

A COMMENT ON THE YAYOI PERIOD DATING CONTROVERSY

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INTRODUCTION

In May 2003, the National Museum of Japanese History (NMJH) announced, that the beginning of Yayoi period dates back to 500 years earlier than it had previously been thought; charred remains stuck to pottery samples had been analysed by AMS 14C dating (HARUNARI et al. 2003). A few archaeologists accepted the new dating right away, while many scholars expressed critical opinions.

Especially the archaeologists in the Kyūshū region, who had been playing a leading role in the dating of Yayoi period, strongly rejected it. The reason for this may be found in the great confidence archaeologists use to have in the dating of the Yayoi period, which after all had kept unchanged for nearly 50 years. And moreover, the NMJH announcement lacked evidences in several points; subsequently it was not possible to persuade the audience to fully agree to the new dating. After more than three years, there are still various contrary opinions, not only addressing the chasm between the methods of natural science (14C dating) and 'purely' archaeological approaches (typological cross-dating). Even among merely archaeological perspectives different beliefs add to the controversy.

Why is this controversy going on? And why is it important? Isn't it just a recurrence of the '14C revolution' in the Japanese Archipelago?

In this paper I attempt to explain what kind of discussion is currently going on relating to this subject, and evaluate its meaning. Actually, a lot of articles have already been published, but almost all of them in Japanese; very few appeared in English.¹ For an interested

international audience it is in consequence difficult to follow this highly intriguing discussion.

Three years ago, I already made a brief presentation on this matter in English at the 3rd World Wide SEAA Congress in Daejeon, South Korea (SHŌDA 2004a).² I have also written some essays on this subject in Japanese (2004b; 2006), and Korean (2005). The following essay, however, aims at introducing the many discussions that are going on, rather than stressing the author's opinion. It has to be emphasized, that there is no factual consensus yet, and the conclusions I draw are open to modification. I will start this essay with looking back on the history of 14C dating in Japan and on the traditional dating of the Yayoi period. I will then focus on various new opinions connected to the subject, and in conclusion discuss the problems and meaning of the Yayoi dating controversy.

only one, but unfortunately his article's quotations are mainly from newspapers, not academic papers. It should be noted that what newspapers wrote is NOT what most of archaeologists thought and discussed. In Korea, an article introducing this controversy appeared in *Journal of the Korean Archaeological Society*, the leading journal in Korean archaeology (CHOI 2006). It shows that there is a lot of interest in this topic.

² Fumiko IKAWA-SMITH, moreover, organized and chaired a session on the 'Problems presented by the AMS Radiocarbon Dates for the Yayoi Period in Japan' at the same conference, thus initiating a first international platform for discussing the topic (IKAWA-SMITH 2004). Unfortunately, the papers have not been published since. The session comprised presentations of Fumiko IKAWA-SMITH, FUJIO Shin'ichirō and SAKAMOTO Minoru (National Museum of Japanese History), TAKAKURA Hiroaki (Seinan Gakuin University) and MIZOGUCHI Kōji (Kyūshū University), and discussants were Sarah M. NELSON (University of Denver) and Gina L. BARNES (University of Durham) [see program and abstracts in www.SEAA-web.org/Archive/SEAA_Conferences/arc-con-dae-sced.htm (editor's note)].

¹ As far as I know, KEALLY's critic (KEALLY 2004) was the

14C DATING IN JAPANESE ARCHAEOLOGY

In Japan, 14C-dating was applied in 1951 for the first time (LIBBY 1951:295). A charcoal remain was examined, excavated from a dwelling pit in the vicinity of the shell mound of Ubayama (Ubayama *kaizuka* 姥山貝塚) in Chiba Prefecture, which belongs to the Middle Jōmon period. As ISHIKAWA (2006:60) mentioned in his paper, it was no later than at the end of the 1950s that Japanese archaeologists started to recognize the importance of 14C-dating. In studies focusing specifically on the dating of the Yayoi period, references to 14C dating as well began to appear (MORI 1968). However, many Japanese archaeologists seemed to regard 14C dating less effective than the chronological sequences they had achieved by typological method over a long period of time. In typological studies of Yayoi pottery (*Yayoi doki* 弥生土器) or Sueki 須恵器 pottery from the Kofun period the time span of each chronological phase represented less than 30 years, thus apparently being much more precise than 14C dating.

Bronze mirrors from Han 漢 dynasty China are a common find in latter Yayoi period elite burials, and the production time of many of them is known in absolute dates. The approximate calendar year of a Yayoi find therefore – at least from the 1st century B.C. onward – was already known, while 14C dating obviously offered a much wider range of chronological results. 14C dating thus appeared useless within a Yayoi framework, contrary to the situation of the previous cultural phases in Japan. SAHARA (1981:12) accordingly wrote, "The archaeologist who use 14C dating in Yayoi period, just select the dates which are fit to their opinion from various data." And not only with regard to relative chronology, but also about absolute dating, there was a serious controversy between 14C dating and typological cross-dating in the 1960s.³ YAMANOUCHI and SATO (1962) strongly denied the 14C dating of Natsushima shell-mound (Natsushima *kaizuka* 夏島貝塚, CRANE et al. 1960), which postulated Jōmon pottery is the oldest in the world, by comparing the artefacts of the continent and the Japanese Archipelago.

Even now, many Japanese archaeologists think highly of their achievements of those days. Dates were determined by 'archaeological' methods without relying on 14C. Unfortunately, the material at that time was too limited to reveal that 'long chronology' (*chōki hennen* 長期編年) is possible purely by cross-dating. As IMAMURA (2005:183) mentions, in consequence of YAMANOUCHI's opinion many Japanese archaeologists are reluctant to follow 14C dating even now, and feel shame to rely on it.

It is too easy to just 'believe' the dates offered from a laboratory; dating and chronology was (and is) one of

the most fundamental and important subjects in Japanese archaeology. If small pieces of charcoal tell everything, many efforts spent on typological study become meaningless, if I may carry this line of reasoning further.

So for a long time, typology and 14C-dating were in a delicate relation (YOSHIDA 2005:37). However, like TSUJI (1999) recently has shown by means of the dating of Sannai-Maruyama 三内丸山 site, AMS 14C dating and typological chronology actually can coincide in their results. Few scholars regard 14C dating as absolutely nonsense, but many archaeologists think that it is necessary to have 14C results checked by typological method.

YAYOI PERIOD DATING AS IT USED TO BE

As mentioned above, 14C dating was initially applied to determine the beginning of the Yayoi period in the late 1960s (MORI 1968). However, some scholars offered similar dates for the Yayoi period even before that. For instance, KOBAYASHI (1951) and SUGIHARA (1961) presented the dating of Yayoi period using mirrors and coins from China, without 14C data. Both studies described the date of the beginning of Early Yayoi as 3rd or 2nd century BCE. In the 1970s OKAZAKI (1971) and HASHIGUCHI (1979) also assumed the beginning of Early Yayoi at about 300 BCE.

Around this time the definition of 'Yayoi period' began to change. Paddy fields, a characteristic feature of the Yayoi culture, were excavated in Itazuke 板付 (1977-78) and Nabatake 菜畑 (1980-81) sites, but they belonged to the stage of Yu'usu-type pottery (*Yu'usu-shiki doki* 夜臼式土器), which had been considered as Final Jōmon. SAHARA (1983:5) suggested that this stage should be incorporated into the Yayoi Period and called it 'Initial Yayoi' (*Yayoi sōki* 弥生早期). The dating of Yu'usu-type pottery was considered to be 5th to 4th century BCE, as this stage was thought to precede Early Yayoi only slightly (e.g. OKAZAKI 1971). From that time on the beginning of the Yayoi period has been regarded as dating from the 5th century BCE.

According to the increase of excavated material from the Korean Peninsula, some scholars on the other hand investigated the dating by using material other than Han dynasty mirrors or coins unearthed in Japan. They focused on lute-shaped (or Liaoning type) bronze daggers⁴, a find distributed in China, Korea, and Japan. This type of bronze dagger dates back to the end of the 9th century BCE, so it is very useful for estimating the beginning of the Yayoi period. In Japan, however, only one example is extant coming from Imagawa 今川 site

⁴ This kind of dagger is called *qurenqing tongduanjian* 曲刃青铜短剑 or *dongbeixi duanjian* 东北系短剑 in China, *bipa-hyeong donggeom* 비파형동검 in Korea, and *ryōnei-shiki dōken* 遼寧式銅劍 or *biwa-gata dōken* 琵琶形銅劍 in Japan.

³ Imamura (1996:46-50) explained this controversy in detail.

in Fukuoka Prefecture, which belongs to Early Yayoi. Thus the Korean materials (over 60 pieces) were used alternatively to determine the date. Some of the daggers have been excavated together with pottery or stone tools that have a firm position in relative chronology. Moreover, cross-dating of pottery or stone tool between the southern part of the Korean Peninsula and northern Kyūshū has been done in detail. It is therefore possible to date the Yayoi period by using these materials. TAKESUE (2002:3), for example, determined the beginning date of Yayoi period at the 6th or 5th century BCE, according to the above mentioned method and to tree-ring dating.

As early as in 1996 it was, moreover, announced that the Middle Yayoi in the Kinki 近畿 area should be re-dated a hundred years back. In Ikegami-Sone 池上曾根 site the wooden pillar of a building, belonging to the later part of Middle Yayoi, had been dated 52 BCE by dendrochronology. That was about a hundred years earlier than the date commonly accepted (MITSUTANI 2000:47). The influence of this re-dating, however, was limited to the Kinki area. Kyūshū or other areas were not involved, although on the other hand the new dating somehow solved the gap that existed until that time between Kyūshū and Kinki chronologies. As mentioned above, TAKESUE postulated the earliest date for the beginning of Yayoi, by making use of new material, before the NMJH announcement. The NMJH, however, presented their conviction of an even much earlier date only one year later.

OLD OPINIONS VS. NEW OPINIONS

The National Museum of Japanese History claimed the new dating of the Yayoi period in May 2003. Initially the discussion seemed to become a mere conflict between ‘believers’ and ‘sceptics’. Three months later, a meeting took place in Tōkyō⁵ with the aim of rethinking the archaeological evidence of the traditional dating, i.e. the short chronology (*tanki hennen* 短期編年). Some of the scholars there admitted that the evidences which had determined the dating of the Yayoi period was not accurate, even if there were still many archaeologists who insisted on the short chronology and its ‘evidences’ like TAKAKURA (2003) and HASHIGUCHI (2003). These scholars strongly rejected the NMJH’s opinion by presenting some evidence which supported the old, short chronology.

Many of the evidences in favour of a short chronology, however, have problems within their archaeological context. For example, the ironware from dwelling pit no. 16 in Magarita 曲り田 site is one of the most important

evidences produced in this discussion. The dwelling belongs to Initial Yayoi, so it shows that ironware already appeared during this stage. In the Korean Peninsula ironware is thought to have been introduced by the state of Yan 燕 in the Chinese *zhanguo* 戰國 era, 5th – 3rd century BCE (e.g. SHIOMI 1982:225). Thus the date of Initial Yayoi cannot be earlier than that. However, the Magarita dwelling pit is overlapped by some other archaeological features and ‘the ironware’ is just a fragment which is no larger than about 3 cm, reported as “excavated near the floor”.

There is additional ‘evidence’ from China playing an important role in the dating: bronze dagger and *zhanguo* era’s (Chin.) *mingdao* 明刀 coin finds from Loushang 樓上 tumuli site in Liaoning 辽宁 province. AKIYAMA (1969:25) dated the newer type of lute-shaped daggers as lasting until the 3rd century BCE according to this ‘combination’. Although LIN (1980:150) pointed out that these materials have not beyond doubt been unearthed together, the majority followed the dates by AKIYAMA. Actually, according to the site report these finds were not excavated by archaeologists, but donated by a junior high school student who happened to live in the vicinity of the site. GOTŌ (2005:36) also pointed out this problem, and claimed a necessity for a re-examination of the material to support the dating.

ŌNUKI Shizuo is among those who have long been arguing in favour of the long chronology, even though his full paper on this subject was published no earlier than 2005 (ŌNUKI 2005). He pointed out that in North Korea, there was a shift from short chronology to long chronology in accordance with new materials unearthed in China, such as Nanshangen 南山根 excavated in the 1960s (ŌNUKI 2003:40). We also know of Zhou 周 dynasty wares with calendar year inscriptions from the 1st millennium BCE. Archaeologists are thus able to date the materials of this age, such as the above mentioned lute-shaped bronze dagger, without carbon dating. A problem concerns the so-called ‘inclined chronology’ (*keisha hennen* 傾斜編年), which is based on the perception of a long time lag between the same type of find depending on its location in the centre or in the periphery of a culture. Ōnuki criticized, that in previous studies the dates of the finds from the periphery were considered much too young owing to the adoption of the inclined chronology (*ibid.*:42).

Unfortunately, historical events were also used to support this inclined chronology. The bronze dagger with narrow blade (*sehyeong donggeom* 細形銅劍) is the type of dagger following the lute-shaped one in the Korean Peninsula. The distribution of this dagger is limited to south of Cheongcheon 淸川 River, while the distribution of *mingdao* coins is limited to north of it. YUN (1972:124-127) linked these distributions to events in historical records such as the *Shiji Xiongnu*

⁵ ‘Yayoi jidai no jitsu nendai o dō toraeru ka’ (How can we interpret the true dating of Yayoi period), 9th June 2003, at the University of Tōkyō.

Liezhuan 史記匈奴列傳 and the *Weilue* 魏略. The historical records tell about the invasion of the Liaodong area by a Yan general named Qinkai 秦开. Qinkai served king Zhao 昭王, who was on the throne during the years 311 to 279 BCE. YUN assumed that the lute-shaped daggers continued to exist until this time, and were then replaced by the narrow dagger, thus mirroring the major political changes in Liaodong. YUN considered the end of the lute-shaped dagger at the end of the 4th century to the beginning of the 3rd century BCE. This, however, is not logically acceptable because there is no evidence that narrow-bladed bronze daggers appeared at the same time as *mingdao* coins. Although it seems an absolutely groundless argument, it made many archaeologists believe in the short chronology. YUN's argument was based on a dating that many archaeologists assumed to be correct at that time. On the other hand, YUN's linking of find distributions with historical events somehow ended up with the conviction of archaeologists that the dating is built on firm grounds of historical events. It was very hard to get out of this circular reasoning once it had started.

In South Korea the lute-shaped dagger has been dated as early as the 8th century BCE in the 1990s, in accordance with the bronzes from north-eastern China (YI 1992:131). This 'long chronology' was, however, only addressing the appearance of the lute-shaped dagger; the dating of the subsequent narrow-bladed dagger was not influenced. Thus the period of lute-shaped daggers was enlarged by almost 500 years in the Korean Peninsula. This dating was widely accepted in Korea. However, Japanese scholars did not follow this dating. While the long chronology was accepted in the 1990s in Korean archaeology, in Japan archaeologists continued to favour the short chronology (SHŌDA 2006:144). As a result, a gap of about 300 years arose regarding the early 1st millennium BCE between Korean and Japanese perceptions, although for the later phase common viewpoints and dating existed.

After the announcement by NMJH, two Japanese leading scholars on bronze wares in north-eastern Asia nevertheless changed their standpoint from short chronology to long chronology (see MIYAMOTO 2004; OKAUCHI 2004). MIYAMOTO (2004) regards the beginning of Yayoi as no earlier than 9th century BCE; TAKESUE (2004) and myself (SHŌDA 2005) as no earlier than 8th century BCE according to cross-chronology, independent from AMS data. Both opinions postulate younger dates than those presented by NMJH. They consider the 10th century BCE date of NMJH as too early when checked by typological cross-dating.

DISCUSSION

The majority of the archaeologists is aware of the need to change the viewpoint for North East Asia's 1st millennium BCE, especially in the Korean Peninsula and Japanese Archipelago. Still various contradictory opinions exist. It is not the simple question whether to believe in AMS or not. As ŌNUKI (2005:106) stresses, the most important point in this discussion is that 14C dating made many archaeologists aware of the necessity to reassess the typological studies they made. Still, many problems are left on all sides, either concerning AMS dating or typological cross-dating using inscribed wares from China.

For instance, ISHIKAWA (2006) criticizes not AMS dating itself, but the way NMJH interprets the data. IWANAGA (2005), on the other hand, pointed out the difficulties and logical problems in cross-dating. For the material that has been the focus of the AMS dating itself, YOSHIDA (2005:54) warned that "the problem is, that we don't know what the charred material actually was." NMJH announced that the Initial Yayoi dates back to the 10th century BCE, but there are only three samples for the earlier part of Initial Yayoi (FUJIO et al. 2005:82). Moreover, the samples presented contain a sherd, which is the mere bottom part of a pottery, and we cannot identify to which type it belongs. NMJH thus determined the date of the beginning of the Yayoi period mainly on the basis of AMS dates from the later part of Final Jōmon and the later part of Initial Yayoi, and they still have not fulfilled the duty to explain. The evidence NMJH presented is not enough to make many scholars understand and agree.

Cross-dating from Chinese central plain also faces problems due to the shortage of materials. Only five examples of lute-shaped bronze daggers have been unearthed in China in assemblages of bronze wares which can be absolutely dated. The pottery chronology for this area, moreover, is not distinct enough to discuss the dating in detail. Many scholars wrote papers on lute-shaped bronze daggers in China, North and South Korea, and Japan, but they had not compared and referred to each other sufficiently (SHŌDA 2006:134). Research on this subject should be practiced from a broader point of view.

As I pointed out at the beginning, conclusions are still open to modification. It is important to compare the results of these two absolutely independent methods and to investigate the difference and its reason. There is no need to look for common ground right now. The announcement in 2003 influenced Japanese archaeology dramatically, but unlike the "second radiocarbon revolution" in Europe (RENFREW 1973:94), the framework did not 'collapse'. This change of dating will never transform the megalithic structures or metallurgy of

Japan into the earliest in East Asia.

It is possible in north-eastern Asia to salvage large parts of the traditional structures, especially with regard to their relative position in each area. But the circumstances change when it comes to crossing ‘the fault zone’ in the Korean Peninsula. Inclined chronology ‘solved’ the time-lag by enlarging the time span of Korean Early and Middle Bronze Age – which means the age of the lute-shaped bronze dagger – and by connecting the old dates of the inscribed wares with the younger dates, which are believed to be Yayoi period.

In consequence, the cross dating of China-Korea or Korea-Japan needs to be corrected. It includes reassessing the diffusion of bronze and iron from China eastwards. In South Korea, abundant archaeological data have been unearthed recently through numerous rescue excavations. They will help both typological study and 14C dating.

CONCLUSION

The dating controversy cannot be schematised as that archaeological typology suffered defeat to carbon dating. In Japan also, the relationship between the two methods is getting more cooperative than in the past. Again, it is important to verify each other by comparing the results of different methods based on different principles and to discuss the differences and the reasons for that. Now archaeologists have to reconstruct the history of the 1st millennium BCE not only in Japan, but also for the whole of North East Asia. Inclined chronology was denied and we have to reassess the relationship between centre and periphery, not only from a passive perspective but more simultaneously and interactive.

This essay mainly dealt with the beginning date of Yayoi period, but there are more complicated problems when it comes to determine Early and Middle Yayoi periods. I will refer to it at the next opportunity.

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REFERENCES

- AKIYAMA Shingo 1969, Chūgoku tōhoku chihō no shōki kinzokuki bunka no yōsō (ge) (Aspects of early metal culture in north-eastern China <III>). In: *Kōkōgaku Zasshi (Journal of Archaeology)*, Vol. 54, No. 4: pp. 21-47 [秋山進午 「中国東北地方の初期金属器文化の様相(下)」 考古学雑誌, 第54巻4号].
- CHOI Seong-rak 2006, Ilbon Yayoi-sidae yeondae munje daehayeo (Some considerations on the new dates proposed for the beginning of the Yayoi period in Japan). In: *Han'guk Gogohakbo (Journal of the Korean Archaeological Society)*, Vol. 58, pp. 146-164 [최성락 2006 「일본 야요이시대 연대 문제에 대하여」 한국고고학보 58].
- CRANE, H. R. and J.B. GRIFFIN 1960, University of Michigan radiocarbon dates V. In: *American Journal of Science Radiocarbon*, Supplement, Vol.2: pp.31-48.
- FUJIO Shin'ichirō, IMAMURA Mineo and NISHIMOTO Toyohiro 2005, Yayoi jidai no kaishi nendai (The beginning of Yayoi period). In: *Sōken Daibun Kagaku Kenkyū*, Vol. 1: pp. 73-96 [藤尾慎一郎・今村峯雄・西本豊弘 2005 「弥生時代の開始年代」 総研大文化科学研究 創刊号].
- GOTŌ Tadashi 2005, Kōkōgaku to reki-nendai, sokutei-nendai (Archaeology, calendar age, 14C age). In: *Shigaku Zasshi*, Vol. 114, No. 1: pp. 34-36 [後藤直 2005 「考古学と暦年代、測定年代」 史学雑誌 第114編第1号].
- HARUNARI Hideji, FUJIO Shin'ichirō, IMAMURA Mineo and SAKAMOTO Minoru. 2003, *Yayoi Jidai no Kaishi Nendai* (The beginning of the Yayoi period). Nihon Kōkōgaku Kyōkai Dai 69 Kai Sōkai Kenkyū Happyō Yōshi. Tōkyō: Nihon Daigaku, pp. 65- 68 [春成秀爾・藤尾慎一郎・今村峯雄・坂本稔 2003 「弥生時代の開始年代」 日本考古学協会 第69回総会研究発表要旨. 東京: 日本大学].
- HASHIGUCHI Tatsuya 1979, Kamekan no hennen-teki kenkyū (A chronological study of jar coffins). In: *Kyūshū Jidōsha-dō Kankei Maizō Bunkazai Chōsa Hōkoku. XXXI Chūkan*. Fukuoka: Fukuoka-ken Kyōiku Iinkai, pp. 113-203 [橋口達也 1979 「甕棺の編年的研究」 九州自動車道関係埋蔵文化財調査報告 XXXI 中巻, 福岡: 福岡県教育委員会].
- HASHIGUCHI Tatsuya 2003, Tanso-14 nendai sokuteihō ni yoru Yayoi jidai no nendai-ron ni kanren shite (About 14C dating of Yayoi period). In: *Nihon Kōkōgaku*, Vol. 16, pp. 27-44 [橋口達也 2003 「炭素 14 年代測定法による弥生時代の年代論に関連して」 日本考古学 16, 日本考古学協会].
- IKAWA-SMITH 2004, Yayoi in the East Asian interaction sphere: Problems presented by the AMS radiocarbon dates for the Yayoi period in Japan (abstract), In: *SEAA, Korea 2004, Third International Congress of the Society for East Asian Archaeology* (Program). Daejeon: Chungnam National University, p. 83.
- IMAMURA, Keiji 1996, *Prehistoric Japan: New Perspectives on Insular East Asia*. London: UCL Press.
- IMAMURA Keiji 2005, Doki: nendaigaku – keishikigaku (Dating and typology). In: *Bunkazai Kenkyūjo Nara Bunkazai Kenkyūjo (ed.), Nihon no Kōkōgaku: Doitsuten Kinen Gaisetsu, Ge* (Japanese Archaeology: Outline of the German Exhibition, Vol. 1). Tōkyō: Gakuseisha, pp. 180-186 [今村啓爾 2005 「土器: 年代学・型式学」 文化財研究所奈良文化財研究所,

日本の考古学: ドイツ展記念概説 (上). 東京: 学生社].

- ISHIKAWA Hideshi 2006, AMS-14C Sokutei – kōsei-hō ni yoru Yayoi nendai-ron e no gimon (Questions concerning the debate on AMS-14C dating and calibration). In: *Kōkōgaku Shūkan*, Vol. 2, pp. 59-76 [石川日出志 2006 「AMS-14C 測定・較正法による弥生年代論への疑問」 考古学集刊 第2号].
- IWANAGA Shōzō 2005, *Yayoi Jidai Kaishi-nendai Saikō* (Re-examination of the civil year of the beginning of Yayoi period), Kyūshū Daigaku Sōgō Hakubutsukan Kenkyū Hōkoku (Bulletin of the Kyūshū University Museum), No. 3, pp. 1-22 [岩永省三 2005 「弥生時代開始年代再考」 九州大学総合博物館研究報告, No. 3].
- KEALLY, Charles T. 2004, Bad science and the distortion of history: radiocarbon dating in Japanese archaeology. In: *Sophia International Review*, No. 26, pp. 97-104.
- KOBAYASHI Yukio 1951, *Nihon Kōkōgaku Gaisetsu* (Outline of Japanese archaeology). Ōsaka: Sōgensha [小林行雄 1951 「日本考古学概説」. 大阪: 創元社].
- LIBBY, W. F. (1951), Radiocarbon dates, II. In: *Science, New Series*, Vol. 114, No. 2960, pp. 291-296.
- LIN Yun (1980), Zhongguo dongbei xi tongji chulun (A pilot study on the bronze daggers in north-eastern China). In: *Kaogu Xuebao* 1980, No. 2, pp. 139-161 [林云 1980 「中国东北系铜剑初论」 考古学报, 1980年2期].
- MITSUTANI Takumi 2000, Present situation of dendrochronology in Japan. In: *Proceedings of the International Dendro-Chronological Symposium* (Abstracts). Nara, pp. 46-50.
- MIYAMOTO Kazuo 2004, Seidōki to Yayoi jidai no jitsu nendai (Bronze wares and the true dating of Yayoi period). In: *Yayoi Jidai no Jitsu Nendai* (True dating of Yayoi period). Tōkyō: Gakuseisha, pp. 198-218 [宮本一夫 2004 「青銅器と弥生時代の実年代, 弥生時代の実年代」. 東京: 学生社].
- MORI Teijirō 1968, Yayoi Jidai ni okeru hoso-gata dōken no ryū'nyū ni tsuite (On the influx of narrow-bladed bronze daggers in the Yayoi period). In: *Nihon Minzoku to Nanpō Bunka*. Tōkyō: Heibonsha, pp. 127-161 [森貞次郎 1968 「弥生時代における細形銅剣の流入について」 日本民族と南方文化. 東京: 平凡社].
- OKAUCHI Mitsuzane 2004, Tōhoku-shiki dōken no seiritsu to Chōsen-hantō e no denpa (The formation of Tōhoku-type bronze daggers and their diffusion to the Korean Peninsula). In: *Yayoi Jidai no Jitsu Nendai* (True Dating of Yayoi Period). Tōkyō: Gakuseisha, pp. 181-197 [岡内三眞 2004 「東北式銅剣の成立と朝鮮半島への伝播」 弥生時代の実年代. 東京: 学生社].
- OKAZAKI Takashi 1971, *Nihon kōkōgaku no hōhō* (Methods in Japanese archaeology). In: *Kodai no Nihon* 9. Tōkyō: Kadokawa Shoten, pp. 30-53 [岡崎敬 1971 「日本考古学の方法」 古代の日本 9. 東京: 角川書店].
- ŌNUKI Shizuo 2003, Seitō to itan (Orthodox and heresy). In: *Kōkōgaku Kenkyūkai Tōkyō Reikai Dai 4 Kai Reikai, Kenkyū Happyō Shiryōshū*. Tōkyō, pp. 37-46 [大貫静夫 2003 「正統と異端」 考古学研究会東京例会 第4回 研究発表資料集].
- ŌNUKI Shizuo (2005), Saikin no Yayoi jidai nendai-ron ni tsuite (A review of the recent debate about the date of Yayoi period). In: *Anthropological Science* (Japanese Series), Vol. 113, pp. 95-107 [大貫静夫 2005 「最近の弥生時代年代論について」 人類学雑誌 113].
- RENFREW, Colin 1973, *Before Civilization*. London: Jonathan Cape.
- SAHARA Makoto 1981, Kōkōgakusha kara mita shizen kagakusha (Natural scientists as seen by an archaeologist). In: MABUCHI Hisao and TOMINAGA Takeshi (eds.), *Kōkōgaku no tame no Kagaku 10 Shō* (10 chapters on chemistry for archaeology). Tōkyō: University of Tōkyō Press, pp. 1-24 [佐原真 1981 「考古学者からみた自然科学者」 考古学のための化学 10章. 東京: 東京大学出版会].
- SAHARA Makoto 1983, Yayoi doki nyūmon (Introduction to Yayoi Pottery). In: SAHARA Makoto (ed.), *Yayoi Doki I* (Yayoi Pottery I). Tōkyō: Nyū-Saiensusha, pp. 1-24 [佐原真 1983 「弥生土器入門」 弥生土器 I, ニュー・サイエンス社].
- SHIOMI Hiroshi 1982, *Higashi-Asia no Shoki Tekki Bunka* (Early iron culture in East Asia). Tokyo: Yoshikawa Kōbunkan [潮見浩 1982 「東アジアの初期鉄器文化」. 東京: 吉川弘文館].
- SHŌDA Shinya 2004a, Yayoi Dating: Across the North-eastern Asia (abstract). In: *SEAA, Korea 2004, Third International Congress of the Society for East Asian Archaeology* (Program). Daejeon: Chungnam National University, pp. 74-75.
- SHŌDA Shinya 2004b, Hiraidō dōken no ichi to Yayoi rekinendai-ron <jō> (A bronze dagger from Hiraidō (Biraedong) and the dating of the Yayoi period I). In: *Kodai*, Vol. 117, pp. 1-29 [庄田慎矢 2006 「比來洞銅剣の位置と弥生暦年代論 (上)」 古代, 117].
- SHŌDA Shinya 2005, Hoseo jiyek chulto bipahyeong donggeom gwa misaeng sidae gaesi yeonda (Lute-shaped bronze daggers from Hoseo region and the beginning of Yayoi period). In: *Hoseo Kokohak* (Journal of the Hoseo Archaeological Society), Vol. 12, pp. 35-62 [庄田慎矢 2005 「湖西地域 出土 琵琶形銅剣과 彌生時代 開始年代」 호서고고학 12].
- SHŌDA Shinya 2006, Hiraidō dōken no ichi to Yayoi rekinendai-ron <ge> (A bronze dagger from Hiraidō (Biraedong) and the dating of the Yayoi period II). In: *Kodai*, Vol. 117, pp. 123-158 [庄田慎矢 2006 「比來洞銅剣の位置と弥生暦年代論 (下)」 古代, 119].
- SUGIHARA Sōsuke 1961, *Nihon Nōkō Bunka no Seisei*. (The formation of Japanese agriculture) Tōkyō: Tōkyōdō [杉原莊介 1961 「日本農耕文化の生成」. 東京: 東京堂].
- TAKAKURA Hiroaki 2003, Yayoi bunka kaishiki no aratana nendaikan o megutte (On the new date of the beginning of Yayoi period). In: *Kōkōgaku Jānaru*, No. 510, pp.4-7 [高倉洋彰 2003 「弥生文化開始期の新

たな年代観をめぐって」考古学ジャーナル No. 510].

TAKESUE Jun'ichi 2002, *Yayoi no Mura* (Villages in Yayoi period). Tōkyō: Yamakawa Shuppansha [武末純一 2002 「弥生の村」. 東京: 山川出版社].

TAKESUE Jun'ichi 2004, *Yayoi jidai zenhanki no rekinendai* (The calendar year of the former part of Yayoi period). In: *Fukuoka Daigaku Kōkōgaku Ronshū*. Fukuoka: Oda Fujio Sensei Taishoku Kinen Jigyōkai [武末純一 2004 「弥生時代前半期の暦年代」 福岡大学考古学論集. 福岡: 小田富士雄先生退職記念事業会].

TSUJI Sei'ichirō 1999, *Kōseido 14C nendai sokutei ni yoru Sannai-Maruyama iseki no hennen* (A chronology of Sannai-Maruyama site based on high precision 14C dating). In: *Gekkan Chikyū, Gōgai*, 26, pp. 32-38 [辻誠一郎 1999 「高精度 14C 年代測定による三内丸山遺跡の編年」 月刊地球, 号外 26].

YAMANOUCHI Sugao and SATO Tatsuo 1962, *Jōmon doki no furusa* (The ancientness of Jōmon pottery). In: *Kagaku Yomiuri*, Vol. 14, No. 12, pp. 1-13 [山内清男・佐藤達夫 1962 「縄紋土器の古さ」 科学読売 第 14 卷第 12 号].

YI Geon-mu 1992, *Han'guk eui yolyeong-sik donggeom munhwa* (Lute-shaped dagger culture in Korea). In: *Han'guk eui Cheongdonggi Munhwa* (Bronze culture in Korea). Seoul: Gungnip Chungang Bangmulgwan, pp. 126-132 [이건무 1992 「한국의 요령식동검 문화」 한국의 청동기문화. 서울: 국립중앙박물관].

YOSHIDA Kunio 2005, *14C Nendai sokutei no shin-tenkai* (New development of 14C dating). In: *Radioisotopes*, Vol. 54, No. 7, pp. 233-255 [吉田邦夫 2005 「14C 年代測定の新展開」 *Radioisotopes*, Vol. 54, No.7].

YUN Mu-byeong 1972, *Han'guk cheongdong yumul eui yeongu* (Research on Korea's bronze relics). In: *Baek-san Hakpo*, No. 12, pp. 59-134 [윤무병 1972 「한국 청동유물의 연구」 백산학보 제 12 호].