Shifting Perceptions of Insects in the Late Chosŏn Period*

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Introduction

Scientific debates on the nature of insects originate with Aristotle who tried to understand all *Entoma* in a general order. Aristotle's natural history established the early foundation of studying tiny creatures in the Western world. The natural history of insects in East Asia also has a long history but it is hard to determine a specific founder like Aristotle. The English word "insect" came from the Aristotelian concept that *Entoma* has incisions. Chinese and Korean concepts of worms (*ch'ung*) are not as apparent in terms of their origins.¹ Nevertheless, we should not take this

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1 Li Shizhen traced the origin of entomological knowledge back to the time of the Zhou dynasty. In *Bencao gangmu*, he found the earliest record of Chinese knowledge on insects in *Li Ji* [C] (*Book of Rites*), *Kaogong Ji* [C] (*Records of Examination of Craftsman*) in *Zhou Li* [C] (*Rites of Zhou*), and *Shen Nong Bencao Jing* [C] (*Shen Nong's Great Herbal*). See Li Shizhen, *Compendium of Materia Medica (Bencao gangmu)* Book V, translated and Annotated by Luo Xiwen (Beijing: Foreign Language Press, 2003): 3303. In *Chunqiu* [C] (*Spring and Autumn*),

as evidence that people in East Asia had little knowledge about insects. Silk, for example, gives us a powerful example that humans and insects built a working partnership early in China. Shadowed by the success of China, Korea's skills in handling insects have received little attention in historical research.² This article intends to examine how Koreans perceived and explored insects in the late Chosŏn period and how those perceptions changed through the cases of three thinkers: Yi Ik (1681-1763), Yi Pinghŏgak (1759-1824) and Yi Kyu-kyŏng (1788-?).

Before the eighteenth century, insects had been a topic of academic discussions and literary descriptions mostly because of their symbolic roles in Confucian metaphysics. Neo-Confucianism (*Sŏngnihak*) had built

there exist early records on insects. Sun Guan-long, "Chunqiu zaiyi kao," *Sahoe sasang kwa munhwa* 19 (May 2009):10-11. About the history of Western entomology, see Harry B. Weiss, "The Entomology of Aristotle," *Journal of the New York Entomological Society* 37, no.2 (June 1929): 107. Regarding pre-modern Korean entomology, there have been only a few articles published. Kim Yŏng-chu, "Hanmunhak e nat'an an Yi ŭi hyŏngsanghwa yangt'ae wa kŭ insik," *Tongpang Hanmunhak* 63 (June 2015); Yun Il, Mun T'ae-yŏng, "Chosŏn wangjo sillok e kiroktoen hwangch'ung e taehan munhwa konch'ungghakchŏk chŏpkŭn: kirok ŭi ŭimi wa yuhyŏng kŭrigo munje," *Kosindaehakkyo chayŏn 'gwahakyŏn' guso non-munjip* 13 (2006); Yun Il, Mun T'ae-yŏng, and Nam Sang-ho, "Yŏksasŏ ŭi pŏl e taehan munhwa kongch'ungghakjŏk chŏpkŭn," *Chayŏn kwahak* 15, no.1 (2004); Yun Il, Mun T'ae-yŏng, and Nam Sang-ho, "Chosŏn sidae hwangch'ung e taehan munhwagon'chunghak," *Chayŏn kwahak* 13, no.1 (2002).

- 2 Korean sericulture is believed to have existed from ancient times, but it has barely received any scholarly attention. The origins of Korean sericulture demand more research. Dieter Kuhn argues that Chinese immigrants introduced the skills in Korea in the second century. Dieter Kuhn, *Science and Civilisation in China*, vol.5 "Chemistry and Chemical Technology Part IX Textile Technology: Spinning and Reeling" (Cambridge: Cambridge University Press, 1988): 418. Historical records that were written in China mention briefly the use of silk in ancient Korea. And yet it is still unclear how and when the skill spread from China to Korea. In a Korean source, *Samguk sagi* (*Records of Three Kingdoms*), the earliest appearance of silk is only dated back to the fifth or sixth centuries. Min Kil-cha, "Urinara kodae chingmul yŏn'gu," *Kyoyuk nonch'ong* 2 (February 1983): 104-105.

moral knowledge into the core body of human cognitive works, establishing the belief that all things are subject to the moral cosmos of *li* (pattern principle). Some insects, most notably the honeybee, were believed to be self-evidently virtuous because their behaviour proved the ethical consciousness for which humans must strive. On the contrary, others like the locust appeared to punish people, mirroring the degree of immorality in the world. A plague of locust was deemed unavoidable and uncontrollable as if they acted on behalf of an angry superior being. When people broke ethical rules, the insects delivered a message to wrong-doers. Needless to say, other insects likewise had tremendous symbolic weight in the Confucian worldview. For instance, sericulture (*sang*) focused on silkworms occupied a critical position in East Asia in a political-economical set with agriculture (*nong*). The Chosŏn dynasty passionately adopted the same Chinese system of thought and technology, but there has been little research on the historical change in Korean perceptions of insects.³ Therefore, the continuously growing knowledge on insects that existed in the late Chosŏn period can give us unique opportunities to look into the transformation of Korean knowledge on the natural world.⁴

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- 3 By contrast, Japanese sericulture has received the spotlight for its essential role in Japanese industrialization. The level of Japanese silk production and technology of caring for the silkworm (*Bombyx mori*) quickly advanced in the Tokugawa period. European nations tried to learn from Japanese know-how and practical skills even before the opening of Japan. So the level of industrial entomology in pre-modern East Asia was high and there is a possibility that Koreans also made their own progress in sericulture. About Japanese sericulture in the Tokugawa period, see Tessa Morris-Suzuki, "Sericulture and the Origins of Japanese industrialization," *Technology and Culture* 33, no.1 (January 1992).
- 4 In a similar vein, the relationship between humans and insects has been an important topic in the historical understanding of the Scientific Revolution in Europe. Observational research on the physical structure and life system of insects appeared from the sixteenth century. An empirical view on the creatures can provide a microscopic view of the changing concept of nature and its meaning to humans. As an example, see J.F.M. Clark, *Bugs and the Victorians* (New Haven: Yale University Press, 2009).

In this article, I will examine the reformation of Korean entomological discourses from the eighteenth to the early nineteenth century. The academic interest in insects initially appeared as part of the metaphysical study of *li*, as Neo-Confucianists believed that they could discover causes for all phenomena through the “investigation of things and the extension of knowledge (*kyŏngmul ch’iji*).” The standard epistemological method of Neo-Confucianism directed intellectual efforts to the comprehension of the connectivity between the human mind and the external world. Since *li* was *a priori* knowledge, every phenomenon even in the world of insects could be explained by the universal truth. While the metaphysical unity between humans (*in*) and non-humans (*mul*) began to be questioned, the method of *kyŏngmul* (investigation of things) continued to inspire academic surveys on myriad things. Under the new banner of Broad Learning (*pakhak/pangmul*), Koreans revitalized research on non-humans, distancing themselves gradually from medieval metaphysics.⁵ As Benjamin Elman points out, the pursuit of comprehensive knowledge on nature evolved in the direction of scientific learning in late imperial China. And the Korean scepticism on the metaphysical unity of humans and non-humans was significantly influenced by Chinese scholars such as Xu Guangqi (1562-1633) and Fang Yizhi (1611-1671).⁶ In the milieu of new intellectual experiments and dynamism, Yi Ik, Yi P’inghŏgak and Yi Kyu-kyŏng led Korean entomological discourses toward a new age of learning

5 About the new intellectual discourses and methods of understanding animals, see my previous article “Chosŏn hugi tongmul e taehan chisik kwa kirok,” *Han’gukhak yŏn’gu* 60 (March 2017).

6 The activities of European Jesuits, Evidential Studies (Kaozhengxue [C]), and the broadening scopes of Chinese knowledge production impacted and inspired Koreans from the seventeenth century. About the new intellectual movement in Ming-Qing China, see Benjamin Elman, *On Their Own Terms: Science in China 1550-1900* (Cambridge: Harvard University Press, 2005). My book on the epistemological change in Korean concepts of knowledge will be published soon. See Sang-ho Ro, *Neo-Confucianism and Science in Korea: Humanity and Nature, 1706-1814* (London: Routledge, forthcoming).

from physical evidence. In so doing, they not only recognized the value of observational discovery but also acknowledged the disunity of humans and non-humans, and humans and their environment.

The Ethical Quality of Bees: Honeybees and Wasps

General ideas and nomenclatures about bees had already existed before Yi Ik, and Korean elite males could learn about the bee from their main source of education, Chinese classics. Until Yi Ik initiated an in-depth discussion on the bee, however, information about it had at best remained fragmented and elementary. A sixteenth-century glossary written by Ch'oe Se-chin (1468-1542), for instance, gives us an apparent contrast to Yi Ik's essay that I will examine in depth below. In the glossary, *Hunmong chahoe* (*Chinese-Korean Dictionary for Educating the Unlearned*), Ch'oe Se-chin paired classical Chinese terms with Korean vernacular terms. About the bees, he had only a general concept of *pong* (*ponga* or *pŏl*) with one sub-category of honeybee (*milponga*).⁷

Since Yi Ik was a philosopher of Neo-Confucianism and Sino-classics, he was indifferent to translating the names of bees into Korean. Instead, he tried to contemplate the general nature of the honeybee as one agent in the moral cosmos. As *li* was a self-evident and universal pattern of all things, he believed that bees must have their pre-designed role and function. His investigation was to manifest the metaphysical meaning of the insect and, by doing so, enrich moral knowledge. His essay on the natural history of bees, "Pongsa," focused on the ethical quality of honeybees (*Apis cerana Fabricius*).

In Yi's method, personal experience or empirical information was of less importance than textual sources and metaphysical thinking. He highly evaluated the excellence of bee social organization in terms of orderliness, harmony, and hierarchy. The behaviour of bees, it seemed to him, reas-

7 Ch'oe Sejin, *Hunmong chahoe* (Seoul: Chosŏn kwangmunhoe, 1913): 61.

sured that social hierarchy was natural. Yi Ik took the unconditional loyalty of worker bees and the division of labour in a hive as physical evidence of the social order. The tight organization of bees embodied the universal pattern of *li*. Ethical lessons were derived from the life of bees. In Yi's view, honeybees never wasted their time. They devoted their life solely to the single mission of collecting honey. They never competed with other insects in vain, Yi Ik complimented. As a real-life case of *li*, bee society exemplified the moral virtues of tranquillity, harmony, and order. The lord ruled at the top, and the subjects worked relentlessly below. In this regard, he argued that there was nothing that could better follow *li* and Confucian ethics than honeybees. He believed that by observing the virtuosity of honeybees he could enhance his own moral integrity.⁸

His anthropocentric discourses of the bee perfectly fit into the standard model of Neo-Confucian epistemology. "The investigation of things" would result in "the extension of knowledge," where knowledge served for strengthening one's moral backbone. Since Neo-Confucianism trained its students in analogizing from *a priori* knowledge, the extension of knowledge should not undermine the fundamental premise that nothing was free from *li*. If loyalty and diligence were the manifestations of universal morality, his study of bees intended to confirm the truth already known. Studying the exact nature of bees for its own sake, therefore, was out of the question.

In his Neo-Confucian epistemology, there appeared a serious gap between the physical reality and the metaphysical order. It is striking that Yi Ik missed a critical fact of bee society that they have a female monarch. He might not have realized the gender of the queen bee; or, he might have

8 Yi Ik, "Pong sa", *Sŏngho sasŏl*. Understanding other species within the lens of human qualities can be found in the West as well. As Keith Thomas points out, Greek, Roman, and medieval writers all described animals in categories of human behaviour and character. Animals symbolized certain traits of moral perfection such as bravery, diligence, and loyalty. Keith Thomas, *Man and the Natural World: A History of the Modern Sensibility* (New York: Pantheon Books, 1983): 64.

ignored it intentionally. In either case, he consistently called the queen bee “King bee” (*pongwang*). To him, the existence of the queen bee would have been a dangerous antithesis to the concepts of *li* and Confucian gender ethics. In fact, worker bees as well as the queen bee are all females. If we bear in mind that male drones have only a marginal role of fertilizing a queen in a bee colony, Yi Ik’s description of the bee society was a philosophical fiction. The actuality of nature was to be concealed for the purpose of defending *a priori* knowledge that patriarchy was a natural condition of all things.

Because of his metaphysical promise, he failed to understand the nature of the mating flight (nuptial flight) of the queen bee and her drones. He observed that the “King bee” came out of the hive regularly. In the essay “A Royal Tour of King Bee” (*pongsun*), he managed to discover the natural phenomenon that a queen bee flew with her male drones. It would have been easier for him to explain the nuptial flight if he could have accepted the “King” as a female that needed to get fertilized by her mating partners. And yet he chose not to compromise the philosophical cohesion that bee society exemplified ethical ideals. Instead, he analogized again from a known fact in human society. Given the premise that the queen bee was “King,” he assumed that all the monarchs, including bees, took a royal tour for a show of splendid pageantry.⁹ Thus, he misinterpreted that the nuptial flight was the same as the king’s ceremony. In a similar fashion, his moral entomology gave a fictional role to the male drones. He did not understand why the males always stayed close to the queen for seemingly no reason. He connected his observations of the bee’s behaviour to a political and ethical lesson that the drones, like lazy aristocrats in human society, embodied the low morality of seeking comfort from the monarch. He claimed, “all those who filled their belly without any contributions must feel ashamed” in his observations of the behaviours of the male drones.¹⁰

9 Yi Ik, “Pongsun”, *Sŏngho sasŏl*.

10 Yi Ik, “Sangbong”, *Sŏngho sasŏl*.

Fig. 1. Korean traditional beehive

Fig. 2. The internal structure of the hive¹¹

Simultaneously, his moral perception of insects had a positive effect of encouraging direct observation. According to Neo-Confucianism, insects were able to think and behave morally with a predetermined cause. If the mission of honeybees was ethical, everything hostile to honeybees could not help but be unethical. He called predators that fed on bees “bad bugs” (*akch’ung*) for that reason. Yi’s concept of “bad bugs” differed from the modern concept of pest because he defined the “badness” from an ethical standpoint. Spiders and house centipedes, for instance, received his attention for their predatory habits against honeybees.¹² The category of “bad bugs” also included various bee killers such as wasps, moths, ants, mantids, aphids, and dragonflies.

However, the moralistic view of insects faced one dilemma. The *Book*

11 A surveyor in the Japanese colonial government drew figure 1 and figure 2 which were printed in *Chōsen sōtokufu geppō* of 1914. According to an early Japanese survey of Korean honey production, P’yŏngan province produced about 30% of all domestic honey. Kangwŏn province followed with 23% of the production. Chōsen sōtokufu, “Yōhō chōsa,” *Chōsen sōtokufu geppō* 4:4 (1914): 62.

12 Ch’oe Se-chin translated the classical Chinese noun of *Soso* to *Kalgŏmi* in Korean vernacular. Ch’oe, *Hunmong chahoe*, 56.

of *Odes*, a Chinese classic upon which Neo-Confucianism relied, taught differently about the nature of wasps. The contradiction between the Chinese classic and his personal observation must have been a serious problem to him given the fact that his vocabulary and knowledge of insects heavily depended on Chinese texts. In the *Book of Odes*, the wasp was praised for acting upon noble causes. In the poem “Xiao wan,” it says:

*In the midst of the plains there is pulse,
And the common people gather it.
The mulberry insect bears an heir,
But the sphinx carries it away.
Teach and train your offspring,
And they will be good as you are yourself.*¹³

The author of this ancient poem knew that the wasp caught caterpillars. And they interpreted that the wasp did so for the good cause of raising it as its own offspring. By the effects of education, according to this poem, the caterpillar transformed into a wasp. The message of the poem was clear: that education could change one species to another. This ancient view on metamorphosis gave birth to the theory of “born of change” (*hua sheng* [C]) in Chinese knowledge of insects.¹⁴ It seems that Yi Ik found a good solution to this dilemma: since the reality of wasps, like the gender of the queen bee, could imperil the moral knowledge of the ancient classics, he simply left the two contradicting characteristics of wasps unexamined.

The enigmatic nature of wasps had attracted many observers in China.

13 Recited from Huang Hsing-Tsung, “Plants and insects in man’s service”, *Science and Civilisation in China*, by Joseph Needham with the collaboration of Lu Gwei-djen, Huang Hsing-tsung, Vol.6 Biology and Biological Technology, Part.1: Botany (Cambridge: Cambridge University Press, 1986): 521.

14 Huang Hsing-Tsung, “Plants and insects in man’s service”, *Science and Civilisation in China*, 523.

As early as the fifth century, Tao Hong-jing (456-536) cast doubt on the classical description of the wasp in the *Book of Odes*. The legendary Daoist physician and alchemist claimed that the wasp, in fact, sacrificed the caterpillar for the selfish cause of feeding its own offspring. The wasp was not at all acting out of an egalitarian will but abducted the worm, he claimed. Later, Li Shizhen (1518-1593) agreed with Tao Hong-jing in *Ben cao gang mu* [C] (*Compendium of Materia Medica*). When a more realistic and non-ethical approach to the wasp became normal, the debate met another turn with Fang Yizhi. Fang Yizhi argued in *Wu li xiao shi* [C] (*Small Encyclopedia of the Principle of Things*) that the worm might be alive after the wasp captured it. Fang Yizhi did not elaborate his thesis with more evidence, but he may have developed the notion that wasps placed eggs in the body of captured prey. Like a parasite, the larvae of the wasp grew within the live victim, making the host a zombie. Therefore, Fang Yizhi's entomology distanced itself further from moral debates and concerned itself with the actuality of the external world. His implication was that the cruelty, which easily transcended human imagination, was normal in the world of insects. Once ethics became a particular property of humans, the philosophical fiction of insects gave way to more scientific and evidence-based non-fiction.¹⁵

If Yi Ik implicitly reckoned the value of direct observation in knowledge production, it was Yi Kyukyŏng who stepped further away from the moral entomology and moved closer to evidential learning of insects. Although we still need more research on Yi Kyukyŏng's philosophy and methodology, it seems clear that he depended more on physical evidence than Yi Ik. Yi Kyukyŏng relied on pure thinking less than Yi Ik

15 Willard J. Peterson explains the new epistemology of Fang Yizhi as "a counter-explanation to Chu His's claim that coherence (*li*), a nonmaterial agency, is the 'cause'." So, Fang Yizhi did not derive knowledge *a priori* but collected evidential information to build accurate knowledge. Willard J. Peterson, "Advancement of Learning in Early Ch'ing", *The Cambridge History of China*, vol.9 Part Two: The Ch'ing Dynasty to 1800, edited by Willard J. Peterson (Cambridge: Cambridge University Press, 2016): 518.

in understanding the nature of things/matter. Yi Kyu-kyŏng's method can be better explained by his term "learning basics" (*chipon*). He thought that it would be an error to follow either Neo-Confucianism or the Yang-ming School blindly unless one confirmed basic facts. We can assume some influence of Fang Yizhi on Yi Kyu-kyŏng because Yi quoted many times from Fang Yizhi's book, *Wu li xiao shi*. Just as Fang Yizhi recognized matter (*wu* [C]; *mul* [K]) in separation from the human mind, it is plausible that Yi Kyu-kyŏng acknowledged the limit of moral knowledge.¹⁶ He argued that the true value of learning can be found in verification of accurate knowledge. Even though it was irrelevant to moral education, he thought, knowledge had a value in itself. What he most despised was "insufficient explanations" (*sŏlyak*).

He sensed that Korean knowledge of insects needed improvement. That explains why Yi Kyu-kyŏng wrote twenty essays on insects and added them to his encyclopedia, *Oju yŏnmun changjŏn sango* (*Yi Kyu-kyŏng's Collection of Individual Essays in Myriad Things*). In the collection of his entomological essays, we can see that he sought specific and accurate information about honeybees and wasps.¹⁷ In particular, Yi Kyu-kyŏng made remarkable progress in the two questions that Yi Ik could not solve decades before. Yi Kyu-kyŏng also failed to grasp the gender of the queen bee. And yet he described the nuptial flight in great detail, and claimed that the flight brought about specific effects on bee society. The group of "King bee" and male drones together called "the bee's court (*pongjo*)" came out of the hive.¹⁸ He added empirical descriptions on the flight as

16 Regarding a controversy about the genuine meaning of '*kyŏk*,' he took a position of emphasizing the fundamentals in the physical world. He chose classical terms of '*mupon*' (focusing on the basics) and '*kŭnsa*' (thinking about small things in the surroundings) that appear in *Analects*. I will analyze his epistemology in more depth in another article.

17 Yi Kyu-kyŏng, "Kyŏngmul pyŏnjŭngsŏl," *Oju yŏnmun changjŏn san'go*.

18 He wrote that he read it from 'a book of popular tales (*p'aesŏ*). So it is impossible to know exactly what book he was referring to. Yi Kyu-kyŏng, "Milpong pyŏnjŭngsŏl," *Oju yŏnmun changjŏn san'go*.

below:

On a sunny spring day, when there is no wind, bees fly out from their hive and circle around it. They enter and leave their home a few times. Then, the king comes out. [I assume] it must be a kind of a ritual for learning. Soon enough, the king goes and is followed by a group of bees. Among the chasers, those who only fly to the highest point can stay close to the king. Those who cannot fly so high must take a position at a distance. Those that remain close stay alive, while the others die.¹⁹

If Yi Ik observed the same thing and interpreted it from a human perspective, Yi Kyu-kyŏng tried to capture the actuality of the happening. The cruel selection of the fittest in the queen's mating flight received no moral judgment from him. Instead, he took it as a matter of fact.²⁰

Likewise, we can find that Yi Kyu-kyŏng took a non-ethical approach to the wasp. Since he trusted observation as a method of learning, he rejected the ancient theory that the wasp acted for a noble cause. In his survey of the wasps in Korea, he listed three different types: *Kwara*, *Yŏlong*, and *P'oro*. These three types not only had distinctive behavioural patterns but also hunted different prey. The first two usually hunted mulberry caterpillars and small spiders. The third one captured a long-legged spider and a cricket. Being in the same family of the wasp, they had the common characteristic of stinging their prey. Once they secured the victim, they removed the victim's legs and stored them in a cave. In the cave, they deposited their eggs.²¹ Therefore, he believed that the wasps gave the abducted to their caterpillars in the cave. Yi Kyu-kyŏng questioned Fang Yizhi's thesis that the wasps stunned their prey and made zombies out of

19 Yi Kyu-kyŏng, "Milpong pyŏnjŭngsŏl."

20 He juxtaposed "rough description" (*sŏlyak*) to "accurate description". See Yi Kyu-kyŏng, "Kyŏngmul pyŏnjŭngsŏl," *Oju yŏnmun changjŏn san'go*.

21 Yi Kyu-kyŏng, "Kwara Myŏngryŏng pyŏnjŭngsŏl," *Oju yŏnmun changjŏn san'go*.

them. Without more evidence, he refused to support Fang's thesis.

As such, the Korean discourses on bees and wasps changed with the increasing importance of observational information. If Yi Ik initiated the debate on the ethical quality of bees and wasps, Yi Kyu-kyōng continued it when he surveyed myriad things for writing his encyclopedia. Yi Ik's accounts reveal the basic structure of Korean perceptions of insects. Insects were important players of the ethical universe. When this philosophical fiction no longer explained the actuality of nature such as the nuptial flight and the wasps' hunting, new methods were employed by Yi Kyu-kyōng. The quest of describing nature accurately can be revisited in a different angle. In the following section, I will examine the same shift from philosophical fiction to scientific non-fiction through an episode of silkworms.

Neo-Confucian Political Economy and Korean Indigenous Silkworms

The Korean relationship to insects can be assessed from another perspective to show that some insects had a symbolic role in the Confucian political economy. If beekeeping was a personal hobby, silk production from breeding a moth (*Bombyx mori*) required systematic efforts and long-term state policy. This approach was employed more in a place like Korea where the insect was not a native species. In China, the moth had evolved with humans from an early age. At some point in its evolution, the moth lost the ability to fly and entirely depended on human aid for reproduction. While the Chinese mastered the skill of caring for the moth and its caterpillar, it is questionable whether Koreans had the same level of expertise and technology in pace with the Chinese. The exact natural history of *Bombyx mori* in Korea is difficult to know, but later records show us that there could have been a substantial difference between the Chinese moth and the Korean moth in the late Chosŏn period. At the very least there existed a notion that Korean moths were different from Chi-

nese. In sericulture, the care of the silkworm always demanded intensive care and expertise, and an outbreak of sickness quickly annihilated populations of silkworms in nurseries.²² Just as sericulture had symbolic meaning in the Chinese perception of humans-and-insects relations, it also created a long-lasting and veiled interaction between Koreans and the indigenous moth on the peninsula. Given the heavy weight of the Neo-Confucian normality of civilization, discovering the native moth could not have been done without a departure from the obstinate natural philosophy.

The history of humans-and-moths relations altered significantly after the Chosŏn dynasty defined sericulture as an essential part of its political economy. In 1415, the royal court supported the publication of a manual, *Yangjam kyŏnghŏm ch'walyo* (*Essence and Experience of Growing Silkworms*). The author, Han Sang-tŏk, compiled it from Chinese references while working as a high-ranking official.²³ Embracing the Chinese concept of Confucian monarchy, the Yi royal family actively promoted sericulture as well. In particular, the queen and female members of the royal family were obliged to partake in the palace ceremony of *Ch'injamrye*.²⁴ Since the Chosŏn king proclaimed that he would be a Confucian, the family showed its dedication to sericulture by building a royal nursery and a

22 A well-known case of silkworm plagues happened in France in the 1850s and 1860s. The outbreak of *Pébrine*, for example, collapsed French sericulture in the mid-nineteenth century when the *Nosema bombycis* parasite, one of the causes of the silkworm disease, quickly devastated the silkworm population. See Junko Takeda, "Global Insects: Silkworms, Sericulture, and Statecraft in Napoleonic France and Tokugawa Japan," *French History* 28, no.2 (May 2014): 213.

23 About this fifteenth-century manual of sericulture, see Yi Kwang-rin, "*Yangjam kyŏnghŏm ch'walyo* ae taehayŏ," *Yŏksa hakbo* 28 (September 1965).

24 Agriculture (*nong*) and sericulture (*sang*) became a pair in the Confucian political economy. The two were divided by gender. Ideally, the first was a duty of men and the second was a duty of women. The farming husband and the weaving wife were believed to form the ideal Confucian family. The ethical norm was applied to the Yi royal family so the king took charge of a farming ceremony, while the queen was in charge of a silkworm nursery.

textile workshop in and outside of Seoul. The queen, as the female head of the royal family, showed her efforts and attention to the enterprise when she attended the ritual at Ch'angdŏk palace every spring.²⁵ Around the capital, mulberry tree orchards appeared in vicinities such as the current Chamsil (which literally means "silk-rearing rooms") and Chamwŏn ("mulberry orchards").²⁶ In spite of these early efforts from the highest level of society, it seems that Korean silk production grew slowly at best.²⁷

Considering the sheer amount of knowledge, it seems rational that Koreans relied on the Chinese sources. China was doubtlessly the most advanced in silk production. Chinese textual sources and knowledge had enjoyed absolute authority.²⁸ For example, Li Shizhen in *Ben cao gang mu* recorded that Chinese silk-producing moths were diverse in species. Breeders in southern Guangdong had identified five different species: San Mian, Si Mian, Liang Xing, Qi Chu, and Ba Chu. The moth, as Li Shizhen noted, passed moultings that the Chinese understood as "sleep" (mian [C]). San Mian, which had three "sleeps", was a standard species in

25 In 1416, the Chosŏn court opened two nurseries for exhibiting sericulture and educating people in the technique. It soon ordered to establish the same facility in local cities. But the top-down policy of promoting sericulture caused resistance in local society. The supervisors at public nurseries forcibly mobilized labour to meet the expectation of the court. The policy of building local bases of sericulture was thus aborted in the sixteenth century. See Yi Ŭi-myŏng, "15, 16-segi yangjam chŏngch'aek kwa kŭ sŏnggwa," *Han'guksaron* 24 (February 1991): 104-105, 118. As for the Yi royal family's efforts of promoting silk-farming in the early Chosŏn period, see Nam Mihye, "Chosŏn ch'ogi nongsang chŏngch'aek ŭi surip kwa yangjam ŭirye ŭi chŏngpi," *Iwha sahak yŏn'gu* 29 (December 2002): 163-164.

26 Yi Ŭi-myŏng, "15, 16-segi yangjam chŏngch'aek kwa kŭ sŏnggwa," 108.

27 Yi Ŭi-myŏng, "15, 16-segi yangjam chŏngch'aek kwa kŭ sŏnggwa," 100-104.

28 In Chinese mythology, the first sericulturist is believed to be Lady Xi Ling, the wife of Huangdi. Along with the Lady, a few other saint patrons such as Princess Yu, the 'horsehead' woman were revered in China. See Dieter Kuhn, *Science and Civilisation in China*, vol.5 "Chemistry and Chemical Technology Part IX Textile Technology: Spinning and Reeling," 247.

northern China while the four-time sleepers (Si Mian) were more commonly found in southern China.²⁹ This biological difference and nomenclature of *Bombyx mori* was widely acknowledged from the Yuan dynasty as we can see in *Wang Zheng nong shu* (*Agricultural Writings of Wang Zheng*), a popular manual of agriculture and sericulture.³⁰

The growth of Korean knowledge in the field can be found in the late Chosŏn period. In the same way that moral philosophy motivated Yi Ik to observe honeybees, Korean women began to garner first-hand information as they were expected to care for the moth according to Confucian ethics. Initially their empirical knowledge did not enter the realm of letters, as the literacy rate of women remained low in the early Chosŏn period.³¹ The active participation of Korean women in sericulture proves that Neo-Confucianism became a motivation of scientific activity despite its oppressive gender ethics on women. Nam Mihye, a Korean scholar, reports a case in which a Korean woman of the late seventeenth century established her own business by utilizing her skills of breeding the caterpillar. After she married a man in P'yŏngan Province where many silk-producing workshops existed, she mastered the technique and proved her expertise enough to be a successful and independent breadwinner.³²

29 Li Shizhen, *Ben cao gang mu*, chong zhi yi.

30 Re-cited from Watabe's commentary in page 47. See Cui Shi, *Shimin gatsuryō: Kandai no saiji to nōji*, translated by Watabe Takeshi (Tokyo: Heibonsha, 1987).

31 A Korean scholar Nam Mihye, who has studied the history of Korean sericulture extensively, has discovered a few cases in which women played a significant role in spreading and continuing the technique. According to Nam, there are several records of the spread of expertise through females. A woman from a noble clan of Yŏhŭng Mins is known as the first to introduce sericulture in the Sŏngju area of Kyŏngsang province. Her marriage to a family in the area can be dated back to the fifteenth century. After her, the next fifteen generations continued it. Nam Mihye, "Chosŏn hugi sadaepuga yŏsŏng ŭi ch'isan kwa kyŏngje hwaldong – kilssam ŭl chungsim ŭro", *Tongyang kojŏn yŏn'gu* 64 (September 2016): 215-216.

32 Her story is recorded in "Mokssipujŏn" written by Chŏng Pŏnjo (1723-1801). See Nam Mihye, "18-segi chamsang ŭro ch'isanhan Chŏnju Yissi," *Yŏsŏng kwa yŏksa* 9 (September 2008). It seems that sericulturists in P'yŏngan province also sold

Map 1. The Map of Korean Sericulture in 1907 (Black dots mark the silk production) Hayashi Dansaku, *Kankoku sangyō chōsa fukumeisho* (Seoul: Chōsen sōtokufu, 1907).

eggs to other regions. So the region could be a primary origin of *Bombyx mori* in Korea and likely distributed the breed to nurseries in the south. A Yi family in Kyōngsang province is known to have bought the eggs from breeders in P'yōngan province. See Nam Mihye, "16-segi sadaepu Yi Mun-gōng'ga ūi yangjamōp kyōngyōng ae taehan ilyōn'gu", *Chosōn sidaesa hakbo* 26 (September 2003): 25-26.

Therefore, no matter how fictional the perception of female-and-caterpillar companionship was, the moral philosophy did not oppose the development of scientific knowledge. Training women as good breeders perfectly fit into the metaphysical order of *li*. We can find another case of the combination between moral philosophy and natural philosophy in female scholar Yi Pinghŏgak. Writing in the Korean vernacular alphabet, she recorded what she knew and how she felt about the caterpillar. First of all, she took it for granted that caring for the caterpillar was a female duty. However, she claimed that Korean women must raise their voice and make decisions from their own ethical thinking. Instead of following the customs blindly, she urged her female readers to treat the caterpillar as a life. Yi Pinghŏgak recognized an unethical element of silk production because it was made possible by the death of the moth. She wrote, "If you put the cocoon in boiling water, you can see that it reacts and writhes in pain. ... They act so because they want to live and cannot tolerate the hot temperature". She later questions, "How can a benevolent person (*ŏjin saram*) do such a thing?" Yi Pinghŏgak instructed differently from the Confucian norm that virtuous women should raise and kill the caterpillar. Based on her own observations, she noticed that the caterpillar was not so different from any other living thing. "Occasionally, you can raise them in a small number and weave cloth for seniors of your family," she instructed.³³

Her independent voice on the meaning of sericulture challenged existing ideas based on self-evident propositions. Yi Pinghŏgak tried to refine her scientific knowledge of the caterpillar as if she were a medical caretaker. Her ethical enthusiasm pushed her to examine the insect as an object of research. In her encyclopedia, *Kyuhap ch'ongsŏ* (*Home Encyclopedia for Women in the Inner Chamber*), she wrote specific remedies for treating the illnesses of the insect. The caterpillar became most vulnerable after its "sleep", she argued. If it showed any signs of sickness, the breeder must counter it with swiftness and determination. One possible remedy

33 Yi Pinghŏgak, *Kyuhap ch'ongsŏ* (Seoul: Pojinje, 1975):176.

was to nourish the insect with special foods. After boiling red peppers in water, one could spill the water on mulberry leaves. Then, one should add powders of sticky rice on top of the leaves soaked in the peppered water. She verified this remedy in her own experiment. In a severe case of illness, one should add licorice to the spicy water. It is striking that she did not quote from any Chinese classics or Korean texts as verification of her methods; rather, she believed that real-life lessons alone created scientific knowledge.³⁴

In the same context, the appearance of Korean empirical knowledge widened the boundary of the Korean concept of the silk-producing moth. The empirical method could not have appeared without the awareness that China could be wrong about the moth - especially Korean indigenous moths. The authority of Chinese knowledge weakened decisively when Koreans recognized the distance between Chinese moral and natural philosophy and the Korean reality. The discovery of Korean native moths coincided with similar discoveries in Ming-Qing China and Tokugawa Japan. In Japan, a native species of *Antheraea yamamai* was found. Terajima Ryōan called it “Yamamayu” in his encyclopedia *Wa Kan sansai zue* (*Illustrated Sino-Japanese Encyclopedia*). In his account, there was a difference between the Chinese moth and the Japanese wild moth in that the Japanese moth could fly and survive in nature without human aid. The silk from the wild moth, conventionally called Tussar silk now, is sturdier than the ordinary silk of *Bombyx mori*. The Japanese weavers used Tussar silk without dying because no ink could change the color. Later, this moth

34 In the eighteenth century, the skill and knowledge of caring for *Bombyx mori* developed in many countries other than China. In Tokugawa Japan, sericulture became an important economic activity of many domains like Eichizen Kaga. Yi Pinghōgak adopted the Chinese mythology in revering the patron spirit of *Bombyx mori*, but Terajima Ryōan insisted in his encyclopedia *Wa Kan sansai zue* (*Illustrated Sino-Japanese Encyclopedia*) that the Japanese had their own mythical origin of sericulture. Instead of Lady Xi Ling, the goddess of food Ukemochi no kami was given credit for introducing sericulture to humankind. Terajima Ryōan, *Wa Kan sansai zue* (Tokyo: Nihon zuihitsu taisei kankōkai, 1929): 574.

migrated to Europe by the hands of European breeders.³⁵ In fact, the family of *Saturniidae* has many other varieties in China and India as well.³⁶ In Ming China, the Chinese wild moth, perhaps *Antheraea pernyi*, began to draw attention from the fifteenth century. As far as we can confirm from the records, Chinese breeders in Shandong province raised the wild moth in oak trees in the seventeenth century.³⁷

In the early nineteenth century, Yi Kyu-kyŏng noted in his entomological essay the existence of Korean knowledge and practices in using various wild moths. Today it is impossible to determine what kinds of wild moths Korea had in the nineteenth century. However, Yi gives us some reasonable clue to guess their identity. He claimed that farmers in Hwanghae province weaved Tussar silk. Koreans normally used three species of moths in sericulture: *Sangjam*, *Chamsiljam*, and *Chakpanjam*. Interestingly he argued that these three were not identical to the Chinese moth, which Koreans called *Wŏnjam* (which literally means, “Original Caterpillar”). The Chinese moth was only found in the northwestern border area of Hamgyŏng province, and in all the other regions, people disliked the Chinese caterpillar. Unfortunately, he did not elaborate on how different the Korean moths were from the Chinese, and thus it is difficult to determine whether *Bombyx mori* had taken a different form on the Korean peninsula. It is also possible that there appeared a mutation of the species in Korea. Either way, it seems that Koreans believed that their

35 The global migration of *Antheraea yamamai* from Japan to Europe started in 1861. And it spread in Eastern Europe after it escaped from a nursery in Slovenia in the 1860s. See Ana Nahirnić, Stoyan Beshknov, “The first report of Japanese oak silkmoth *Antheraea yamamai* (Guérin-Méneville, 1861) (Lepidoptera: Saturniidae” in Montenegro,” *ZooNotes* 82, no.1-4 (October 2015): 81.

36 See T.P.S. Chauhan and Mukesh K. Tayal, “Mulberry Sericulture,” *Industrial Entomology*, Omkar ed. (Singapore: Springer, 2017): 199-200.

37 See Yanqun Liu, Yuping Li, Xisheng Li, and Li Qin, “The Origin and Dispersal of the Domesticated Chinese Oak Silkworm, *Antheraea pernyi*, in China: A Reconstruction Based on Ancient Texts,” *Journal of Insect Science* 10, no.180 (October 2010): 4-5.

silk-producing moths were unique and indigenous.

In his classification of the moths, Yi Kyu-kyŏng did not confine himself within the normative idea that Koreans should learn about *Bombyx mori* from China. He classified the insects into four species: *San* (Mountain), *Ya* (Field or the Wild), *Ka* (House), and *Su* (Water).³⁸ He found two sub-kinds of *Ya* (Field or the Wild) in Korea. In Hwanghae province, local breeders raised a moth that only fed on the leaves of the Chinese Cedrela tree. By taking a name of the Chinese Cedrela tree, the local people called it *Ch'un'gyŏn*. Another kind of *Yajam*, he wrote, had no preference in diet.³⁹ Given the short information, it is difficult to determine which was *Antheraea pernyi* and which was *Antheraea yamamai*. He collected information about the moths from Korean breeders because for him, their empirical knowledge was equal in value to any text. According to a local breeder, four towns of Hwanghae province – Haesŏ, Hwangju, Sŏhŭng, and Pongsan – were producing Tussar silk. The method was described as below:

When one rears wild moths, the task starts from catching them in the wild.⁴⁰ They are much larger in size [than the normal moth]. Then, their legs must get tied by a string. It is to prevent them from escaping. After that, one places males and females on the same paper. They begin to mate, and females lay eggs. The eggs must be stored carefully until the next spring. When spring comes, the eggs will hatch. The caterpillars should be placed on branches of the *Ailanthus altissima*. They will feed themselves on the trees. Later, they turn into cocoons. The cocoon is the gigantic size of a

38 Yi Kyu-kyŏng wrote that Koreans in his time avoided rearing Chinese silkworms because it could cause a natural disaster. It seems that Korean breeders preferred to raise Korean indigenous silkworms.

39 Yi Kyu-kyŏng, “Sanyajam pyŏnjŭngsŏl,” *Oju yŏnmun changjŏn san'go*.

40 Kang Chi-mun who narrated the information to Yi Kyu-kyŏng called the wild worm “*Yajam*.”

chicken egg. They are firm and densely spun.⁴¹

Yi Kyu-kyŏng added a special note that the wild moth had a certain merit. Because the wild moth had no dietary preference, poor peasants could raise it at a relatively low cost. When they did not have mulberry orchards for common use, the native moth could be a cheap alternative to *Bombyx mori*.⁴²

To sum up, Korean perceptions of the moth were based on more concrete and specific knowledge in the late Chosŏn period. Initially, Korean sericulture spread under the state policy of transplanting the Confucian ideal. As a part of moral philosophy, the duty of breeding the caterpillar enforced close contacts between Koreans and insects. Gradually, however, Korean knowledge of insects moved toward greater inclusion of empirical information. When sericulture was no longer something that Koreans should copy from China, Korean voices appeared on why and how to raise the moth. Moreover, their discovery of Korean wild moths was an astonishing sign that they had departed from the nominal thinking and behaviour.⁴³

41 Yi Kyu-kyŏng, "Sanyajam pyŏnjŭngsŏl."

42 If it liked to eat the leaves of *Ailanthus altissima*, it is possible that the moth was a Korean wild moth, *Kajung namu koch'i napang*. It is a species of *Samia cynthia*. This wild moth makes a different colour of silk, depending on the kinds of leaves it eats. It makes a dark black color in the case of eating *Z. piperitum* (Japanese Prickly Ash tree). It produces a dark grey color when it feeds *Aralia elata* (Japanese angelica tree). So it is possible that the Hwanghae breeders intentionally fed the caterpillar with the tree of heaven to achieve a desirable color of Tussar silk. Kim Poyŏn, Ch'oe Yŏnghwan, Pak Namsuk, Yi Houng, Pak Sangpong, Chang Ch'angsik, Sŏng Suil, Mun Chaeyu, Hwang Chaesam, Yi Sangmong, "Milyang esŏ ch'ŏumŭro palgyŏndoen yasaeng kyŏnsa konch'ung'in Kajung namu san nue napang ŭi kwanch'al t'ŭkjing," *Han'guk ŭngyong konch'ung hakhoe haksul taehoe nonmunjip* (2000): 97.

43 In 1914, a Japanese sericulture expert, Nagaoka Tetsuzō, examined traditional Korean sericulture. According to him, Korean sericulture was found almost all around the country. In Kyŏnggi province, Suwŏn County had a substantial size of

A New Concept of Pest Control

In the last part of this article, I examine another case that illustrates the shift in Korean concepts on insects. As we discussed above, Confucian ethics ruled Korean ideas of “good and bad insects”. “A bad bug (*akch’ung*)” meant a predator which harmed something moral. The ethical balance in nature was beyond the control of humans because the cosmic balance stood on a self-evident rule of *li*. People were to take the behaviours of insects for granted as a result of the natural law of all things. While honeybees and silkworms were born to have a bonding to virtuous people, others were also to have their own cause of existence. The locust exemplifies a different role of insects in the cosmic balance. It seemed that grasshoppers did not have an obvious benefit for humans; rather, there was a notion that they represented the rage of Heaven against immoral humans. The classical Chinese term, *Huang* [C] (*Hwang* [K]), referred to a broad range of grasshoppers in the family of *Acrididae*. The word *Zai Yi* [C] (*Chaei* [K]), which included in its meaning a plague of locusts, held a metaphysical message that natural disasters occurred as a kind of punishment for humans who had severed the harmony of the universe.

production. He found that Kyōngsang, Ch’ungch’ōng, P’yōngan and Kangwōn province all had their own centers of silk production. And he suggested changing the species of silkworms in colonial Korea to improve productivity. Nagaoka’s witness implies that Korean silkworms were not identical to Japanese silkworms in the early twentieth century. Nagaoka Tetsuzō, “Chōsen zairai no mayu oyobi kiito,” *Chōsen sōtokufu geppō* 4:7 (1914), pp.1-2. Nagaoka Tetsuzō evaluated that Korean silkworms were usually of the “three-sleep” variety. The absolute majority of Korean silkworms made a green-color cocoon. And there were no professional breeders. Korean farmers and their wives used many different kinds in the mixture. The traditional method of sericulture contrasted Japanese methods of selective breeding. Nagaoka Tetsuzō, “Chōsen zairai sanshu,” *Chōsen sōtokufu geppō* 4:5 (1914): 2. In the end, Nagaoka Tetsuzō’s survey of Korean traditional sericulture remained at a superficial level.

Since a secular ruler under Chinese civilization was given the Mandate of Heaven, it was his duty to maintain the balance. If he was responsible for moral degradation in his realm, nature could show signs of discomfort and anger through varied catastrophic events. Whenever such disasters happened, it meant there was an urgent need for humans and their leaders to repent their actions and change course. In this philosophical fiction, auspicious occurrences such as a good harvest signaled the excellence of the ruler's moral integrity and actions.⁴⁴

The Confucian concept of natural disasters affected the Korean perception as the Chosŏn dynasty declared Neo-Confucianism as the state's doctrine. In the Confucian tradition, the New Text School contributed to the formation of the theory of natural disasters. Under the leadership of Dong Zhongshu [C] (179-104 BCE), the New Text School interpreted the records of natural blights from an ethical perspective. Although Neo-Confucianists toned down the ancient mysticism of Dong Zhongshu, Neo-Confucianism used the texts created by the New Text School. In the fifteenth and early sixteenth century, Korean nobles who embraced the Chinese philosophy began to use the Confucian concept of natural disasters for their own political purposes. They actively interpreted the happenings in nature as a means of checking the autocratic power of the Yi monarchy.⁴⁵ Prominent scholars such as Yi Ŏnjŏk (1491-1553) and Yi Yi (1536-1584) advised Yi kings to review their moral quality whenever natural disasters struck.⁴⁶ Since the Neo-Confucianists believed that the

44 Mark E. Lewis, *Sanctioned Violence in Early China* (Albany: SUNY Press, 1990), 221.

45 About the theory and its political uses in the Chosŏn dynasty, Ha Sŏjŏng's article, "Injodae chaei ae taehan insik kwa taeŭng," well summarizes historiography. Ha Sŏjŏng, "Injodae chaei ae taehan insik kwa taeŭng," *Taegu sahak* 127 (May 2017): 1-4. Also see Kyŏng Sŏkhyŏn, "Chosŏn wangjo sillok chaei kirok ŭi chaeinsik: 16-segi chaeiron ŭi chŏngch'ŭi sasangjŏk kinŭng chungsim ŭro," *Hanguksa yŏn'gu* 160 (May 2013).

46 Kyŏng Sŏkhyŏn, "17-segi *Chaeigo* ŭi chayŏn kirok kwa kŭ ŭimi", *Han'guk kwahaksa hakhoeji* 37, no.1 (April 2015): 163-164.

human mind and the external world were inter-connected, it was difficult to study nature as an independent object of scientific research.

We can find a critical voice on the old theory in the eighteenth century. Yi Ik initiated scepticism on the Neo-Confucian interpretation of natural disasters. He doubted if Dong Zhongshu comprehended the external world accurately. In the essay “Chaei,” he pondered a different way of seeing the human-and-nature relationship. This does not mean that he wanted to redefine nature as something independent from the human mind, but he did worry about the limitations of Confucian ethics: what if nothing happened when a secular ruler made a horrible mistake? Could the silence of Heaven legitimize a poor administration? Yi Ik lamented that many rulers felt no responsibility for their bad decisions as long as Heaven showed no signs of rage.⁴⁷ As a devotee of Neo-Confucianism, he wished to renovate the ethics by using his method of “the investigation of things and the extension of knowledge.” Although direct observation of nature did not take over ethical contemplation, he used the happenings in nature in his argumentation. When all humans see the same sky, he argued, there was no reason that certain people, like the Son of Heaven, could communicate with it exclusively. He was not willing to separate the human mind from the external world, but he cautiously considered a possibility that there could be multiple sets of the truth; one in the human mind and the others in nature.⁴⁸

In his reconceptualization of natural disasters, the observation of locusts played a significant role. In an essay titled “Pujong kuin (Locusts and Earthworms),” he remarked on his personal experience of watching grasshoppers and their reproductive methods. He wrote as below:

[A grasshopper] flew and sat on the ground. It began to dig a pit like earthworms, using its sharp tail. Once it finished, the grasshopper placed the lower body inside the hole. Then, it did not

47 Yi Ik, “Chaei,” *Sŏngho sasŏl*, vol.1, Ch’ŏnjimun.

48 Yi Ik, “Chaei.”

move for a while. I observed this scene myself. I saw that the tail has two edges and that these edges are sharp enough to penetrate hard soil. One day when I strolled around in the countryside, I happened to spot it doing so. I attempted to repel it away in vain, and it stubbornly refused to move. So, I dragged it out of the hole by force. Then it suddenly reacted and showed intense agony. Soon it released white bubbles from its abdomen. In the bubble, there were several dozen thin larvae [sech'ung]. After a while, the grasshopper flew away. ... For the first time, I realized that the grasshopper's larvae stay underground and that they grew up to be caterpillars. Grasshoppers come in many different varieties, with brown, blue, or patterned legs. They all lay eggs in a hole in the ground.⁴⁹

In this entry, he treated the insect as an object of physical observation without contemplating its metaphysical function. By discovering the sheer fact that grasshoppers lay eggs in the ground, he purposed to disabuse Koreans of the popular myth that hoppers mate with earthworms. According to him, some Koreans even believed that grasshoppers not only had sexual intercourse with worms but also that hoppers could enhance male sexual potency. Yi Ik disregarded the popular myth and asserted that accurate knowledge of the hoppers could save people from ignorance. He wished that people could realize “how things are made [differently]” from the observation of those things.

The efforts to understand locusts scientifically implied that grasshoppers might not be a punitive agent of Heaven. This new idea paralleled with Xu Guangqi's early analysis of locusts. Xu Guangqi pioneered new entomological debates early in the sixteenth century when he worked closely with his Jesuit friends like Matteo Ricci (1552-1610). As a scholar-official of the Ming Empire, Xu Guangqi proposed a plan for controlling the locust population by artificial means. His famous proposal later

49 Yi Ik, “Pujong kuin,” *Sŏngho sasŏl*, Manmul-mun.

inspired similar ideas of pest control in the following Qing Empire. Chen Fangsheng, for example, wrote an essay “Bu huang kao [C]” (An Analysis of How to Catch Locusts) that was included in *Si ku chuan shu* [C] (*Complete Library of the Four Treasures*) in 1781.⁵⁰ The Qing Empire highly evaluated the scholarship of Xu and Chen and their claim that nature could be controlled by scientific knowledge.

As Yi Ik esteemed the works of Xu Guangqi and his Jesuit friends, Xu’s concept of insects deserves our attention. Xu thought that natural disasters were preventable; in other words, that there was no proof that such disasters reflected the intention of Heaven. “If a state failed to prepare food for the future and remained unprepared for a famine, it is all the responsibility of humans,” Xu remarked.⁵¹ He admitted, however, that drought and flood could occur no matter how hard people tried to prevent them. But when it came to a plague of locusts, people could control the hungry insects before they got out of control. Xu argued confidently, “the cost of having a swarm of locusts is the heaviest, but the prevention of it is the easiest.” China had two different names to identify the stage of the locust in the metamorphosis. The first name was called “*Huang*” [C], meaning the nymph stage. It was born from an egg the size of a grain, but soon grew to the size of a large fly. In the stage of “*Huang*” it could not fly, and it only jumped and lived in a group. A few days later, though, it became able to fly. When it reached to the mature stage, people called it “*Nan*” [C]. The adult grasshopper began to lay eggs underground and in eighteen days a new life cycle of “*Huang*” began. Therefore, Xu believed that accurate perception of biological life cycle, not moral quality, should be the first step in knowing things.⁵²

Korean entomological discourses shifted in the same direction in the

50 Chen Fangsheng, “Bu huang kao,” *Zhong guo huang zheng quan shu*, 2-ji (Beijing: Beijing gu ji chu ban she, 2004): 19-31.

51 Recited from Chen Fangsheng, “Bu huang kao.”

52 One of the methods was to remove their habitat. It was assumed that a lakeshore often hosted grasshoppers and their young. Ibid.

time of Yi Kyu-kyŏng. Yi Kyu-kyŏng was not only aware of the work of Chen Fangsheng but also tried to upgrade the information with more factual details that he discovered in Korea. Similar to his ideas on wasps and moths, he did not believe that the Chinese authors had flawless knowledge about things in Korea. He learned from the Chinese debates that “*Huang nan* [C], *Hwangnam* [K]” could cause immense damage to people’s lives. However, he wondered if Koreans perceived the grasshopper in the same way. The gap between the Chinese concept and the Korean perception was reassured by his examination of Korean locusts. In his record, a swarm of locusts occurred in 1759 on the western shores of Hwanghae, Ch’ungch’ŏng, and Chŏlla province. They appeared all of a sudden. Yi Kyu-kyŏng wrote, however, that their external shape looked more like a cicada than a grasshopper. Also, the size was much smaller than what he had learned in Chinese books.⁵³ When the locusts arrived, they destroyed crops and vegetables. When the disaster occurred, he noted, the local administration conducted a religious ceremony (*P’oje*) for soothing a spirit of the plague.⁵⁴

Before analyzing the identity of the insect, we should consider the pos-

53 In *Oju yŏnmun changjŏn san’go*, he wrote that the drought happened in a year of Muja. The year of Muja was 1708 and 1768. If the plague occurred in a year of Kimyo, the plague must have happened in 1759 because the eighteenth century had only the year of Kimyo once in 1759. Therefore, we can assume that the year of Muja was a misspelling of the year of Muin which was the year of 1758. Yi Kyu-kyŏng, “*Hwangnam pyŏnjŭngsŏl*,” *Oju yŏnmun changjŏn san’go*.

54 Ibid. Yi Kyu-kyŏng’s thesis preceded modern research on the pests that plagued Korean agriculture. In 2010, a group of Korean entomologists again agreed that the insects which troubled Korean farmers were not exactly grasshoppers. They conclude that the insects were more likely oriental armyworms (or rice ear-cutting caterpillars, *Mythimna seprata*) of the family *Noctuidae*, not grasshoppers. They found 262 cases of the plague in the *Sillok*. Pak Hae-ch’ŏl, Han Man-chong, Yi Yŏng-po, Yi Kwan-sŏk, Kang T’ae-hwa, Han T’ae-man, Kim T’ae-u, “Chosŏn wangjo sillok kwa haegoejetŭngnok punsŏk ŭl t’onghan Hwangch’ung ŭi silch’e wa pangje yŏksa,” *Han’guk ŭngyong konch’ung hakhoeji* 49, no.4 (December 2010).

sibility that Yi Kyu-kyōng's information was inaccurate. In the *Chosōn wangjo sillok* (*the Veritable Records of Chosōn Dynasty*), there is no record of the same ceremony in 1759. Table 1 shows the years of the ritual and their locations.

Table 1. Records of *P'oje* in the *Veritable Records of Chosōn Dynasty*⁵⁵

Year	Reign	Location
1725	1 st year of King Yōngjo	Hwanghae, P'yōngan
1731	7 th year of King Yōngjo	Kyōngsang, Chōlla
1733	9 th year of King Yōngjo	Hwanghae
1734	10 th year of King Yōngjo	Ch'ungch'ōng, Chōlla, Hwanghae, Kyōnggi
1744	20 th year of King Yōngjo	P'yōngan
1763	39 th year of King Yōngjo	Hwanghae
1765	41 st year of King Yōngjo	Hamgyōng, Hwanghae
1768	44 th year of King Yōngjo	Many provinces
1781	5 th year of King Chōngjo	Kyōngsang, Chōlla
1782	6 th year of King Chōngjo	Kyōnggi
1784	8 th year of King Chōngjo	Kyōnggi
1786	10 th year of King Chōngjo	Chōlla, Hwanghae
1792	16 th year of King Chōngjo	Chōlla, Kyōngsang
1828	28 th year of King Sunjo	Kyōngsang

The year 1759 does not appear on the list. Instead, the closest years of the happenings were 1733-1734 and 1763. In both, the swarm appeared in Hwanghae province, which had a broad rice field. Because Yi Kyu-kyōng was born in 1788, his memory could be wrong on the exact date of the occurrence.

On the other hand, his account of what happened in his lifetime looks more credible. He wrote of another swarm in 1828 in which he claimed

⁵⁵ The data is collected from a search of the keyword *P'oje* in the digital version of the *Veritable Records of Chosōn Dynasty* (<http://sillok.history.go.kr>).

that the insect had the shape of a cicada. *Sillok* has the same record on the outbreak in 1828. A royal inspector Chŏng Ki-sŏn submitted a report saying that he saw a small insect. In his report, he described how “Fourteen counties, including Taegu, are now under attack of what looks like a cicada. It is small like a mayfly.”⁵⁶ Yi Kyu-kyŏng saw the same insect. Yi wrote, “All mishaps caused by the insect are equivocally called the plague of locust. But [in fact] they are not grasshoppers.”⁵⁷ He identified the insect as “*Myŏlmyoch ’ung*.” It was a hopper in the shape of a cicada and the size of a mosquito. Given the description, there is a high chance that the insect was a brown planthopper (*Nilaparvata lugens*), a member of the *Delphacidae* family, that has continued to be a major threat in rice farming until today.⁵⁸

In the early twentieth century, modern biologists faced the same question that Yi Kyu-kyŏng raised for the first time in Korea. In 1921 and 1924, Japanese biologists Muramatsu Shigeru and Okamoto Hanjirō published two conflicting opinions on the identity of agricultural pests in Korea. Muramatsu Shigeru claimed that a grasshopper caused the damage in his time and assumed that the insect was probably to blame for past incidences as well.⁵⁹ He arrived at that conclusion in 1921 after examining the pests at the Public Agricultural Promotion Centre in Suwŏn. By contrast, Okamoto Hanjirō argued that it was not a grasshopper but a brown planthopper. Later in 1976, Korean entomologist Paek Un-ha agreed with

56 *Sunjo sillok*, 30-kwŏn, Sunjo 28-nyŏn, 7-wŏl 9-il, Chŏngmi 3-pŏnjjŏ kisa.

57 Yi Kyu-kyŏng, “Hwang nam pyŏnjŭngsŏl”, *Oju yŏnmun changjŏn san’go*.

58 In the 1900s, Koreans began to adopt modern entomology and mixed their traditional nomenclature with Japanese nomenclature. “Unka [J] (Pujinja [K]),” (at the top of the right side in figure 2) instead of Hwangnam, meant a group of agricultural pests in the early twentieth century. In *Honam hakbo* of 1908, the new term was introduced with an explanation that this pest has more than 20 varieties. The Japanese influence on Korean entomology grew later after the Japanese colonization of Korea. “Nonghak,” *Honam hakbo* 7 (1908): 32-37.

59 Paek Un-ha, “Chosŏn wangjo sillok e nat’anan Hwanghae charyo,” *Kyujanggak* 1 (November 1976): 1.

Okamoto that the Korean historical records on the swarm must be attributed to the brown planthopper.⁶⁰ Paek Un-ha assumed that the brown planthopper must have caused the damage of 1828. However, none of the three biologists above had any chance to see Yi Kyu-kyōng's early report of the event.

Fig. 3. Illustrations of Agricultural Pests in 1908 ("Nonghak", Honam hakbo 7, December 1908)

Yi Kyu-kyōng's understanding of the grasshopper also went beyond the previous level of moral philosophy. What interested him the most was physical reality, not ethical meaning. He heard that "[Korean grasshoppers] stay on the leaves of the rice plant. But they consume only dew and do not harm rice." One way of controlling the population of grasshoppers was to eat them as a snack. Yi reported that people in rural areas caught and ate grasshoppers, claiming that they tasted like shrimp. Sometimes people crushed them in powder and dried them in sunlight. They then added the powder to salty water and drank it. They believed that the lo-

60 Yi Kyu-kyōng, "Hwang nam pyōnjūngsōl", *Oju yōnmun changjōn san'go*.

cust drink had a therapeutic effect of enhancing the kidney.⁶¹ It seemed to him that grasshoppers were relatively easy prey for human hunting. He wrote, “If people do nothing and let the insects destroy everything, isn’t it a pity?”⁶²

Thus, the invasion of locusts was no longer taken as an unstoppable punishment of Heaven. The grasshopper was subject to human control, and the success of that control depended on scientific knowledge. If the secularized view of the grasshopper started from the time of Yi Ik, it earned more factual details and empirical methods in the stage of Yi Kyu-kyŏng. His strong interest in the actuality of things made the shift possible in the early nineteenth century. Even if Yi Kyu-kyŏng was rather an exceptional figure of the time, we should not miss that the philosophical fiction of insects was losing its authority at least among Korean intellectuals.

Conclusion

To summarize, Korean perceptions of insects reflected the change in the relationship between humans and non-humans in the late Chosŏn period. Neo-Confucianism and the ethical understanding of things were once primary platforms upon which Koreans understood the nature of insects. The creatures did not exist *ad hoc* but were designed to play significant roles in the cosmos of *li*. In the Neo-Confucian worldview, “the investigation of things” (*kyŏngmul*) manifested the symbolic meanings of all happenings in the physical world because humans and non-humans had no boundary between the two. Honeybees and caterpillars represented the noble mind, while the overgrowth of locusts meant moral downfall. In

61 Yi Kyu-kyŏng, “Hwang nam pyŏnjŭngsŏl.” I also had a chance to see that people in Yŏju of Kyŏnggi province fried grasshoppers and ate them as a snack in the late 1980s.

62 Yi Kyu-kyŏng, “Hwang nam pyŏnjŭngsŏl.”

ethical entomology, each creature had a pre-determined level of virtue and presented useful lessons to those who “investigated” things. Moral discourses on insects would benefit the self-cultivation of human observers.

However, moral entomology was a philosophical fiction. The presence of a queen bee was incompatible with the social ideology that the male patriarch was deemed the most natural. Thus, the queen must be called the king to defend the moral idealism. That can explain why Yi Ik missed the existence of the queen and female worker bees after all his years of beekeeping. Along with Neo-Confucianism, Chinese knowledge of insects, as an essential element of the fictional world, had enjoyed high status in Korean perceptions of insects. The case of sericulture teaches us how and why Korean entomological knowledge had depended on Chinese books more than the physical reality until empirical knowledge finally appeared in the eighteenth century. Even though *Bombyx mori* was a foreign species, the ideological framework of agriculture and sericulture required *Bombyx mori* in Korea. This does not mean that the fictional view of insects hindered the growth of scientific knowledge. On the contrary, the state policy of fostering *Bombyx mori* had a positive effect on developing Korean skills in the care of the vulnerable caterpillar.

Therefore, it is critical to note that the Korean discovery of new species such as *Antheraea pernyi*, *Antheraea yamamai*, *Samia cynthia*, and *Nilaparvata lugens* occurred against the backdrop of the philosophical fiction of things. It is indeed a puzzle to understand how the old fictional view of insects gave way to a realistic view of things. In my view, Yi Ik, Yi P'inghōgak and Yi Kyu-kyōng give us clues to better understanding this complicated change in Korean epistemology. The three figures represent transition from moral entomology to observational studies. Most of all, they acknowledged the possibility that matter (*mul*) had its own rules and laws. If the physical world could not be confined to philosophical fiction, a new method of learning was deemed necessary. Observing the behaviours of insects opened their eyes to the strange rules and nature of the physical reality. Korean native caterpillars and grasshoppers unknown

in Chinese books and metaphysics thus inevitably became objects of scientific research.

The ancient theory that ethical havoc would cause a catastrophe of locusts was viewed with doubt in the same manner. Since insects were nothing but physical matter, their symbolic roles turned invalid in the minds of observers of nature. After scholars such as Xu Guangqi argued that humans could control nature by scientific knowledge, Korean entomological discourses also paid more attention to matters of fact over spiritual messages. Most notably in the case of Yi Kyu-kyŏng, real-life observation mattered more in his search for truth than the textual sources written by Chinese authors. His discovery of “*Myŏlmyoch ’ung*” (*Nilaparvata lugens*) deserves our attention for this reason. It not only preceded by about a hundred years the discoveries of modern entomologists in the twentieth century but also marks a new level of pre-modern Korean knowledge of insects in the late Chosŏn period.

Hence, even before the arrival of modern science and biology, the body of Korean scientific knowledge on insects was growing at its own pace. However, it would be an exaggeration to claim these discoveries as a sign of the scientific revolution. Both Yi Ik and Yi Kyu-kyŏng maintained their respect of Neo-Confucian metaphysics and Chinese classics. And they were far from scientists in the modern definition of the term. Their goal, as men of their time, was to reform the Korean perception of things. By recognizing the value of observational discovery, their reform intended to supplement the pre-existing philosophical fiction with a new genre of non-fiction. In my view, their intellectual endeavours to broaden the scope of knowledge had substantial meaning as part of the reform within Neo-Confucian epistemology.

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<Abstract>

Shifting Perceptions of Insects in the Late Chosŏn Period

Sangho Ro

In this paper, I examine the historical shift of Korean perceptions about insects that occurred in the late Chosŏn period. By analysing three specific cases of bees, moths, and hoppers, I argue that Korean knowledge of insects expanded its volume with the appearance of new consciousness about nature. Although Korean concepts of insects initially depended on Chinese books and Neo-Confucian natural philosophy, the eighteenth and early nineteenth century saw new voices of Koreans who perceived insects as the object of scientific research. The Chosŏn dynasty and its ruling ideology of Neo-Confucianism introduced the notion that humans and insects were inter-connected in the same realm of *li*. Moral philosophy not only instructed how humans could cultivate their moral integrity by watching virtuous insects but also encouraged cooperative relations between the two. The philosophical fiction that insects could think and behave ethically nurtured early interest in insects, but some Korean intellectuals, most notably Yi Ik (1681-1763), Yi P'inghŏgak (1759-1824) and Yi Kyu-kyŏng (1788-?), realized the distance between moral philosophy and physical reality. Especially, Yi Kyu-kyŏng attempted to reform Korean knowledge of insects by using observation and empirical evidence. His realistic description of Korean insects reflected the intellectual efforts to relativize moral knowledge in the production of scientific knowledge. Influenced by many Chinese thinkers such as Xu Guangqi (1562-1633) and Fang Yizhi (1611-1671), the Korean thinkers of the late Chosŏn period questioned how accurate knowledge of things could be found. Their

discourses on the insects of Korea, therefore, give us a unique opportunity to see how Korean perceptions of nature transformed within their Confucian tradition on the eve of the modern era.

Keywords: Yi Ik, Yi Kyu-kyŏng, *Sŏngho sasŏl*, *Oju yŏnmun changjŏn san'go*, Confucian epistemology

〈국문초록〉

조선 후기 곤충에 대한 인식 변화

노상호 (이화여대)

본고에서 필자는 조선후기 곤충에 대한 지식이 어떠한 궤적을 통해서 변해가는지를 살펴보고자 한다. 특히 벌, 나방, 메뚜기를 사례로 삼아서 살펴봄으로써 조선후기 자연에 대한 과학적 지식의 발전이 성리학적 전통 속에서 형성된 자연관(自然觀)의 변화와 어떤 관련성을 갖고 있는지를 고찰한다. 성리학의 ‘격물치지(格物致知)’의 방법론과 농상(農桑)을 중시하는 전통은 곤충을 중요한 담론의 대상으로 삼았지만 곤충에 대한 지식은 인물(人物)의 동질성을 전제로 하여 당위적 도덕률을 확인하는 것을 중요한 목적으로 삼았다. 곤충의 덕성(德性)과 양잠의 당위성은 인간으로 하여금 곤충을 관찰하고 연구하는 모티브가 되었다. 그러나 동시에 곤충을 형이상학적 주체로 삼았기 때문에 곤충을 그 자체로 관찰하고 연구 못하는 결과를 낳았다. 조선후기 이익(李瀼)과 이규경(李圭景)은 곤충에 대한 실험적 글쓰기를 통해서 이러한 형이상학적 담론에서 벗어나서 곤충을 순수한 관찰과 탐구의 대상으로 삼으려 하였다. 조선 후기 박물학자들은 덕성(德性)과 재이관(災異觀)에서 한걸음 나아가서 조선에서 관찰로 습득한 곤충의 독특한 특성을 기록하고자 하였다. 서광계(徐光啓)와 방이지(方以智)의 영향을 받아서 이익과 이규경은 물(物)의 자체적 특성을 고찰함에 중국과 다른 조선의 곤충들에 대해서 인식하기 시작하였다. 따라서 곤충에 대한 윤리적, 규범적 지식은 보다 정확하고 증명 가능한 과학적 지식으로 변모하는 모습을 보인다. 특히 이규경의 오주연문장전산고에서 보이는 나나니벌, 야잠(野蠶), 벼멸구에 대한 발견적 보고는 성리학의 전통 속에서 보다 실증적인 방법을 통해서 한반도의 자연을 탐구하고자 한 사례라고 할 수 있다. 이들의 곤충담론은 근대과학의 전래 이전에 전통적 자연철학과 방법론의 한계를 뛰어넘고자 한 지적 움직임이라고 할 수 있다.

주제어: 이익(李瀼), 이규경(李圭景), 성호사설(星湖僿說), 오주연문장전산고(五洲衍文長箋散稿), 성리학적 인식론.

Appendix

akch'ung 惡蟲	Hwangju 黃州
Ba Chu [C] 八出	Hwasangch'ung 禾上蟲
<i>Ben cao gang mu</i> [C] 本草綱目	in 人
Bu huang kao [C] 捕蝗考	Ka 家
Ch'injamrye 親蠶禮	Kajung namu koch'i napang
Ch'oe Se-chin 崔世珍 (1468-1542)	가중나무고치나방
Ch'un'gyŏn 椿繭	Kaozhengxue [C] 考證學
Chakpanjam 鵲斑蠶	Kimyo 己卯
cham 蠶	Kusu 蠅蝮
Chamsil 蠶室	Kwara 螺贏
Chamsiljam 蠶室蠶	kyök 格
Chamwŏn 蠶院	kyöngmul ch'iji 格物致知
Chen Fangsheng 陳芳生	kyöngmul 格物
chipon 知本	<i>Kyuhap ch'ongsŏ</i> 閨閣叢書
chiun 地運	Li Shizhen [C] 李時珍
Chögyŏn 樗繭	li 理
Chöng Ki-sŏn 鄭基善	Liang Xing [C] 兩生
Chöng Pöm-jo 丁範祖	milponga 蜜蜂兒
<i>Chosŏn wangjo sillok</i>	Mokssipujŏn 陸氏婦傳
朝鮮王朝實錄	Muin 戊寅
Dong Zhongshu (179-104 BCE)	Muja 戊子
董仲舒	mul 物
Fang Yizhi 方以智 (1611-1671)	mupon 務本
Haesŏ 海西	Myölmoyoch'ung 蔑苗蟲
Han Sang-tök 韓尙德	Nagaoka Tetsuzō [J] 長岡哲三
Hayashi Dansaku 林驛作	Nan [C] 蝻
hua sheng [C] 化生	Nana-pöl 나나벌
Huang [C] / Hwang [K] 蝗	nong 農
Huang [C] 蝗	nongsang 農桑
Huangdi [C] 黃帝	öjin saram 어진 사람
<i>Hunmong chahoe</i> 訓蒙字會	<i>Oju yŏnmun changjŏn san'go</i>

五洲衍文長箋散稿

Otpasi 옷바시

p'aesŏ 稗書

P'oje 醕祭

P'oro 蒲蘆

pakhak 博學

pangmul 博物

pŏl 벌

pong 蜂

ponga 蜂兒

pongjo 蜂朝

Pongsa 蜂史

Pongsan 鳳山

pongsun 蜂巡

pongwang 蜂王

Public Agricultural Promotion

Center 勸業模範場

Pujong kuin 蟲螽蚯蚓

Pyŏ myŏlgu 벼멸구

Qi Chu [C] 七出

Samguk sagi 三國史記

San Mian [C] 三眠

San 山

sang 桑

sang 詳

Sangjam 常蠶

sech'ung 細虫

Si Mian [C] 四眠

Sigyŏng 詩經

Sŏhŭng 瑞興

sŏlyak 說約

Sŏngju 星州

Sŏngnihak 性理學

Soso 蠨蛸

Su 水

T'obong 土蜂

Tao Hong-jing [C] 陶弘景

Ukemochi no kami [J] 保食神

Unka [J] Pujinja [K] 浮塵子

Wa Kan sansai zue [J]

和漢三才圖會

Wang Zheng nong shu [C]

王禎農書

Wŏnjam 原蠶

wu [C]; mul [K] 物

Wu li xiao shi [C] 物理小識

Xi Ling [C] 西陵

Xu Guangqi 徐光啓 [C] (1562-1633)

Ya 野

Yajam 野蠶

Yamamayu [J] 山蠶

Yangjam kyŏnghŏm ch'walyo

養蠶經驗撮要

Yi Ik 李穡 (1681-1763)

Yi Kyu-kyŏng 李圭景 (1788-?)

Yi Ŏn-chŏk (1491-1553)

李彦迪

Yi Pinghŏgak 憑虛閣李氏

Yi To-wŏn 李道原

Yi Yi (1536-1584) 李珥

Yŏhŭng Mins 驪興閔氏

Yŏlong 蠨蛸

Yuan Can [C] 原蠶

Zai Yi [C] / Chaei [K] 災異