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Becoming Mesoamerican archaeologists and recognized worldwide: A text mining analysis of Japanese scholarship

Akira Ichikawa and Misaki Fukaya

Introduction

Japanese scholars have been working on Mesoamerican archaeology, including the Maya region, for several decades. Nowadays, these accomplishments have been published and broadly recognized in academia and by the general public. For example, Professor Seiichi Nakamura is one of the Japanese pioneers in field-based Maya archaeology since the mid-1980s. He directed the first long-term archaeological project organized by Japanese scholars, known as the La Entrada Archaeological Project [e.g., Nakamura, Aoyama, and Uratsuji eds. 1991]. This project focused on archaeological research and also the conservation of pre-Hispanic architecture and its use to establish a better life for local people. This flow of project management continues to the present day in projects run by Japanese scholars. Furthermore, through this project, several young enthusiastic archaeologists at that time such as Takeshi Inomata, Kazuo Aoyama, and others rose to become very well-known Maya archaeologists in academia.

This paper aims to explain how Japanese scholars became Maya and more specifically internationally recognized Mesoamerican archaeologists. To date, Japanese scholars have published more than 900 items on this topic in different languages. We examine what kind of research topics Japanese scholars focused on, and how they were recognized and contributed to Maya studies, using a text mining analysis of 161 published papers by Japanese scholars. Collectively, the Maya regions of Central America are the main research target for Japanese scholars but they include other areas in Mesoamerica such as the Central Highland of Mexico, the Gulf Coast, Oaxaca, and peripherical areas like El Salvador and Nicaragua because the Maya civilization was not isolated from other areas in Mesoamerica and its interactions with those areas provide clues to understand the rise and fall of the Maya civilization. Additionally, this study includes works by Japanese scholars from vast regions of Mesoamerica to highlight a variety of Japanese scholars in Mesoamerican archaeology (Figure 1).

Several researchers have introduced research history of Japanese archaeologists in Mesoamerica [e.g. Aoyama 2002; Ichikawa 2014], but this study is the first to use a text mining analysis to quantitatively clarify the research topics and periods prioritized by Japanese scholars in Mesoamerican archaeology through the time. Additionally, this study argues that the text-oriented digital humanities is a useful tool for a quantitative review of research history in this big data era.

Historical background: Japanese scholars in Mesoamerican Archaeology

Since the early 1940s, Japanese scholars published more than 900 articles and books about Mesoamerica in different languages such as Japanese, Spanish, and English[1]. According to the overview of those publications, the history of Japanese scholars on Mesoamerica can be divided into four phases, with some overlap.

The first phase: 1950s-1970s

The first phase is an introductory phase. During the late 1950s, 1960s, and 1970s, Japanese scholars provided an overview of ancient civilizations that developed in the New World including the Andes and Mesoamerica in Japanese. *Maya Civilization* written by Eiichiro Ishida is the first comprehensive introduction to the Maya civilization in Japan, it is a significant work, even today [Ishida 1967]. Subsequently, the first translated book from English into Japanese was a watershed examination of the Maya, titled "*Maya*" written by Michael D. Coe, an American leading archaeologist, anthropologist, and epigrapher. It was published in 1975 and translated by Kazuo Terada and Yasutake Kato [Coe 1975]. Takaji Sadasue's work, as a former professor at Kanazawa University, is also substantially meaningful. He published on different and vast topics related to Mesoamerica such as the rise and fall of the Maya civilization, Olmec arts, mural arts, and others [e.g., Sadasue 1984]. The books and papers mentioned above must have sparked the interest of Japanese citizens who were drawn to learn about civilizations that were previously unknown in Japan. The initial works about Mesoamerica focused on introducing general knowledge about ancient civilizations in the New World and any analysis was based mainly on literature reviews.

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Figure 1. Main sites mentioned in this paper (drawn by authors).

The second phase: 1960s-1980s

The second phase involved a few Japanese pioneers who studied Mesoamerican archaeology and joined archaeological projects in Mexico in the 1960s, 1970s, and 1980s. From the late 1960s to the 1980s, Yoko Sugiura conducted archaeological and ethnological surveys in the Toluca Valley, Mexico. She published numerous articles and books regarding lacustrine everyday life, Late Classic collapse, and other topics on the central highlands of Mexico [e.g. Sugiura 2009]. Kuniaki Ohi worked with great Mexican archaeologist Roman Piña Chan at Teotenango during the early 1970s. Importantly, Ohi learned the philosophy of Mexican archaeology, which emphasizes archaeological investigations based on scholars' academic interests and also conserves archaeological sites and contributes to a better life in the local community [e.g. Ohi 2006]. Saburo Sugiyama initiated working at Teotihuacan and then dedicated more than 35 years of his life to the largest metropolis in the New World [e.g. Sugiyama 2005]. Furthermore, Akira Kaneko and Harumi Fujita are also exceptional Japanese pioneers in the history of Mesoamerican archaeology. They obtained bachelor's degrees at the Escuela Nacional de Antropología e Historia (known as ENAH in Mexico). Kaneko has worked in Chiapas since late 1970s at sites such as Yaxchilan, Tonina, Pomona and Iglesia Vieja and is the investigator of Centro de Instituto Nacional de Antropología e Historia (INAH) Chiapas [e.g. Kaneko 2003]. Fujita has been interested in the settlement along the coast and working in Baja California as an investigator of the Centro INAH Baja California [e.g. Fujita and Melgar 2014].

The third phase: 1980s-1990s

The third phase is substantial because it marks the first long-term archaeological project organized by Japanese scholars, known as the La Entrada Archaeological Project (1983-1993), in Honduras. It was organized and directed by young Japanese archaeologists dispatched from the Japan International Cooperation Agency (JICA). Through this historical project, young Japanese archaeologists transformed into field-based Maya archaeologists with Seiichi Nakamura, Takeshi Inomata, Kazuo Aoyama, Shuichiro Terasaki, Etsuo Sato, and Etsuo Hasegawa directing projects. On the La Entrada project, they carried out a systematic survey of the La Entrada region and conducted the excavation and conservation of the El Puente site. Recently, El Puente was opened as an archaeological park and made a significant contribution to the development of the local community and conservation of local cultural heritage and identity [e.g. Nakamura and

Uratsuji eds. 1991]. Subsequently, those archaeologists emerged from the project having conducted remarkable studies in different areas of western Honduras including Copan [e.g. Aoyama 1999; Schortman and Nakamura 1991] and Aguateca, Guatemala [e.g. Aoyama 2009; Inomata 2008]. Those accomplishments were published in different languages and gradually became recognized in academia.

Another project organized by Japanese scholars emerged with support from the Tobacco and Salt Museum, Tokyo. This project was directed by Kuniaki Ohi, with participation from Nobuyuki Ito, Shione Shibata, and others from 1991-1994 at Kaminaljuyu, Guatemala, which has large Preclassic and Classic occupations [e.g. Ohi ed. 1994]. Afterward, this research group shifted their main research field area to Chalchuapa, El Salvador. They excavated and reconstructed earthen monumental architectures in the Casa Blanca group from 1995-2000 [e.g. Ohi ed. 2000]. Importantly, thanks to a considerable effort, part of the Casa Blanca group was opened as an archaeological park with support from the El Salvadoran and Japanese organization.

In 1996, a Japanese academic research group on ancient America emerged from a substantial increase in Japanese scholars of Mesoamerica and Andean Archaeology. This research group became the Japan Society for Studies of Ancient America in 2003.

The fourth phase: 2000-Present

The fourth phase, starting around 2000, comprised several Japanese archaeologists including new generations conducting international and interdisciplinary projects in vast areas of Mesoamerica. Inomata and Aoyama's work at Ceibal, Guatemala, and Aguada Fenix, Mexico had a significant impact on researches about the origin and collapse of the Maya civilization [e.g. Aoyama et al. 2017; Inomata et al. 2013, 2017, 2020]. Those works are interdisciplinary including radiocarbon dating, paleoenvironmental studies, bioarchaeology, isotopic studies, and LiDAR[2] so far [e.g. Inomata et al. 2018; Sharpe and Aoyama 2022]. Saburo Sugiyama directed/codirected several projects at Teotihuacan for decades including at the Temple of Quezalcoatl, the Sun and Moon Pyramids, the architectural complex of the Plaza de Las Columnas [e.g. Sugiyama S. 1989, 1993, 2005; Sugiyama and Cabrera Castro 2007l; Sugiyama N. et al. 2013]. This project also clarified aspects of the urbanization process, religion, symbolism, monumentality, the political organization of Teotihuacan, and its social interaction with other Mesoamerican regions. Nakamura has been trying to reveal the early history of two significant Maya dynasties: Tikal, Guatemala, and Copan, Honduras [e.g. Nakamura ed. 2013, 2022]. Additionally, it is important to mention that Nakamura made a huge effort to establish a liaison office at these two world heritage sites and contributed to local community development through archaeology, museology, and international cooperation.

New generations of Japanese archaeologists have emerged in Mesoamerican Archaeology and conducted remarkable projects that cover different areas and periods of Mesoamerican civilization. Many from this generation have participated in projects directed by Japanese scholars mentioned above and obtained Ph.D. degrees from foreign universities and then evolved into project directors based on their research interests. Tatsuya Murakami and Shigeru Kabata carried out several field seasons at Tlalancaleca, Mexico to understand the origin of the large Classic urban centers of Central Highland of Mexico, in other words, an era before Teotihuacan's emergence [e.g. Murakami et al. 2017]. Moreover, they have important publications on power relationships, urban landscape formation, and the collapse of metropolitan Teotihuacan [e.g. Kabata 2010; Murakami 2010]. In the Central Highlands of Mexico, Nawa Sugiyama conducted significant work at Teotihuacan especially based on a zooarchaeological method and perspective [e.g. Sugiyama N. et al. 2017]. In the Maya area, Tsukamoto Kenichiro directed a long-term project at El Palmar, Campeche, Mexico. He discovered hieroglyphic stairways at the Guzman group, located in an outlier architectural complex at El Palmar. Its interpretation sheds light on political negotiation among different social status groups and political interactions including the Calakmul and Copan dynasties [e.g. Tsukamoto et al. 2015]. His first edited book with Inomata Mesoamerican Plaza has innovative theoretical and methodological approaches to understanding this important arena as a place to interact with different people in the Mesoamerican civilization [Tsukamoto and Inomata eds. 2014]. Other important works in Maya archaeology are bioarcheological and isotopic studies conducted by Shintaro Suzuki. He worked in different sites in Mexico, El Salvador, Guatemala, and Honduras and obtained Ph.D. from the Universidad Nacional Autónoma de Mexico (known as UNAM in Mexico). His researches revealed that the Late Classic Copan dynasty might have been a multi-ethnic society, which indicates that multidirectional movements among different cities and coexisting within cities were more common than previously assumed [e.g. Suzuki et al. 2020]. Yuko Shiratori excavated Tayasal and Nixtun-Ch'ich', which are located around Lake Petén Itzá, Guatemala to reveal the Postclassic to the Spanish contact period in the Maya area [e.g. Shiratori 2021]. Reiko Ishihara's work about a cave in a Maya region and Satoru Murata's work

about salt production on the Belizean coast are also significant contributions to Maya archaeology [e.g. Ishihara-Brito et al. 2011; Murata 2011].

There are other remarkable projects conducted by Japanese researchers in other Mesoamerican areas. Hirokazu Kotegawa conducted investigations at Estero Rabon, Veracruz, Mexico to reveal the everyday life of Olmec culture [e.g. Kotegawa 2017]. This project intimately involved local people to establish a community museum with eight Olmec-style carved stone monuments. In Gulf Coast archaeology, Mitsuru Kurosaki is well known as an expert on Yugo, Hacha, and Palma, which have representative material assemblages in the ancient Gulf Coast of Mexico [e.g. Kurosaki 2006]. Moreover, Masakage Murano has a public archaeology project bridging the study of negative Usulután style ceramic, contemporary art, and public engagement [e.g. Murano 2017]. Akira Ichikawa, one of the authors of this paper, has conducted archaeological excavations at Nueva Esperanza and San Andrés and covers different research topics such as sudden environmental change and human adaptation, salt production, the conservation of earthen architecture, and so on [e.g. Ichikawa 2022; Ichikawa et al. 2021]. In El Salvador, archaeologists from JICA volunteered between 2003 and 2014. Murano and Ichikawa were JICA volunteers.

Additionally, Japanese archaeologists expanded to incorporate Nicaragua and Costa Rica. Etsuo Hasegawa, one of the La Entrada Archaeological Project members, conducted archaeological works at different sites in Nicaragua [e.g. Hasegawa 2019]. Also, Hiroshi Minami and his colleagues at the Kyoto University of Foreign Studies were involved in Nicaraguan archaeology combining public archaeology and museology [e.g. Fukaya et al. 2020]. In Costa Rica, Waka Kuboyama conducted experimental archaeological research on the lapidary technology of celtiform pendants [Kuboyama 2022].

Text Mining Analysis

The historical background of Japanese scholars in Mesoamerican archaeology indicates that currently, Japanese scholars have worked across a vast regional area and on different topics regarding Mesoamerican civilizations. Japanese scholars transformed into field-based archaeologists in the late 1970s and 1980s joining projects organized by Mexican or other foreign scholars, and subsequently obtained recognition in the academic world. The La Entrada archaeological project was a turning point in the history of Japanese scholars on Mesoamerica archaeology, even though different academic trajectories exist. This study investigates their research topics and contributions to Mesoamerican Archaeology. Furthermore, it traces how Japanese scholars became recognized in Mesoamerican archaeology. This article asks these questions and identifies the trends and specifics of Japanese scholarship. Thereby, this study provides important information, especially to younger and future generations of Japanese academics and the public. To address these goals, this article uses a text mining analysis of 161 published articles by Japanese scholars on Mesoamerica with English-language abstracts.

Material

It is hard to follow and track all the accomplishments of Japanese scholars due to the wide range of publication types. Japanese Mesoamerican archaeologists have published more than 900 articles in English, Spanish, and Japanese and in different mediums such as journals, proceedings, edited books, and manuscripts.

This article focuses on analyzing 161 English-language abstracts to understand diachronically the research trends and topics by Japanese scholars. Those articles include publications as first author, corresponding author, and co-author. In total, 161 English abstracts yielded 101 English articles in different journals. These English articles were published in the journals listed in the Web of Science and open access journals since the 1980s. Articles in edited books are not included. Furthermore, 60 Spanish articles were published in the series of proceedings of Symposium of Archaeological Investigations, Guatemala. These articles were published between 1986 and 2022. The reason that the authors chose English-language publications is that it is the most common language in academia. Furthermore, English peer-reviewed and open-access articles are ideal materials to understand Japanese scholars' contribution to the international academic discourse. Additionally, Spanish-language publications were chosen because materials printed in this language are an important resource in Mesoamerica archaeology. However, some of this literature may not have English-language abstracts. The Symposium of Archaeological Investigations, Guatemala is an important annual symposium for Mesoamerican archaeologists and has published open-access Spanish-language articles with English abstracts since 2004 on the website of Tikal association[3].

Most of the articles written about Mesoamerican civilizations by Japanese scholars are, of course, written in Japanese. However, many lack English abstracts and are not open access. It would be ideal to analyze all articles published in different languages. However, unifying the data from articles written in different languages remains problematic regarding translation and vocabulary standardization. This should be done in a future

task. Despite this limitation, as shown below, the text mining analysis obtains meaningful results to understand the trends and topics of Japanese scholars in Mesoamerican archaeology.

Method

For text mining analysis we use the KH Coder, which is a free and versatile text mining analysis tool [Higuchi 2016, 2017]. To understand quantitatively the trends and topics of Japanese scholars in Mesoamerican archaeology we use the "Frequency list" and "Co-occurrence analysis." The Frequency list can provide data about main research topics, areas, sites, and periods and their diachronic change over time. To understand diachronic change, we divide the publication years into 5-year increments from the date of the first English article, although the years 1986-2000 are set in one analytical category due to the small sample size. The Co-occurrence Network examines relationships among characteristic words and visually demonstrates those relationships. This study used the top 150 frequent words extracted from all publications. This tool helps clarify what themes Japanese scholars have focused on and contributed to Mesoamerican archaeology. The process of analysis follows.

Data-making is a crucial process for acquiring appropriate data from complex text data so as to meet the aims of the study. After collecting all publications for this study, we entered them into an Excel sheet (.csv file) with data including Text (abstract), Year 1 (1989, 1990, 1991…), Year 2 (1986-1990, 1991-1995, 1996-2000…), Journal, Author(s), and Title. Before running the Pre-screening process, we prepared two text files (.text file), which are "Stop words" and "name," to obtain good results for the analysis. The "Stop words" consists of general and insignificant words in analysis that can be excluded from the analysis such as "a," "the," (articles), "of," "to" (prepositions), "data," "investigation" (noun), "argue," "indicate" (verb), "possibly," "likely" (adverbs), "important," "remarkable" (adjectives), and "which," and "who" (relative pronouns). The "name" consists of words that have one meaning but comprise two words, this mainly applies to proper nouns such as "El Salvador," "San Andres," "El Palmar," and "Late Classic." Once all those file sets are done, it runs a Pre-screening process. However, the Pre-screening process result needs to be revised depending on the nature of the dataset. If needed, Stop words are added and the names are repeated in the Pre-screening process until no meaningless results occur.

After running the Pre-screening process, the KH Coder has different analytical tools to understand the nature and characteristics of word assemblages including the Frequency list, Correspondence Analysis, Hierarchical Cluster Analysis, Co-occurrence Network, and Self-Organization Map. This study uses the Frequency list and Co-occurrence Network. The results and their interpretation are diverse, but this study focuses on the research area, period, and topics so that the reader can easily understand the data.

Results

1) The frequency list of total publications

The frequency list of total publications provides an overview of the trends and topics of Japanese scholars in Mesoamerican Archaeology (Table 1). "Maya" is the most important word including Classic Maya and Maya Lowlands. Even though, as the previous chapter mentioned, Japanese scholars are working in different areas, the data indicates that the Maya are the main focus of Japanese scholars. More specifically, Japanese scholars published articles related to Ceibal, Aguateca, and Copan. Teotihuacan and Chalchuapa also are frequent words about sites. Teotihuacan is the largest urban city in Mesoamerica. On the other hand, Chalchuapa was one of the regional centers in the southern frontier of Mesoamerica. Other words referring to sites in the top 150 are Kaminaljuyu in Guatemala and San Andres and Tazumal in El Salvador. Even though Japanese scholars worked across Mesoamerica, no other sites were listed in the top 150 words.

The most frequent period is the Classic period (250-900/1000 CE), especially the Late Classic period (600-900/1000 CE). The Early Classic (250-600 CE) period is a less frequent period than the Classic period. The next frequent period is the Preclassic period (1800 BCE-250 CE), mainly the Middle Preclassic (1000-400 BCE) and the Late Preclassic (400 BCE-250 CE). The term, Postclassic (900/1000-1521 CE) did not appear in the top 150 frequent words.

Regarding terms related to research topics, the words in the top 20 frequent words are obsidian, structure, production, artifact, center, political, construction, elite, animal, and burial. Subsequent words in the top 100 are exchange, lithic, chronology, public, community, practice, ruler, state, modern, power, radiocarbon, warfare, bone, ceremonial, food, distribution, interaction, LiDAR, volcanic, craft, monumental, organization, salt, blade, residential, urban, consumption, labor.

2) Diachronic change of the frequency list

1986-2000: Top 150 frequency list show early research trends and topics in the history of Japanese scholars in Mesoamerica (Table 2). Representative words indicating research areas and sites are; Aguateca, Petexbatun, Teotihuacan, Copan, La Entrada,

Table 1. Top 150 Frequency list of total publications.

All Frequency List Top 150					
Words	**TF**	**Words**	**TF**	**Words**	**TF**
Maya	113	shell	24	place	15
Ceibal	75	Chalchuapa	23	space	15
obsidian	71	classic	23	spatial	15
structure	67	community	23	temple	15
production	64	practice	23	Terminal_Classic	15
artifact	54	ruler	23	civilization	14
center	54	Late_Preclassic	22	eruption	14
political	54	role	22	event	14
complex	53	society	22	occupation	14
material	52	state	22	Peten	14
construction	50	Mesoamerica	21	platform	14
elite	48	Mexico	21	point	14
Aguateca	47	modern	21	pyramid	14
Guatemala	44	power	21	Southern	14
Classic_Maya	43	radiocarbon	21	type	14
social	42	warfare	21	World	14
animal	41	assemblage	20	Coast	13
Copan	40	bone	20	Early_Classic	13
group	39	ceremonial	20	multiple	13
burial	38	cultural	20	order	13
ceramic	38	food	20	pottery	13
human	38	late	20	regional	13
ritual	38	Late_Classic	20	soil	13
Teotihuacan	37	life	20	value	13
exchange	34	local	20	difference	12
Middle_Preclassic	33	royal	20	economic	12
population	33	distribution	19	history	12
developmen	32	interaction	19	inhabitant	12
process	32	source	19	isotope	12
change	31	form	18	Kaminaljuyu	12
El_Salvador	31	Honduras	18	lime	12
lithic	31	LiDAR	18	monument	12
pattern	31	lowland	18	past	12
architectural	30	technique	18	plaza	12
chronology	29	volcanic	18	raw	12
early	29	craft	17	relation	12
individual	29	monumental	17	settlement	12
Preclassic	29	offering	17	survey	12
time	29	organization	17	transition	12
central	27	relationship	17	Valley	12
Maya_Lowlands	27	salt	17	artistic	11
phase	27	blade	16	landscape	11
building	26	North	16	mesoamerican	11
date	26	prehispanic	16	Olmec	11
object	26	residential	16	physical	11
stone	26	sequence	16	residence	11
context	25	urban	16	resident	11
core	25	consumption	15	San_Andres	11
city	24	dynasty	15	Tazumal	11
public	24	labor	15	tool	11

Table 2. Top 150 Frequency list of 1986-2000 publications

Words	TF	Words	TF	Words	TF
obsidian	14	wall	3	partner	2
center	13	warfare	3	pendant	2
structure	9	western	3	percussion	2
Late_Classic	8	A.C.	2	population	2
artifact	7	artistic	2	process	2
material	7	beginning	2	rapid	2
political	7	blade	2	ritual	2
production	7	building	2	role	2
source	7	central	2	sacrifice	2
time	7	chalcedony	2	scribal	2
Aguateca	6	cobble	2	sequence	2
complex	6	consumption	2	Serpent	2
distribution	6	cost	2	settlement	2
shell	6	creation	2	single	2
assemblage	5	Early_Classic	2	socioeconomic	2
Classic_Maya	5	economic	2	spatial	2
Petexbatun	5	effort	2	stone	2
pyramid	5	eighth	2	survey	2
regional	5	elite	2	test	2
San_Luis	5	enemy	2	transaction	2
Teotihuacan	5	epigraphic	2	underworld	2
control	4	expenditure	2	use-intensity	2
Copan	4	family	2	value	2
defensive	4	Feathered	2	Vanderbilt	2
exchange	4	Feathered_Serpent_Pyramid	2	visual	2
iconographic	4	figurine	2	10L-16	1
Ixtepeque	4	flake	2	10L-22A	1
La_Entrada	4	form	2	260-day	1
Quetzalcoatl	4	framework	2	abandones	1
technique	4	goods	2	abandonment	1
Temple	4	group	2	accordance	1
assay	3	Guatemala	2	accurate	1
burial	3	hondura	2	activation	1
central-place	3	house	2	America	1
compositional	3	human	2	analytical	1
early	3	jaw	2	artifactual	1
geological	3	late	2	attack	1
Honduras	3	Late_Preclassic	2	attention	1
household	3	local	2	authority	1
individual	3	low	2	axis	1
interaction	3	male	2	B.C.-A.C.	1
lithic	3	Marine	2	banquet	1
Maya	3	Maya_Lowlands	2	basic	1
monument	3	Mesoamerica	2	bead	1
ninth	3	mesoamerican	2	belief	1
object	3	microwear	2	bipolar	1
offering	3	Middle_Preclassic	2	body	1
pattern	3	military	2	bone	1
society	3	myth	2	boundary	1
use-wear	3	palisade	2	bundle	1

and Maya. Late Classic and Classic Maya are the most focused periods in 1986-2000 publications. Regarding the research topics, following words are in the top 50; obsidian, center, political, production, distribution, pyramid, defensive, exchange, interaction, warfare.

2001-2005 Top 150 frequency list slightly change from previous years (Table 3). Particularly, the research area and periods focus more on Classic Maya such as Aguateca and Copan. Research topics are clearer than previous years. Words such as elite, residence, craft, state, exchange, production, and royal are representative words. Interestingly, soil, chemical, and food are, also, frequent words in this period, indicating different trends comparing with other periods.

2006-2010 Top 150 frequency list continues same tendency of previous periods, which focus on Classic Maya, obsidian, and elite (Table 4). However, the specific words such as bone, city, ritual, royal, shell and Ceibal presented more apparently. The trends of frequent words regarding research areas changed. El Salvador, Chalchuapa, and Tazumal are listed in the Top 50. It may be related to this tendency, the word TBJ, which is Tierra Blanca Joven eruption, largest volcanic eruption in Americas, appeared from this period.

2011-2015 frequency list indicates that researches on Maya continue central themes for Japanese scholars (Table 5). Main research sites are Copan and Ceibal. Furthr, Teotihuacan rises again in the Top 50 words. Itza appeared for the first time. In addition to the words El Salvador and Chalchuapa, Kaminaljuyu, which is one of the important centers of southern Maya region, comes to in the list. The representative words regarding research topics in the top 50 includes; production, structure, burial, population, ceramic, change, animal, construction, lime, chronology, pottery, volcanic, and dental.

2016-2020 frequency list demonstrates that although the main research field continues Maya and Teotihuacan, the main periods studied by Japanese scholars changed Classic into earlier period such as Middle Preclassic, Preclassic and Late Preclassic (Table 6). Some representative words related to research topics are; material, obsidian, animal, construction, production, artifact, ritual, community, LiDAR, labor, and elite. Additionally, it is remarkable that the words related to the chronology increased from previous periods such as date, ceramic and radiocarbon.

2021-2022 frequency list demonstrates most recent trends and topics interested by Japanese scholars (Table 7), even though there are still small samples. Regarding research areas or sites, El Salvador, Maya, Ceibal, San Andres, Teotihucan, San Lorenzo, and Olmec are frequent words in the Top 100 words. In terms of the periods, Middle Preclassic, Early Classic, Late Postclassic are in the Top 100. Words human, material, and modern are top 3 words in the 2021-2022, which is totally different trends in other periods. Subsequently, construction, landscape, radiocarbon, warfare, eruption, action, agent, animal, anthropogenic are also frequent words within Top 100 words.

3) Co-occurrence Network analysis

Co-occurrence Network analysis demonstrates a graphic visualization of potential relationships among words in the texts. While the frequency list extract only single words in order of frequency, this network analysis is more relational (Figure 2). This analysis could make it possible to visually understand what is being researched in which area, at what time period, and what is being investigated. KH coder automatically divided groups (subgraph in the Figure 2) based on connectivity among words and show them by color. Color density in the subgraph indicate the centrality of the word in the group. Straight line means strong connection among words. On the other hand, dashed line means loosely connected words. Size of circle indicate the frequency of the word.

The red, purple, yellow and emerald green groups are main group and connected with each other different key words. The red group indicate that the most frequent word “Maya” strongly connects with Ceibal and other words related to place or spatial analysis. Representative words in the yellow group are: Classic Maya and Aguateca and those connect with words related to political economy, socioeconomic, and ritual. Those groups connected with purple and emerald green group through words artifact, elite, production and obsidian. The purple group consists of words related to obsidian studies (exchange, source, blade, core), periods (Middle_Preclassic, Late_Preclassic, Terminal Classic). The emerald green group is spread a little wider and more diverse. Production connects with shell and bone. Interestingly, there is Teotihuacan in the emerald green group, connecting with words state, labor, and urban.

The results show other small relational groups. The orange group consists of words related to dating such as date, radiocarbon, ceramic and which connected with Chalchuapa. The blue group consist of words related to Copan and this group is connecting with the yellow group through word dynasty and political. The green and grey groups are words about architecture and construction. The pink group consists of more general words such as development, role and Mesoamerica.

Table 3. Top 150 Frequency list of 2001-2005 publications

Words	TF	Words	TF	Words	TF
elite	13	ethnoarchaeologica	2	chemistry	1
Aguateca	10	floor	2	city	1
soil	10	group	2	classic-period	1
Classic_Maya	9	Honduras	2	commodity	1
Copan	8	ideology	2	competition	1
center	7	local	2	complex	1
residence	7	low	2	conflict	1
building	6	magnesium	2	consequence	1
chemical	6	meaning	2	construction	1
Guatemala	6	modern	2	correlation	1
Maya	6	obsidian	2	court	1
craft	5	pattern	2	culture	1
development	5	ph	2	daily	1
state	5	phosphorous	2	decline	1
concentration	4	point	2	distribution	1
exchange	4	potassium	2	division	1
food	4	power	2	downfall	1
phosphorus	4	preparation	2	DTPA	1
process	4	relationship	2	Early_Classic	1
production	4	scribes/artists	2	earth	1
royal	4	signature	2	emphasis	1
ruler	4	social	2	end	1
space	4	spear	2	exchangeable	1
structure	4	specialization	2	female	1
artistic	3	Valley	2	filing	1
consumption	3	warfare	2	flashlight	1
disposal	3	A.C.	1	gathering	1
enemy	3	abandonment	1	geology	1
family	3	Acropolis	1	guard	1
human	3	act	1	guidance	1
ion	3	active	1	hilltop	1
object	3	alkalinity	1	hinterland	1
political	3	ammonium	1	household	1
role	3	application	1	identifiable	1
society	3	architectural	1	imprint	1
symbolic	3	arena	1	incursion	1
blade	2	arrow	1	inhabitant	1
calcium	2	art	1	innovation	1
civilization	2	artifact	1	insoluble	1
Classic	2	artifactual	1	integrated	1
clear	2	artist	1	intergroup	1
context	2	assemblage	1	intraregional	1
core	2	battery	1	iron	1
creation	2	beginning	1	Ixtepeque	1
crucial	2	body	1	kinship	1
cultural	2	calcareous	1	knowledge	1
dart	2	capital	1	Las_Pozas	1
display	2	carbonate	1	late	1
domestic	2	centralized	1	Late_Classic	1
economic	2	Cerro	1	layout	1

Table 4. Top 150 Frequency list of 2006-2010 publications

Words	TF	Words	TF	Words	TF
Aguateca	27	monumental	5	JOCV	3
obsidian	22	plaza	5	key	3
political	21	Preclassic	5	life	3
structure	21	prismatic	5	Los_Naranjos	3
artifact	17	temple	5	macroscopic	3
lithic	17	theatrical	5	man	3
Maya	16	time	5	Maya_Lowlands	3
elite	15	artistic	4	Mesoamerica	3
burial	14	bell-shaped	4	mesoamerican	3
El_Salvador	14	bird	4	midden	3
phase	14	Casa_Blanca	4	Nagoya	3
architectural	13	center	4	National	3
ceramic	12	central	4	Native	3
Classic_Maya	12	Classic	4	past	3
construction	12	coastal	4	Petexbatun	3
bone	11	Copan	4	population	3
Chalchuapa	11	core	4	primary	3
production	11	exchange	4	product	3
city	10	household	4	San_Bartolo	3
prehispanic	10	ideology	4	settlement	3
complex	9	Late_Classic	4	space	3
development	9	Late_Preclassic	4	tool	3
offering	9	monument	4	University	3
ritual	9	north	4	urban	3
royal	9	occupation	4	urbanization	3
cultural	8	pattern	4	vase	3
power	8	performance	4	western	3
ruler	8	physical	4	woman	3
shell	8	place	4	1940	2
stone	8	Restoration	4	access	2
distribution	7	society	4	adobe	2
Group	7	state	4	adult	2
Tazumal	7	technique	4	ambiguity	2
TBJ	7	Terminal_Classic	4	Americans	2
building	6	vessel	4	b1	2
Ceibal	6	animal	3	B1-1	2
change	6	art	3	ballcourt	2
context	6	community	3	beginning	2
dynasty	6	court	3	bowl	2
Guatemala	6	December	3	C14	2
organization	6	earth	3	capital	2
process	6	eccentric	3	Ceibal-Petexbatun	2
socioeconomic	6	economy	3	chert	2
blade	5	El_Chayal	3	Chiquirin	2
CONCULTURA	5	evaluation	3	clay	2
craft	5	human	3	complexity	2
crevice	5	imagery	3	condition	2
individual	5	inhabitant	3	consequence	2
local	5	in_situ	3	crack	2
material	5	JICA	3	creation	2

Table 5. Top 150 Frequency list of 2011-2015 publications

Words	TF	Words	TF	Words	TF
Maya	37	Kaminaljuyu	6	funerary	4
production	20	Late_Preclassic	6	haplogroup	4
structure	16	life	6	history	4
group	15	lithic	6	Honduras	4
burial	13	obsidian	6	Ilopango	4
population	13	physical	6	interaction	4
ceramic	12	Preclassic	6	landscape	4
change	12	relationship	6	Mazahua	4
human	12	ruler	6	meaning	4
social	12	sequence	6	multiple	4
animal	11	Sun_Pyramid	6	non-local	4
artifact	11	time	6	occupation	4
construction	11	world	6	offering	4
Peten	11	bone	5	order	4
practice	11	classic	5	point	4
architectural	10	common	5	pyramid	4
complex	10	domestic	5	role	4
Copan	10	eruption	5	sculpture	4
Guatemala	10	head	5	shell	4
lime	10	isotope	5	society	4
ritual	10	lowland	5	Southeastern	4
Maya_Lowlands	9	material	5	Spaniards	4
public	9	Middle_Preclassic	5	symbolic	4
type	9	organization	5	Tayasal	4
Acropolis	8	past	5	Tazumal	4
Ceibal	8	perspective	5	temple	4
central	8	phase	5	Terminal_Classic	4
chronology	8	place	5	transition	4
individual	8	plaster	5	acquisition	3
North	8	pre-hispanic	5	Bajo_Lempa	3
object	8	process	5	cache	3
pattern	8	residential	5	calcination	3
political	8	salt	5	cathodoluminescen	3
Southern	8	South	5	chert	3
stone	8	theory	5	City	3
Teotihuacan	8	warfare	5	clay	3
volcanic	8	weapon	5	coastal	3
Itza	7	anthropology	4	component	3
Mesoamerica	7	ash	4	condition	3
pottery	7	Belize	4	conquest	3
America	6	capital	4	conservation	3
carnivore	6	Chalchuapa	4	contact	3
center	6	community	4	core	3
ceremonial	6	context	4	development	3
Classic_Maya	6	date	4	diachronic	3
coast	6	disease	4	diagnostic	3
cultural	6	duration	4	diverse	3
dental	6	elite	4	Early_Classic	3
early	6	evaluation	4	El_Trapiche	3
El_Salvador	6	exchange	4	exploration	3

Table 6. Top 150 Frequency list of 2016-2020 publications

Words	TF	Words	TF	Words	TF
Ceibal	57	Maya_Lowlands	10	faunal	6
Maya	46	practice	10	fish	6
material	27	time	10	initial	6
obsidian	27	difference	9	interregional	6
animal	25	dynasty	9	isotope	6
complex	25	individual	9	Kaminaljuyu	6
Middle_Preclassic	20	interaction	9	Late_Classic	6
center	19	leporid	9	Mesoamerica	6
construction	19	modern	9	multiple	6
social	19	object	9	place	6
chronology	18	raw	9	plaza	6
Guatemala	18	resident	9	polyhedral	6
Teotihuacan	18	residential	9	procurement	6
Preclassic	17	source	9	sequence	6
production	17	urban	9	surface	6
artifact	16	burial	8	Terminal_Classic	6
ritual	16	Chalchuapa	8	transition	6
community	15	city	8	Adobe_brick	5
date	15	consumption	8	architectural	5
Mexico	15	E-Group	8	bayesian	5
population	15	local	8	bioapatite	5
ceramic	14	Oztoyahualco	8	block	5
Copan	14	phase	8	celt	5
development	13	platform	8	Chiapas	5
exchange	13	point	8	Coast	5
LiDAR	13	power	8	diachronic	5
pattern	13	secondary	8	diet	5
context	12	spatial	8	diverse	5
core	12	state	8	earliest	5
early	12	value	8	Early_Classic	5
form	12	building	7	El_Salvador	5
labor	12	highland	7	felid	5
political	12	Honduras	7	greenstone	5
process	12	inhabitant	7	history	5
public	12	management	7	life	5
central	11	order	7	long-distance	5
change	11	plateau	7	map	5
classic	11	relation	7	monumental	5
Classic_Maya	11	relationship	7	occupation	5
elite	11	role	7	Olmec	5
late	11	salt	7	principal	5
radiocarbon	11	stone	7	reference	5
structure	11	blade	6	San_Andres	5
assemblage	10	cache	6	society	5
ceremonial	10	centre	6	Southern	5
food	10	civilization	6	spectroscopy	5
group	10	collapse	6	tabular	5
human	10	compound	6	technique	5
Late_Preclassic	10	El_Chayal	6	vegetation	5
lowland	10	event	6	World	5

Table 7. Top 150 Frequency list of 2021-2022 publications

Words	TF	Words	TF	Words	TF
human	8	organism	3	plant	2
material	8	political	3	pot	2
modern	8	process	3	pre-hispanic	2
construction	6	San_Lorenzo	3	primary	2
early	6	shell	3	public	2
El_Salvador	6	society	3	raw	2
landscape	6	terrestrial	3	rectangular	2
radiocarbon	6	urban	3	regional	2
social	6	workshop	3	response	2
structure	6	world	3	rock	2
warfare	6	action	2	settlement	2
center	5	agent	2	southeastern	2
date	5	animal	2	spatial	2
eruption	5	anthropogenic	2	technique	2
exchange	5	artifact	2	Terminal_Preclassi	2
lidar	5	bayesian	2	tissue	2
life	5	body	2	transformation	2
Maya	5	Campana	2	variation	2
Middle_Preclassic	5	carbonate	2	abandonment	1
monumental	5	Central	2	abrupt	1
production	5	change	2	adaptation	1
role	5	chronology	2	alarming	1
salt	5	complex	2	alignment	1
volcanic	5	correction	2	application	1
building	4	database	2	archaic	1
carbon	4	development	2	architectural	1
Ceibal	4	dynamic	2	array	1
core	4	Early_Classic	2	artificial	1
event	4	economic	2	assemblage	1
individual	4	economy	2	Assessment	1
later	4	emergence	2	bedrock	1
pottery	4	fish	2	bone	1
San_Andres	4	formal	2	bone/shell	1
survey	4	geomorphic	2	brine	1
Teotihuacan	4	ground	2	broad	1
Valley	4	Guatemala	2	capital	1
aquatic	3	heritage	2	catastrophic	1
ceremonial	3	historic	2	categorical	1
civilization	3	identification	2	centre	1
effect	3	identity	2	ceramic-using	1
elite	3	inorganic	2	chronological	1
group	3	interaction	2	City	1
lithic	3	lake	2	classic	1
map	3	late	2	coast	1
market	3	Late_Postclassic	2	Colonial	1
Maya_Lowlands	3	local	2	commonality	1
Mesoamerica	3	Mexico	2	communal	1
mesoamerican	3	Olmec	2	community	1
model	3	past	2	contemporaneous	1
mollusk	3	people	2	continuity	1

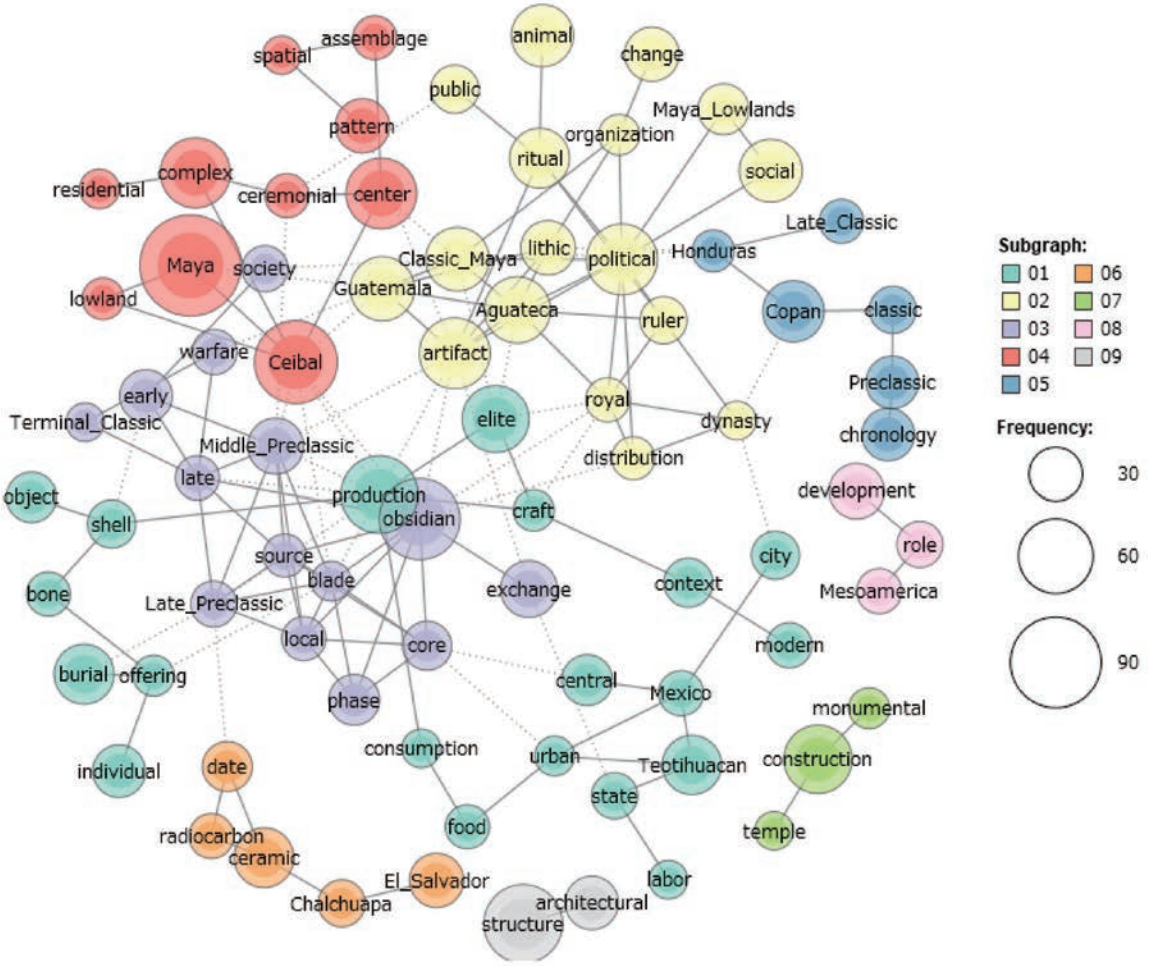

Figure 2. Results of Co-occurrence network analysis (generated by authors using KH coder)

Discussions

As described in introduction, this paper aims to examine what kind of research have been focused on by Japanese scholars, how they were recognized and contributed to in the academia, using text mining analysis of 161 published paper by Japanese scholars. This section discusses the data created by KH coder with the historical background of Japanese scholars described in the previous section to respond research questions mentioned above.

As a whole, the Frequency list and Co-occurrence network analysis both clearly indicate that research on Maya, especially Classic Maya and Maya Lowlands, is a main interest for Japanese scholars all the time. This is not surprisingly but the diachronic change of the Frequency list provides us useful data to understand more specifically what kinds of research have been focused on by Japanese scholars through the time.

Research areas

The data indicate that Japanese scholars have carried out in the vast areas and sites of Mesoamerica. As described in the historical background, Japanese scholars joined or organized archaeological project in Mesoamerica since 1970-80s, which means that Japanese scholars become field-based Mesoamerican archaeologists. Japanese scholars conduct researches and published data and argument about different topics through own original data come from their excavation. La Entrada Archaeological Project organized by JICA archaeologists was remarkable, even though less frequent in the Frequency list. Because researches on Aguateca and Copan, which are most frequent words for next several years, were carried out by archaeologists from the La Entrada Archaeological project such as Takeshi Inomata, Kazuo Aoyama and Seiichi Nakamura.

The Frequency list tell us that Teotihuacan is also one of main targets by Japanese scholars since the beginning of field-based research started in Mesoamerica. Saburo Sugiyama is the pioneer and main scholar at Teotihuacan. Since then, Sugiyama and his colleagues has investigated the main architectural complex at Teotihuacan such as Feathered Serpent pyramid, Sun and

Moon pyramids and the Plaza de las Columnas.

In the 2006-2010 Frequency list "El Salvador" and "Chalchuapa" appear in the top 20 frequent words. New archaeological project at El Salvador is behind this. Kuniaki Ohi, Nobuyuki Ito and Shione Shibata initiated archaeological investigation at Chalchuapa, which is one of the important sites in the southeastern Mesoamerica [Sharer ed. 1978]. Additionally, like a La Entrada Archaeological Project, JICA programs that starts from 2003 also contributed to this tendency.

According to the Frequency list, Maya (Augateca, Ceibal and Copan), Teotihuacan and El Salvador (Chalchuapa) are main research fields for Japanese scholars in the last two decades. This suggests that Japanese scholars have focused on investigating specific sites for long-term to reveal several topics and verify hypothesis. Further, this may indicate that Japanese scholars tend to want enough primary data to argue or prove something.

Based on the historical background of Japanese scholars in Mesoamerican archaeology, however, in the last decade young generation scholars including Reiko Ishihara, Shigeru Kabata, Hirokazu Kotegawa, Mitsuru Kurosaki, Tatsuya Murakami, Yuko Shiratori, Shintaro Suzuki, and Kenichiro Tsukamoto have been working in different areas and sites of Mesoamerica. The outcomes from those researches include in this study but they will reflect more on next decade(s). Interestingly, those scholars studied Mesoamerica archaeology and got Ph.D. in Mexico or US. They have vast knowledge about Mesoamerica and academic network in those countries. This background may contribute to diversification of research field of Japanese scholars.

Furthermore, as for the possibility that the diversity of the research area is not reflected, it is highly possible that it was not reflected in this analysis because the researches have not been published in English.

Research periods

The data indicate that main targeted period is Classic. Major hundreds of monumental architectures and carved stones monuments in Mesoamerica were from the Classic period [Evans 2013]. Therefore, since the early history of Mesoamerican archaeology Classic period is most researched period in Mesoamerican archaeology. This tendency also reflects to the research conducted by Japanese scholars.

The Classic period is main interests by now, but last two decades Preclassic period is also targeted by Japanese scholars [e.g. Inomata et al. 2013, 2021]. This trend is consistent with recent trends in Mesoamerican archaeology [e.g. Nichols ed. 2012]. Recent Mesoamerican archaeology seeks to understand the origin and emergence of several components of Mesoamerican civilization such as sedentary life, maize agriculture, emergence of social complexity and inequality, origin of city and state, cosmovision, religion, and long-distance trade network so far. The 2021-2022 Frequency list marked this shift, which is indicated by Middle Preclassic, Olmec and San Lorenzo.

The Postclassic period has been paid less attention by Japanese scholars. Only a few papers related to this period exists by now. For long time the Postclassic period had been labeled as less developed period but not necessary relationship to a stage of development. Recently, the Postclassic period is recognized as transformation or reorganization period after the Classic collapse in Mesoamerica [Chase and Chase 2004] and also as contact period with Spanish conquistador.

Research topics

Diachronic change of research trends provides interesting insight on the history and contributions of Japanese scholars in Mesoamerican archaeology. Although the research topics are literally diverse, words related to production (craft, artifact, material, and obsidian) and related to political power (elite, ruler, royal) are most frequent words used from the late 1980s to the present. Subsequently, words like warfare and exchange are also frequent and related to obsidian studies and political power. These words mostly cooccurred with "Maya" in the co-occurrence network. This data indicates that over several years, Japanese scholars developed researches on craft production studies through lithic analysis and studies on political power relations in the Maya civilization.

Words like construction, structure, and center are frequent words in all periods. Additionally, even though less frequent, words like place, space, spatial, platform, pyramid, temple, and plaza are meaningful. This indicates that scholars concentrated on structures or more broadly place or space. It is not surprising because generally speaking, structures are the main residential space or political arena, which provide rich information about ancient societies. Although there is no clear correlation in the co-occurrence network, those words likely correlated to words like "urban," "state," and "city," which are relevant topics in archaeology generally [e.g. Love and Guernsey 2022]. Although it is not so frequent on the list, studies on "plaza" by Japanese scholars opened new study directions related to space. Plaza relates to space surrounded by structures and also important gathering spaces and political arenas for ancient people [Tsukamoto and Inomata eds. 2014]. Words like lime, plaster, and labor, increased in the 2011-2015 period and relate to construction and

power relationships [Murakami 2010].

Words like ritual, ceremonial, and community increased in frequency from 2006-2010 up to the most recent period. Interestingly, according to the co-occurrence networks analysis, the word "ritual" has strong ties with words like political, public, and animal. This correlation is consistent with the fact that ritual or more broadly religion is one of the central themes in Mesoamerican archaeology and is deeply embedded in Mesoamerican societies [e.g. Joyce and Barber eds. 2017]. Additionally, the word "animal" is remarkable. In Mesoamerica "animal" is important as a diet resource and potentially sacred and deeply embedded in the Mesoamerican worldview. For this reason, the word "animal" connects to "ritual." In line with recent social science or humanities trends, scholars have tried to rethink the traditional view of human-animal relationships [e.g. Boyd 2017]. Japanese archaeologists could contribute to this area.

The data indicate that chorology-building is one of the important contributions of Japanese scholars in Mesoamerican archaeology, especially after the period 2011-2015. High precision chronology is key to understanding social processes and their correlation with different events including environmental change. This trend was triggered by research about early ceremonial constructions at Ceibal, which analyze large radiocarbon dating and ceramic data sets with Bayesian modeling [Inomata et al. 2013]. Recent investigations about Kaminaljuyu [Inomata et al. 2014], El Palmar [Tsukamoto et al. 2020], Tlalancaleca [Murakami 2022], and San Andres [Ichikawa 2022] follow this trend.

The word "burial" is also highly ranked in the Frequency list. Based on the co-occurrence network analysis, burial connects to the word "offering." This comes from a massive sacrificial burial at Teotihuacan [Sugiyama 1983, 2005]. Although there is no clear co-occurrence in this analysis, the word "burial" should be correlated with the word "isotopic." Isotopic studies, especially for human and animal bones, led to new trends in Mesoamerican archaeology by combining them with bioarchaeology [Tiesler ed. 2022]. Isotopic studies carried out at Copan by Japanese scholars contribute to understanding the nature of immigration, mobility, and multi-ethnicity in the Classic period [Price et al. 2014; Suzuki et al. 2020]. The latest research on non-royal elite burial at El Palmar, combining osteological, archaeological, and epigraphic data, also, is an important contribution to the Classic Maya society [Cerezo-Román and Tsukamoto 2021].

Increasing the frequency of words like volcanic, eruption, and TBJ after the 2006-2010 period is significant. TBJ refers to the Tierra Blanca Joven eruption, which was the largest volcanic eruption in the Americas during the Holocene [Dull et al. 2019]. Research on the TBJ eruption offers important insight into sudden environmental change and human adaptation. However, the eruption date and impact of the TBJ eruption are still under discussion. The argument for short-term recovery from the TBJ eruption based on the San Andres excavations contributes to this issue [Ichikawa 2022]. Although it remains unclear, it has been pointed out that the volcanic eruption of Popocatepetl was one factor causing a substantial settlement shift in Central Mexico and then the rise of Teotihuacan [Plunket and Uruñuela 2006]. Researches on Tlalancaleca in Puebla, a large Preclassic site in Central Mexico [e.g. Murakami et al. 2017], produced new understandings of relationships between early urbanization processes, the rise of Teotihuacan, and volcanic eruption in Central Mexico.

LiDAR, landscape, and map were frequent words in the last few years. LiDAR is a new innovative technology to understand settlement patterns and landscapes. LiDAR hugely impacted Mesoamerican archaeology, particularly the Maya Lowlands, which are broadly covered by jungle and could change our understanding and/or model established in the previous literature [e.g. Canuto et al. 2019; Inomata et al. 2018].

Interestingly, after 2015, and more apparently in 2021-2022, the term "modern" has a high frequency in the Frequency list. This may indicate that Japanese scholars are conscious of connecting studies about the past to the modern world. Words like "anthropogenic" definitely correlate with recent scientific trends in the Anthropocene era [e.g. Kennett and Beach 2013]. Thus, archaeology studies the past and challenges us to resolve several modern problems. This trend is consistent with "Grand Challenges for Archaeology" [Kintigh et al. 2014].

Concluding remarks

This study qualitatively and quantitively demonstrates the history of Japanese scholars in Mesoamerican archaeology. Recently, important articles written by Japanese scholars were published in major peer-reviewed journals including Nature, Science, Proceedings of the National Academy of Sciences, and other high-impact journals in archaeology and anthropology. We believe Japanese scholars are becoming some of the main actors in Mesoamerican archaeology over the last decade. Despite this, no university in Japan has a program dedicated to studying Mesoamerican archaeology, or even New World archaeology. Nevertheless, there are more opportunities than in previous decades to learn Mesoamerican archaeology in Japan. However, many of them are a single-subject class. Our new generations should

make an effort to establish professional and educational organizations/programs to study Mesoamerican archaeology systematically in the future.

As we discussed before, Japanese scholars have contributed specifically to Maya archeology. For this, the La Entrada Archaeological Project was a turning point. Since then, importantly Professor Nakamura and other Japanese pioneers have devoted time to the field over the long term and conducted archaeological research while also establishing good relationships with local communities. Although this is out of scope in this paper, conservation programs for Maya cultural heritage carried out by Japanese pioneers are also an important contribution to Maya archaeology and the communities near archaeological sites. Younger generations, like us, should inherit this tradition.

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Notes

1. The number of publications has been updated since Ichikawa 2014, which counted 777 publications by Japanese scholars [Ichikawa 2014]. Although the exact number of publications might be needed, it is a large enough number to follow the trends and history of Japanese scholars in Mesoamerican archaeology.
2. Light Detection and Ranging, an airborne remote sensing method. This innovative method can precisely generate three-dimensional topographic features on the surface even when dense vegetation covers a research area.
3. http://www.asociaciontikal.com

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