penfield defined the brain as the instrument to realize the heart. We can find the similarity between Bergson and Penfield. Supra I considered the memory theory of Bergson and the brain physiology, specifically from the standpoint of Penfield. I wish summarize them and conclude.

3. CONCLUSION

One hundred thirty years have passed since "*Matter and Memory*" by Bergson was published. In the natural science field that is developing rapidly, the theory that was established one hundred thirty years ago is lack of innovative idea. The thesis that Bergson proposed would be old fashioned theory of philosophy. But, though the rapid progress and development of brain research, we cannot deny the memory theory of Bergson. There are so many obscure points. The relations of synapse, chemistry matter and RNA are confirmed at the neuron level, the engram, memory trace is not explained still. The thought that the engram, memory trace does not exist and it is registered and recalled in the whole of the brain is adequate. There the simple localization of the brain is not passed and the brain and memory should be explained in the place that the localization and the whole theory are sublated.

The traditional sciences are developing by the law of causality and the expressions of quantity and space. Similarly the human consciousness is explained by the relations of the brain cells. Surely man needs the brain to realize the consciousness and heart. But man cannot reduce the consciousness and heart to the movement of the brain cells. The researches of aphasia of Bergson and of Penfield demonstrated the proof. In contemporary age, sciences are developing rapidly, man can say that sciences are all mighty. The science reaches to the area of the human spirit and the problem of the brain and heart. From the 19th to the 20th century,

the brain physiology developed rapidly, it succeeded to discover the localization of sensory-motor function of brain and language center. But about the higher spirit function, the concrete exact mechanism is not explained. Specifically, about memory as I above mentioned, it is unknown. In contemporary psychology, body memory is only researched, pure memory is not researched yet. Such memory is called potential memory. Penfield supposed that it is preserved in the upper brain stem and Toshihiko Tokizane, the typical brain researcher in Japan, supposed that it is conserved in the limbic system⁵⁰. But concretely the condition of the conservation and the process of recall are not explained. The notion of pure memory of Bergson is difficult to explain in the brain mechanism. But the existence of pure memory was confirmed by the experiments of Penfield. Bergson initiated dualism of pure memory (spirit) and pure perception (matter) on the theoretical hypothesis. Penfield also supported dualism of body and spirit. All brain physiologists do not support dualism but Penfield who aimed to monism, where consciousness is the production of the brain by many material experiments, reached to dualism. This conversion had considerable power of persuasion. The theory of dualism of Penfield supported the memory and brain theory of Bergson. It is surprising that the theory of Bergson was verified by sciences over sixty years. Bergson predicted the future. Still more, this dualism is amended by the quantum theory and my philosophy⁵¹ to monism. The appearance of the quantum theory changed the notion of matter. Before it, matter (being) overwhelmed mind, invisible world. Matter world is the world of classic physics from Copernicus, Galileo Galilei, Newton and others. According to the quantum theory, there are many, uncountable particles in the universe. We can call them as the flow of life, energy that is the reality of Bergson and Great, One, Nothingness as it is beyond the word in Chinese philosophy. Molecule, Atom, neutrino and quark were confirmed by physics. The universe is filled with the flow of life, energy. Our heart, spirit and memory are the flow of life and energy. This idea is living in Biocosmological Association⁵², also. The existence of the flow of life, energy was not confirmed by the classic physics. Today, there is no boundary between matter and spirit, invisible someone. The typical existence is the virtual particle⁵³ that appears in an instant and disappears in another instant. If man says that it is, it exists. If man says that it is not, it does not exist. Man can say nothing. It corresponds to the micro world that is smaller than the length of Plank. We cannot confirm the world by physics. Further it corresponds to the end of the universe. As the universe expands, we cannot confirm the end of the universe. We can say nothing. That is 'Nothingness'. This is the whole of the universe. Matter is a small part of the universe. By the friction, resistance of the particle, Higgs boson, mass and matter bore. Compared to the universe, the whole of being and matter is as negligible as three ants to the earth itself⁵⁴. The quantum theory, the idea of Biocosmological Association and my philosophy supported the theories of Bergson and Penfield. Their theories will build the new thought about memory and mind. At the same time their theories prove that my philosophy is adequate for the new physiology and medicine.

<NOTES>

1. Henri Bergson, *Matière et mémoire*, PUF, 1896, 92^e édition. As following, I sketch it M.M.
Bergson treated this as 'memory of lesson '(souvenir de la leçon, M.M. p.84) in *Matière et mémoire*. As this is memory that is carved and conserved in body, I named it as body memory to distinct spirit memory.
2. M.M. p.82
3. Henri Hécaen et G. Lantéri-Laura, *Évolution des connaissances et des doctrines sur les localisations cérébrales*, Desclée de Brouwer, Paris, 1977, Translated by Toshihiko Hamanaka, Yoshiaki Daito, "Establishment and development of localization theory of brain" Japanese translation name, Igakushoin, p.84
4. M.M. p.123
5. M.M. p.137
6. *ibid.* Here Bergson admitted that brain physiology could succeed the localization of sensory motor functions. But the idea as higher spirit function could not be explained. The brain physiology proceeded to analyze the brain far fine and the theory was far complex. But the complexity of reality was not grasped. Here the standpoint that human could be explained by the analyze clearly expressed.
7. Continual memory means the past, time and body memory means space. Therefore, on the notion of memory, the peculiar method of dichotomy, duration and space of Bergson was used.
8. M.M. p.152
9. M.M. p.107
10. M.M. p.107
11. M.M. pp.124-125
12. D. Frank Benson: *Aphasia, alexia, and agraphia*, Churchill Livingstone Inc. 1979, Translated by Sumiko Sasanuma, Motonobu Itō others, Kyōdōsho, pp. 99-102
13. M.M. p.127
14. Benson, *op. cit.*, pp. 96-98
15. M.M. p.99
16. Hiroaki Niki, *Brain and Psychology*, Series 'Science of the Brain', Asakura shoten, 1984, p. 271
17. M.M. p.121
18. M.M. p.132, Théodule armand Ribot (1839-1916)
19. Benson, *op. cit.*, pp.115-119
20. M.M. p.267
21. Jean Theau, *la critique bergsonienne du concept*, PUF 1968, p. 263
22. Hécaen, *op. cit.*, p. 110
23. Hiroaki Niki, *op. cit.*, pp. 10-11
24. M.M. p.124
25. Hécaen, *op. cit.*, p. 177 On the making of the brain map, C. et O. Vogt who was the master of Brodmann pursued it throughout his life. At last he could classify the human brain about over two hundreds regions but the map was too small to confirm for the researchers except himself.
This was one of the failures of the brain physiology and the fact demonstrated that the method of analysis always did not succeed.
26. Toshihiko Tokizane, *Seek for the Dignity of Life*, Misuzu Shobō, 1975, Tokyo, p.172
27. sukada Yūzō, *Extra number Science Search for the Brain*, Nikei Science Company, 1982, p.155
28. *ibid.*, p.156
29. Bergson, *ŒUVRES*, PUF, 1970, pp. 839-840
30. On his life, he fully mentioned it in his autobiography "No Man Alone, A Neurosurgeon's Life" little, Brown and Company, Boston, 1976

31. Wilder Penfield, *The Mystery of the Mind*, Princeton University Press, 1974, p. 19, I sketch it *Mystery*.
32. *ibid.*, p.24
33. *ibid.*, p.21
34. Wilder Penfield and Lamar Roberts, *Speech and Brain-mechanism*, Princeton University Press, 1958, p.45 Against the experiential response that the patient recalled the past by electric stimulation, Penfield named the response that the patient noted the sympathy, hetero sense and loneliness etc. as interpretive responses. *ibid.*, pp. 47-48
35. *ibid.*, pp. 46-47. cf. Sally P. Springer and Georg Deutsch, *Left Brain, Right Brain*, W. H. Freeman and Company, San Francisco, 1981, Edited by Kunihiko Fuki and Jurō, Kawachi, Translated by Takashi Miyamori and Eiji Matsuzaki, Japanese translation, Igakushoin, 1985, pp.274-275
36. *Mystery*, p. 31
37. *Mystery*, p. 31
38. *Mystery*, p. 31 Still more Dr. Soji Takeuchi who was a surgeon, my deceased father-in-law, approved of the operations and thought of Wilder Penfield. Dr. Takeuchi gave me a lot of useful advices from his experiences of brain surgeries.
39. Wilder Penfield and Lamar Roberts, *Speech and Brain-Mechanism*, p. 47
40. Tamotu Fujinaga and others, *Lectures Contemporary Psychology Volume 1, What is heart?*, Shōgakukan, 1981, Tokyo, p.45
41. M. M., p.119, p.180
42. *Mystery*, pp. 37-43
43. *Mystery*, pp. 46-48
44. *Mystery*, p. 37
45. *Mystery*, p. 39
46. Here we should understand the difference and similarity of the notion of memory and heart between Bergson and Penfield. In Bergson, memory is duration • spirit • consciousness • heart • reality. On the other hand, Penfield distinguished heart from memory. According to Penfield, memory is stored in someplace (brainstem upper part) and heart takes out memory from there (*Mystery*, p. 82). But how does memory itself exist and be recalled? On these questions, Penfield did not explain them except the operation of hippocampus (*Mystery*, pp. 64-65). From the standpoint of Bergson, the notion of heart of Penfield must be united with memory, because man needs always memory to feel, think and desire somethings, man cannot separate the work of heart and memory. Still more, the similarity and commonality of both are to preach the reality of spirit and heart.
47. M. M., p.4
48. *Mystery*, pp. 57-61
49. *Mystery*, pp. 46
50. Toshihiko Tokizane, *op. cit.* pp.102-109
51. Kiyokazu Nakatomi, *Philosophy of Nothingness and Love*, Hokuju Company, Tokyo, 2002, Japanese version, Lambert Academic Publishing, Saarbrücken, 2016, English translation
52. The site: <http://en.biocosmology.ru/> The president is Xiaoting Liu of the Beijing Normal University and the international articles of this association is *Biocosmology-Neo-Aristotelism*. Editor is Konstantin S. Khroutski of the University of Veliky Novgorod.
53. Heinz R. Pagels, *The Cosmic Code: Quantum Physics as the Language of Nature*, Simon & Schuster, New York, 1982, Translated by Eiichi Kuroboshi, Japanese translation title: *The ultimate of a material*, Chijin Shokan, Tokyo, 1984, Chapter 8 'Existence and Nothingness', pp.144-152
54. Haruo Saji, *Wonder of the Universe*, PHP Bunko, Tokyo, 1996, p.83

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