PaleoAsia2018

The International Workshop
Cultural History of PaleoAsia
– Integrative Research on the Formative Processes of Modern Human Cultures in Asia
December 15 –18, 2018, Kyoto, Japan

Program and Abstracts

Edited by
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Preface

The processes of the dispersals of anatomically modern humans into regions of Eurasian Continent represent one of the most hotly debated issues among paleoanthropologists and archaeologists today. The PaleoAsia project 2016–2020 (Cultural History of PaleoAsia: Integrative Research on the Formative Processes of Modern Human Cultures in Asia) aims to contribute to our better understanding of these processes in Asia, where a recent increase in the number of new finds has led to the need for fresh insights and interpretations. This project was launched as a five-year multidisciplinary research program in July 2016, following our previous work, the RNMH Project 2010-2014 (Replacement of Neanderthals by Modern Humans: Testing Evolutionary Models of Learning, Project Leader: Takeru Akazawa), also with support from a Grant-in-Aid for Scientific Research on Innovative Areas from the Ministry of Education, Culture, Sports, Science and Technology of Japan.

While RNMH dealt with biological diagnostics, especially regarding the cognitive capacity of modern humans, the PaleoAsia project focuses on their cultures, as indicated by the subtitle. It is well known that modern humans developed regionally varied cultures in a relatively short period after their dispersals. Can these cultures be explained by the inherent behavioral patterns of modern humans in response to different ecological conditions? Or were they established as historical events involving contacts with indigenous populations who already developed local cultural traditions? Further, is the regional pattern a reflection of the cultural evolution made during the population dispersals? We suppose that comparative perspectives on the different cultural processes noted in Asia provide an opportunity, in turn, for a better understanding of modern humans.

In the present workshop, the project participants will present their initial attempts for the research according to their disciplines, related to either field or theoretical science. In addition, in order to supplement the project, up-to-date inputs on the research by our overseas collaborators are consolidated as well. We hope that through intensive discussion sessions the participants will be able to further develop their own research strategies or collaborative research schemes on issues of PaleoAsia. Lastly but not the least, I would like to express our deep thanks to all those who helped in preparing the workshop. We owe much , needless to say, to the Ministry of Education, Culture, Sports, Science and Technology of Japan for their sponsorship, as well as to the Kyoto International Conference Center and the Research Institute for Humanity and Culture, for providing the venues.

Yoshihiro Nishiaki
Project Leader
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PaleoAsia2018 The International Workshop

Cultural History of PaleoAsia
— Integrative Research on the Formative Processes of Modern Human Cultures in Asia

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PaleoAsia2018

The International Workshop on the Cultural History of PaleoAsia

Workshop Program

Day 1: Saturday, December 15, 2018

Venue: Kyoto International Conference Center

Public Lectures

12：00 – 13：00 Registration

Chair: Seiji Kadowaki

15：00 – 15：15 Coffee Break

16：00 – 17：00 Discussion

Welcome Reception

18：00 – 20：00 Kyoto Heian Hotel

Day 2: Sunday, December 16, 2018

Venue: Research Institute for Humanity and Nature

Workshop

9：30 – 10：00 Registration

10：00 – 10：10 Yoshihiro Nishiaki
Opening remarks

Session 1: Archaeological Data from the Northern Arc

Chair: Masami Izuho

12：10 – 13：10 Lunch

13：10 – 14：20 Poster Session

Chair: Yuichi Nakazawa

15：40 – 16：00 Coffee Break

Session 2: Archaeological Data from the Southern Arc

Chair: Seiji Kadowaki

Day 3: Monday, December 17, 2018

Venue: Research Institute for Humanity and Nature

9：30 – 10：00 Registration

Chair: Rintaro Ono

Session 3: Modelling of the Geographic Patterns

Chair: Hiroyuki Kitagawa

12：40 – 13：40 Lunch

Chair: Atsushi Nobayashi

Dinner

18：30 – 20：30 Ganko Takasegawa

Day 4 : Tuesday, December 18, 2018

Venue: Research Institute for Humanity and Nature

9：30 – 10：00 Registration

Session 4: Synthesis

11：50 – 12：30 Discussion and closing remarks

12：30 – Light Meal

Poster Presentations

Public Lectures

Public Lectures

Introduction to the Workshop PaleoAsia2018

Yoshihiro Nishiaki
The University Museum, The University of Tokyo, Japan

Anatomically modern humans (*Homo sapiens*) emerged in Africa approximately 200,000 years ago or even earlier, and spread across Eurasia later and replaced the indigenous populations, which included Neanderthals and Denisovans. The present research project, PaleoAsia, explores the cultural processes during the dispersals of modern humans in Asia with a focus on regional variability in the formative processes of modern human cultures in Asia and theoretical interpretations of the patterns of culture formation. In other words, this project aims to clarify the modern human dispersal processes from cultural perspectives. In this introductory lecture, the research scope and strategies of the PaleoAsia project are presented.

Numerous research projects are on-going across the world to understand the dispersal processes of modern human from Africa to Eurasia. The uniqueness of the PaleoAsia project lies in its attempt to integrate theoretical modelling with the archaeological interpretation of the cultural changes during the population dispersals. Accordingly, the project consists of the following two major research groups using different kinds of evidence(Fig. 1).

Field investigation (A)

Team A01, comprising archaeologists and paleoanthropologists, aims to construct an extensive archaeo-anthropological database to provide a chrono-spatial framework for the emergence of modern humans and their cultures in Asia. The framework serves as a basis for use by other research teams as well. Team A02 consists mainly of archaeologists, too, as well as those employing archaeometry analyses to investigate the diversity of the behavioral patterns in technology, diets, settlement patterns, and so on. The available field evidence is further studied under a framework of the paleo-environmental research by Team A03, who investigate the correlation between the adaptive strategies, diverse ecological conditions and climatic changes.

Theoretical modelling (B)

Group B provides theoretical foundations to interpret the observed cultural processes. Team B01, consisting of cultural anthropologists, examines the patterns of cultural changes in historical and ethnographic records, with a particular focus on changes caused by population contact and movements. The results are expected to provide historical facts that will help develop models of cultural changes from higher levels. The latter endeavor of the latter comprises Team B02's targets: referring to the knowledge of theoretical and population biology, B02 predicts mechanisms governing the observed patterns through mathematical simulations.

While RNMH2011–2014 attempted to explain the dispersals of modern humans in terms of the potential diagnostics in their cognitive capacities, PaleoAsia seeks to unearth patterns in the behavioral records of the formative processes of modern human cultures without postulating any specific biological abilities unique to modern humans. It is hoped that a combination of the results will lead to the development of pertinent models.

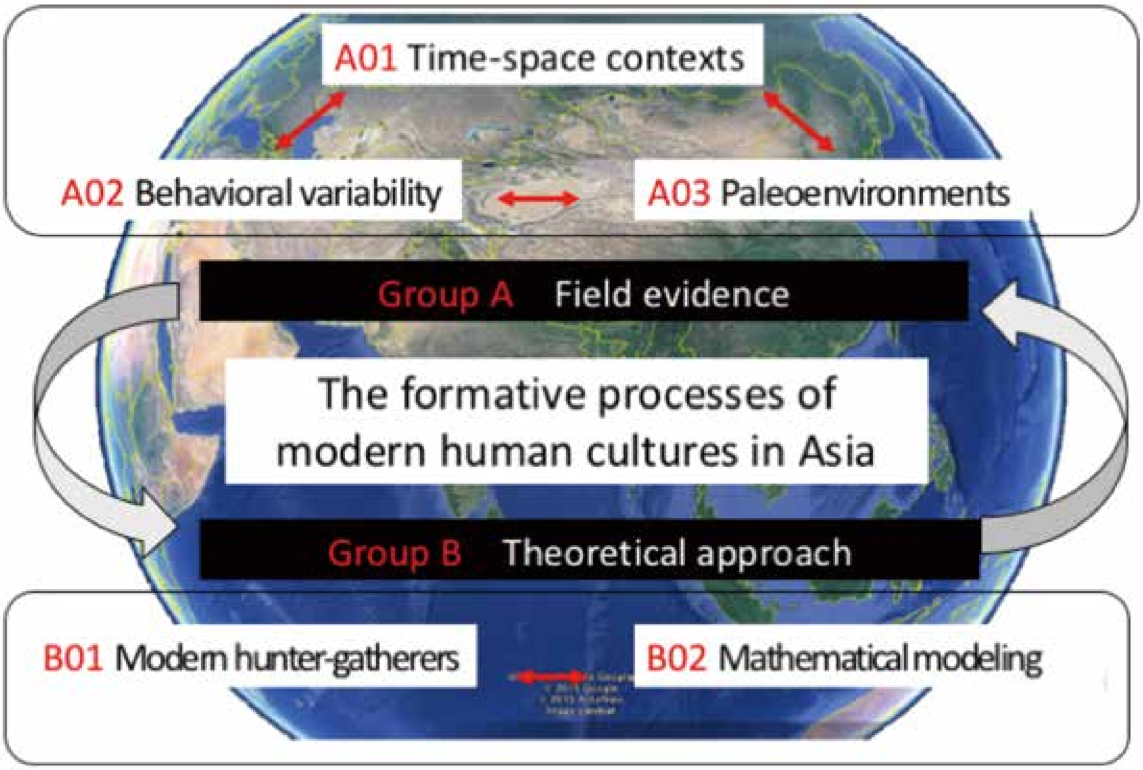

Fig. 1. The research framework of the PaleoAsia project

Public Lectures

Neanderthals in Siberia: New discoveries in Altai Mountains

Andrey Krivoshapkin
Institute of Archaeology and Ethnography of the Siberian Branch of the Russian Academy of Science, Russia

Neanderthals were once widespread across Europe and Western Asia. They also penetrated into the Altai Mountains of southern Siberia, but the geographical origin of these populations and the timing of their dispersal have remained elusive. New discoveries at Chagyrskaya Cave, in the Altai foothills, has yielded 90,000 Middle Paleolithic artifacts and 75 Neanderthal remains from deposits dated to 60,000–50,000 years ago. The hominin remains are associated with a distinctive toolkit that closely resembles Middle Paleolithic assemblages from Central and Eastern Europe. Environmental reconstructions suggest that the Chagyrskaya hominins were specialized bison hunters adapted to the dry steppe. At other Altai sites, evidence of earlier Neanderthal populations associated with absolutely different stone tools implies two or more Neanderthal incursions into this region and their complex interaction with aboriginal Denisovan population.

Public Lectures

Human dispersals into East Asia

Robin Dennell
Department of Archaeology, University of Exeter, UK.

The dispersal of our species into mainland East Asia (China and SE Asia) is probably the most complex part of the story of how we colonised Eurasia. In this talk, I propose that Homo sapiens was not the first hominin to immigrate into China, but the last of several that dispersed into it in the Middle and Upper Pleistocene. I also propose that Homo sapiens colonised East Asia from both the south and the north. In Southeast Asia and South China, immigration by Homo sapiens probably occurred during cool, dry periods when sea levels were low, and there were corridors of open woodland and savannah grassland that allowed entry into these regions. Homo sapiens may have begun to enter South China during MIS 4, with Fuyan and Zhirendong as possible examples. North China has a very different demographic history. In cold, dry periods, much of northern China (and northeast Asia) would have been very sparsely populated, and the basins in the Qinling Mountains and the Yangtse valley were probably refugia. Expansion northwards would then have occurred when the climate ameliorated. This long-established pattern of expansion northwards in warm, moist periods and contraction southwards in cool, dry periods changed radically during MIS 3. After 50 ka, immigration into North China occurred from the north: the first by Neanderthals and perhaps also by Denisovans (or by populations with the genes of both), and after 40 ka, by Homo sapiens. Archaeological evidence suggests a complex history that involved least three dispersal events: the first with large blade tools based on Levallois flakes; a second, small blade tradition; and a third, using micro-blades. I end by commenting on the possible pattern of events that resulted in the colonisation of the Japanese islands were colonised after ca. 38 ka.

Public Lectures

Stories behind the people's migration from Africa to the Japanese Islands 30,000 years ago

Yosuke Kaifu
Department of Anthropology, National Museum of Nature and Science, Tokyo, Japan

Our species, *Homo sapiens*, evolved in Africa around 200,000-300,000 years ago and rapidly dispersed into the rest of the world after 100,000-50,000 years ago. Within this framework, one of the recent focuses of the researchers is directed to the exact age, route, and pattern of this dispersal event in Eurasia. 'Multiple dispersal model' that supposes early (c. 70,000 years ago or earlier) and late (c. 50,000 years ago) dispersals is now favored by many archaeologists (Bae et al., 2017), although 'single, late dispersal model' around 60,000-50,000 years ago still remains tenable (O'Connell et al., 2018).

Apart from this question, another remarkable aspect of this dispersal is that our species adapted to and colonized varying environmental zones in the vast Asian continent, including tropical rainforests, arctic regions, and islands in the outer sea (Kaifu et al., 2015; Roberts and Stewart, 2018). By this process, they further expanded to the areas uninhabited by the previous human species, discovered new lands in the Pacific and the Americas, and ultimately became a ubiquitous species on this planet.

The Paleolithic migrating populations who reached from Africa to the Japanese islands had to pass through different environmental zones where climate, flora, and fauna vary significantly. Some of them probably passed through rainforests in the south of the Himalaya mountains, and developed new technologies to capture arboreal animals unique to there. Other groups of people experienced and behaviourally adapted to the cold environments in the north of the Central Asian deserts. At the eastern edge of the Eurasian continent, they had to cross the open sea to reach the main islands of Japan.

The available archaeological data suggest that the Paleolithic Japanese islanders came from the west (via Korean Peninsula), south (via Taiwan), and north (via Sakhalin) during the period of 38,000-25,000 years ago. In other words, it seems that at least three different populations migrated to Japan in different periods using different routes. In this talk, I will overview the expected challenges that are needed for migrating Paleolithic Eurasians. I also introduce the 'Holistic reenactment project of the voyage 30,000 years ago', our ongoing experimental voyage project that aims to reconstruct late Pleistocene maritime migration in East Asia.

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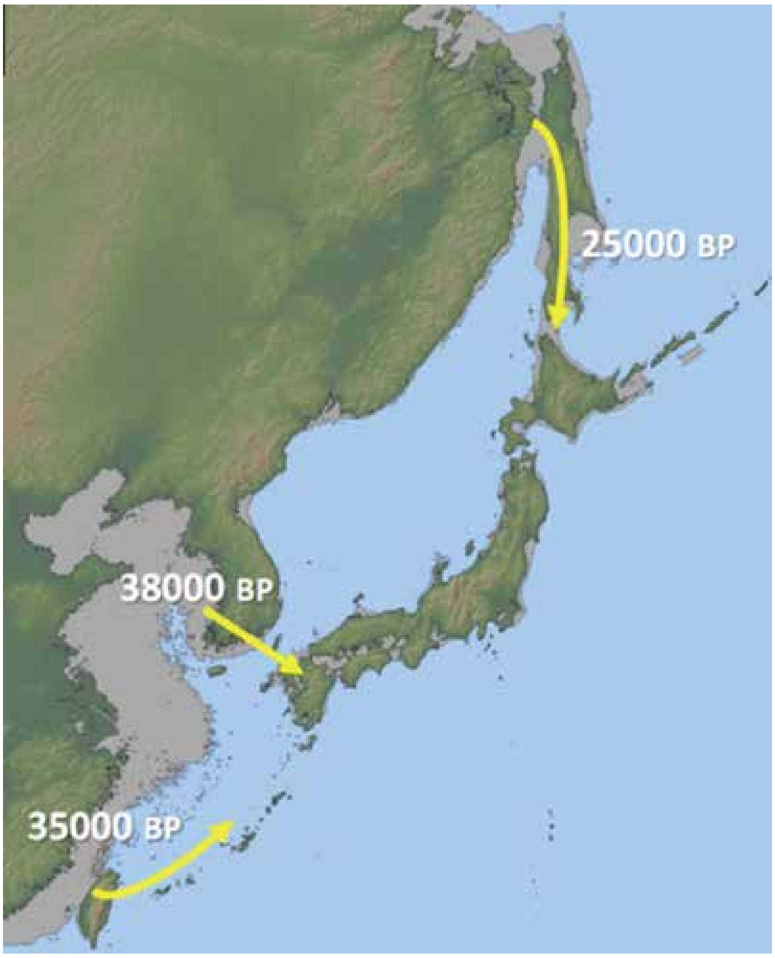


Fig.1. Three possible migration routes to the Japanese islands

Fig. 2. Ongoing experimental voyage project

Workshop: Session 1
Archaeological Data from the Northern Arc

Workshop: Session 1

Reconstructing daily life in prehistory: Using micromorphology to explore the use of space

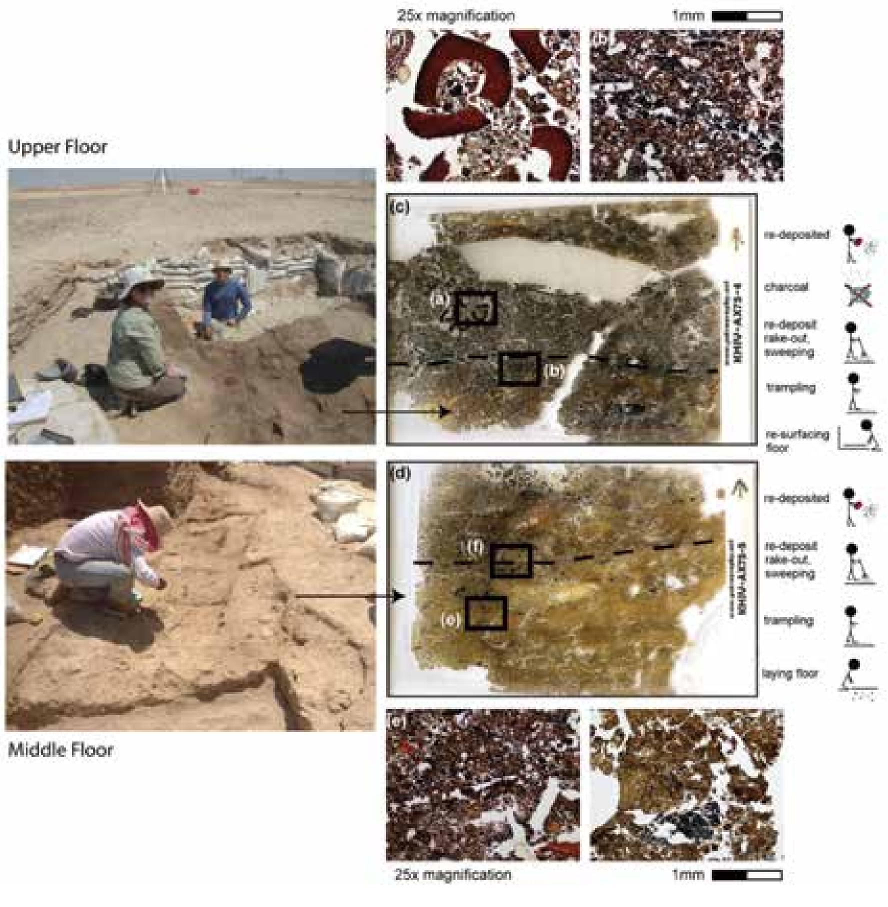
Lisa Maher
University of California, Berkeley, USA

Ethnographic studies of hunter-gatherer societies reveal a richness of lifeways that weave together interrelated aspects of society, economy, technology and symbolism. Yet, reconstructions of the lifeways of Palaeolithic hunter-gatherers often involves working from a highly fragmented and only partially preserved archaeological record. Here, I assess our current understandings of the Palaeolithic and Epipalaeolithic of Southwest Asia based on the contributions of several foundational interdisciplinary long-term research projects in the region, with a specific focus on those employing microscale analyses.

Geoarchaeologists are increasingly recognizing the role that ethnoarchaeology plays in shaping the direction and questions of geoarchaeological research, helping us understand what is knowable and what is not in the archaeological record. Ethnographic data is proving invaluable for identifying activity areas and reconstructing the organization of space in prehistory. Geo-ethnoarchaeology is a research strategy applying geological principles and methods in an ethnoarchaeological context in order to link human activities and the formation of archaeological sites and landscapes. It involves in-depth understandings of the daily practices of contemporary populations as well as study of the natural and cultural processes involved in the deposition, modification, and destruction of archaeological material and traces (i.e., taphonomy and site-formation processes). In essence, we can better reconstruct past behavior by understanding how the archaeological record is created. It is not just material finds (material culture, in all its forms) that are of concern for study, but also material contexts—the anthropogenic sediments that preserve traces of human behavior at multiple scales. We can consider archaeological deposits as artifacts themselves that, much like object biographies, have a life history to tell. Geoarchaeology thus can be particularly well-integrated with ethnoarchaeological datasets because of its ability to a) identify and examine activity areas to get at daily practices, especially amongst those societies whose activities leave few obtrusive traces (e.g., hut floors, cooking areas) and b) reconstruct past landscapes (geographic and social) to understand the complex and nuanced way people created, used and 'lived-in' places.

Most archaeological projects today integrate, at least to some degree, how past people engaged with their surroundings, including both how they strategized resource use, organized technological production, or scheduled movements within a physical environment, as well as how they constructed cosmologies around or created symbolic connections to places in the landscape. However, there are a multitude of ways in which archaeologists approach the creation, maintenance and transformation of human-landscape interrelationships. This presentation explores some of these approaches for reconstructing the Upper Palaeolithic and Epipalaeolithic landscapes of Southwest Asia, using macro- and microscale geoarchaeological approaches to examine how everyday practices leave traces of human-landscape interactions in Southwest Asia. The case studies presented here demonstrate that these hunter-gatherer groups engaged in complex and far-reaching social landscapes. Examination of the Epipalaeolithic, in particular, highlights that the notion of 'Neolithization' is somewhat misleading as many of the features we use to define this transition were already well-established patterns of behavior by the Neolithic. Instead, these features and practices were enacted within a hunter-gatherer world and worldview.

Micromorphology, as one of many microscale methods that link the archaeological record to human activity, has proven to be a particularly useful because it is a contextual technique where strict context is maintained from the field to laboratory. The advantage of micromorphology over other types of analyses is that samples are collected to preserve the spatial relationships of all components. Occupation deposits themselves can then be seen as artifacts that capture evidence of human activity. Both daily, repeated practices and more ephemeral traces of human behavior are preserved in these deposits and can be identified, analyzed and interpreted. In this respect, microscale approaches allow us to tease out of these anthropogenic traces the practices of everyday life. Micromorphological analyses provide evidence for activities related to construction, food preparation, discard or waste disposal patterns, combustion features, and differentiating high- and low-traffic areas such as those related to trampling (e.g., streets) or sleeping (e.g., bedding) or storage. The detection of these types of activities highlights the high-resolution scale of analysis that can be attained, especially in identifying and tracking repeated activities.



Workshop: Session 1

Issues of transition from the Lower to the Middle Paleolithic in Central Asia

Rustam H. Suleymanov (1) **and Otabek Aripdjanov** (2)
(1) National University of Uzbekistan, Uzbekistan
(2) Uzbekisatan State Museum of History, Uzbekistan

Intensive studies of the Paleolithic of Central Asia began after the discovery of Neanderthal remains at the Teshiktash Cave, Uzbekistan, in the middle of the 20th century. The research today allows us to present an outline of the cultural evolution of the Paleolithic in this vast region.

The Pleistocene deposits are quite rich in the mountainous regions and their foothills between the Amudarya and Syrdarya Rivers. The earliest lithic assemblages, characterized by flake tools, have been recovered in the thick sediments of the Varakhsh Valley, south Tajikistan (V. A. Ranov). The second region with Lower Paleolithic assemblages is the rocky terrain of the small Karatau Ridge in the southern Kazakhstan, where numerous lithic artifacts have been recovered from the slope surfaces and terraces since the 1960s (H. A. Alpisbayev; A. P. Derevyanka; A. A. Cibankov).

Middle Paleolithic sites have been more commonly discovered either at caves or open-air stations. The lithic industries of this period are regarded principally to represent a continuity of the earlier one. However, they are distinguished by having more developed elements, notably the blade blank production. Large lithic artifacts were also produced when the sites were situated close to raw material sources. On the localities of the Karatau slopes in South Kazakhstan, large round pebbles, abundantly available at the mountain foothills, were widely used for cores. Due to their limited traces of knapping, the cores were once erroneously attributed to a pebble culture as defined by of H. Movius (V. A. Ranov). Typical retouched tools include retouched blades, scrapers and burins. We assume that the Middle Paleolithic industry characterized by these tools and blade blank production could have originated from an earlier tradition of the Karatau type. Comparable assemblages have been recovered from, besides Karatau and Obirakhmat, plenty of sites inclusing Teshik-Tash, Kuturbulak, Amankutan in the Zarafshan valley, Angilak, which we discovered in 2001 in the Kashkadarya valley. Materials recently recovered from the Pleistocene loess in the Ugam Valley in South Kazakhstan seem also belong this tradition, designated as the Obirakhmat culture. Comparable assemblages discovered by V.A. Ranov from the Vakhsh Valley, south Tajikistan, have been estimated to date back 100 thousand years ago, or even earlier.

Assemblages displaying similar features to the Obirakhmat ones show a large geographic distribution, the Altai mountains to the east and the Middle East to the west. In the latter region, the Tabun D type industry of the Levantine Mousterian is most comparable. The general similarity of the lithic industries and their development across a huge geographic region suggests active interaction between local populations as well as migration. The region stretches from the steppe and desert of the Middle East to the basin of the Huang He River, overlapping the region the Great Silk Road later developed.

Fig. 1. Anghilak Cave, South Uzbekistan, discovered in 2002. Excavations were carried out by an Uzbek-American team in 2003–2004, and by an Uzbek-Japanese team in 2013–2014.

Workshop: Session 1

Late Pleistocene population dynamics in continental Asia: Insights from North Mongolia

Nicolas Zwyns
Department of Anthropology, University of California, Davis, USA

With Neanderthals and Modern Humans moving into Central Asia and Siberia, at least two major human dispersals occurred across the Eurasian steppe during the Late Pleistocene. Although they visited the Gorny-Altai more than once, and even met and interbred with Neanderthals, Denisovans whereabouts remain unknown. Hence evidence calls for further archaeological support to document the timing and environmental context of ancient human occupation of Central and Northeast Asia to better understand the drivers of such long-distance population movements. In this context, I present the summary of an international and interdisciplinary effort to document the nature and the pace of human occupations during the Late Pleistocene of North Mongolia. The focus is on the Tolbor Valley (Ikh-Tolborin-Gol) and a section of the Selenga River where crucial data on the beginning and development of Upper Paleolithic have been collected over 20 years of fieldwork. Recent excavations confirm that a major archaeological shift occurs in Mongolia as early as 45,000 years ago with the Initial Upper Paleolithic, a techno-complex whose sudden appearance coincides with the first occurrence of Modern Humans in Central and Northeast Asia. This initial phase is followed by successive episodes of human occupations, raising questions regarding the impact of climate and environmental changes on the population dynamics along the Eurasian steppe belt.

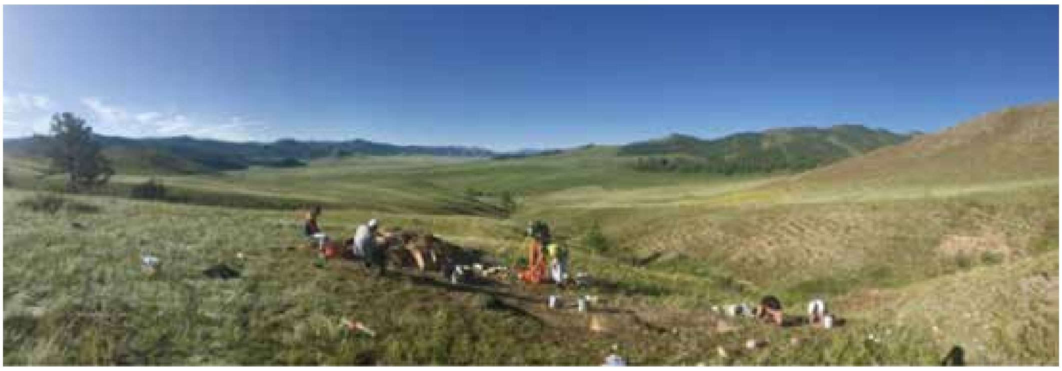


Fig.1. excavation at the site of Tolbor-17 (in collaboration with Byambaa Gunchinsuren and Masami Izuho).

Fig. 2. Summer storm in the Tolbor-Valley.

Workshop: Session 1

Preservation conditions of the initial and early Upper Paleolithic sites in northern and eastern Mongolia

Masami Izuho
Faculty of Social Sciences and Humanities, Tokyo Metropolitan University, Japan

The extensive distribution of Initial Upper Paleolithic (IUP) assemblages from North Africa to Northeast Asia likely fall within the range of 50,000-40,000 Cal yr BP, characterized by blade-based primary reduction with elements of the Levallois technique. Yet the internal variability of IUP cultural expression is still unclear, with its discontinuous distribution of smaller regional clusters across the continents. New evidences on the timing of IUP and subsequent evolution through the Early Upper Paleolithic (EUP) found in the Transbaikal region, Russia, and Mongolia challenge our understanding of broad similarities and local evolutions in lithic technology at the northeastern tip of their distributions, suggesting the importance of archaeological research on the IUP-EUP in Mongolia. Recent fieldworks in northern Mongolia such as at the Dorolj and Tolbor sites in the Selenge River Valley System provides relatively high-resolution datasets for particularly reconstructing on the origin and evolution of local IUP-EUP assemblages in Mongolia. Those data allow us to hypothesize the roles of cultural transmission and convergence during IUP-EUP assemblages as a local perspective.

The preservation condition of the systemic context at each open-air site situated on high colluvial wash slope in northern Mongolia seems better than other regions. However, it does not simply mean that the archaeologists can ignore our effort to assess the natural formation processes at each site. Additionally, the resolution of age determination in northern Mongolia is also still not enough to compare the timing of human behavioral and social changes to abrupt environmental fluctuations recognized during MIS3. Geoarchaeological investigations to assess degrees to which systemic contexts can be reconstructed at the open-air sites buried in colluvial sediment in the area of Mongolia play important role for comparisons with other regions in different environmental conditions.

In this paper, I present a model to assess correspondence relations between contextual data at sites and regional environmental and landscape data from northern and eastern Mongolia, having the awareness of problems and limitation. This model is compared to the another model established in the southwestern Transbaikal to highlight the characteristics of preservation conditions in north and eastern Mongolia.

Fig. 1. The south wall of GT02 in the 2017 expedition of the Tarvagataiin Am, Khudel Sum, Selenge Aimag, northern Mongolia (Izuho *et al*., 2018).

Fig. 2. A splintered large mammal lib bone and chipped stone artifacts are found from a fine sand layer in the unit VI composed of bedded silt and sand layers at 145cm below the surface in the test unit of GT02 (Izuho *et al*., 2018). The fossil specimens buried in the low energy vertical accretion deposit shows very high preservation condition.

Workshop: Session 1

The Paleolithic of China: Its industries and chronology

Shinji Kato
Nara National Research Institute for Cultural Properties, Japan

We, the A01 group of the PaleoAsia Project, have been inputting the data of Paleolithic sites and their assemblages into a Paleolithic database (PDB). The PDB covers Paleolithic sites from 200 to 20 ka across the globe except for North and South America. One of the goals of the study is the establishment of a network of chronological sequences of each region's Paleolithic culture based on the PDB. As one of our projects, we analyze the Paleolithic of China.

1) When we input the data of each assemblage into the PDB, we identify the composition of the modes (PaleoAsia modes, or PAMs), which are improvements on John Shea's modes (Shea 2015) (fig.1). Paleolithic assemblages in China are classified into industries listed below based on the composition of PAMs and my previous observations and studies of the Chinese Paleolithic:

D: Denticulate tool industry (D8). **Dq**: Quartz Denticulate tool industry.
DS: Denticulate tool industry of southwestern China. **DP**: D with many pebble tools (C1).
DL: D with long core tools (E1). **DSL**: DS with long core tools (E1).
PF: Pebble and flake tool industry. **PFL**: PF with long core tools (E1).
PFAX: PF with axes (E4): Hoabinhian. **F**: Flake tool industry. **P**: Pebble tool industry.
B: Large blade industry (F2, G2). **TB**: Industry with backed tools (D2: trapeze and backed knife).
UP: Industry with Upper Paleolithic tools (D1: end scraper, D3: burin).
M: Microblade industry (G3)

2) We investigated the validity of categorization by industries on the basis of the principal component analysis of PAMs. Our analysis showed that the industry of classification was well reflected and objective (fig. 2).

3) The Chinese Paleolithic chronology is tentatively assembled according to the industry and date for each assemblage (fig. 3). Next, we can posit certain findings from this chronology: (i) Long core tools such as biface and pick disappeared at OIS 5, except in the Changjiang (Yangtze) and Luonan Basins. (ii) The denticulate tool industry prevails in northern, northeastern, and southwestern China. During the Upper Paleolithic period, this industry combined blade techniques and polished bone tools. (iii) In northern and northeastern China, the microblade industry appeared at ca.27ka. (ⅳ) The large blade industry or assemblages with large blades and the Levallois technique appeared temporality, suggesting that invaders brought these techniques. (ⅴ) Within OIS 3, we can set a clear boundary between the Upper and Middle Paleolithic periods; the southern region enters the Upper Paleolithic earlier than the northern region.

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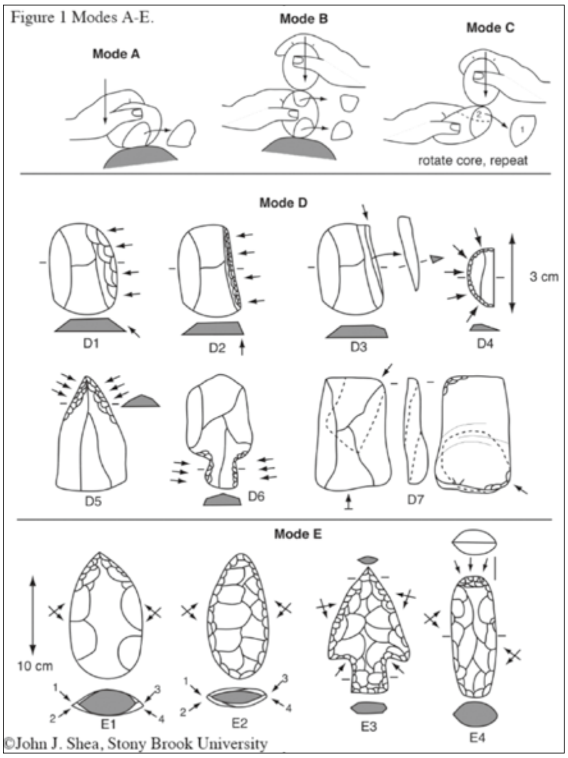

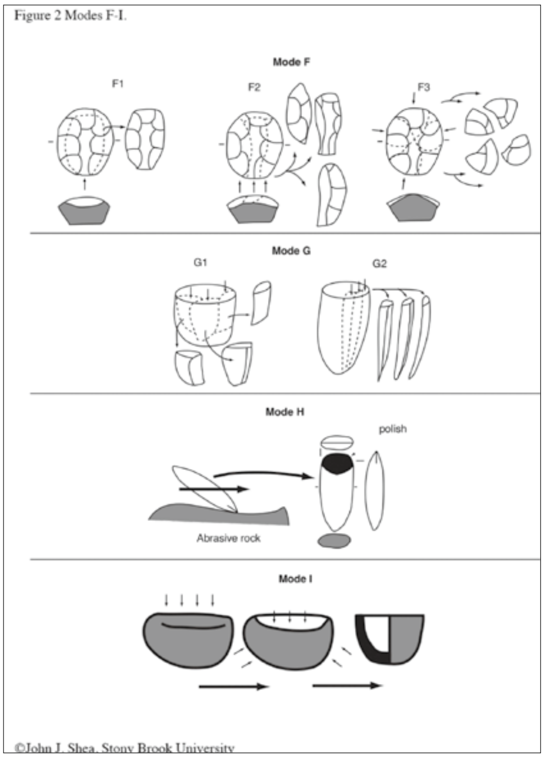

C1: Chopper, Chopper-core C2: Polyhedron, Polyhedron-core C3: Spheroid D8: Denticulate G3: Microblade core

Fig.1. PAMs (Based on Shea 2015).

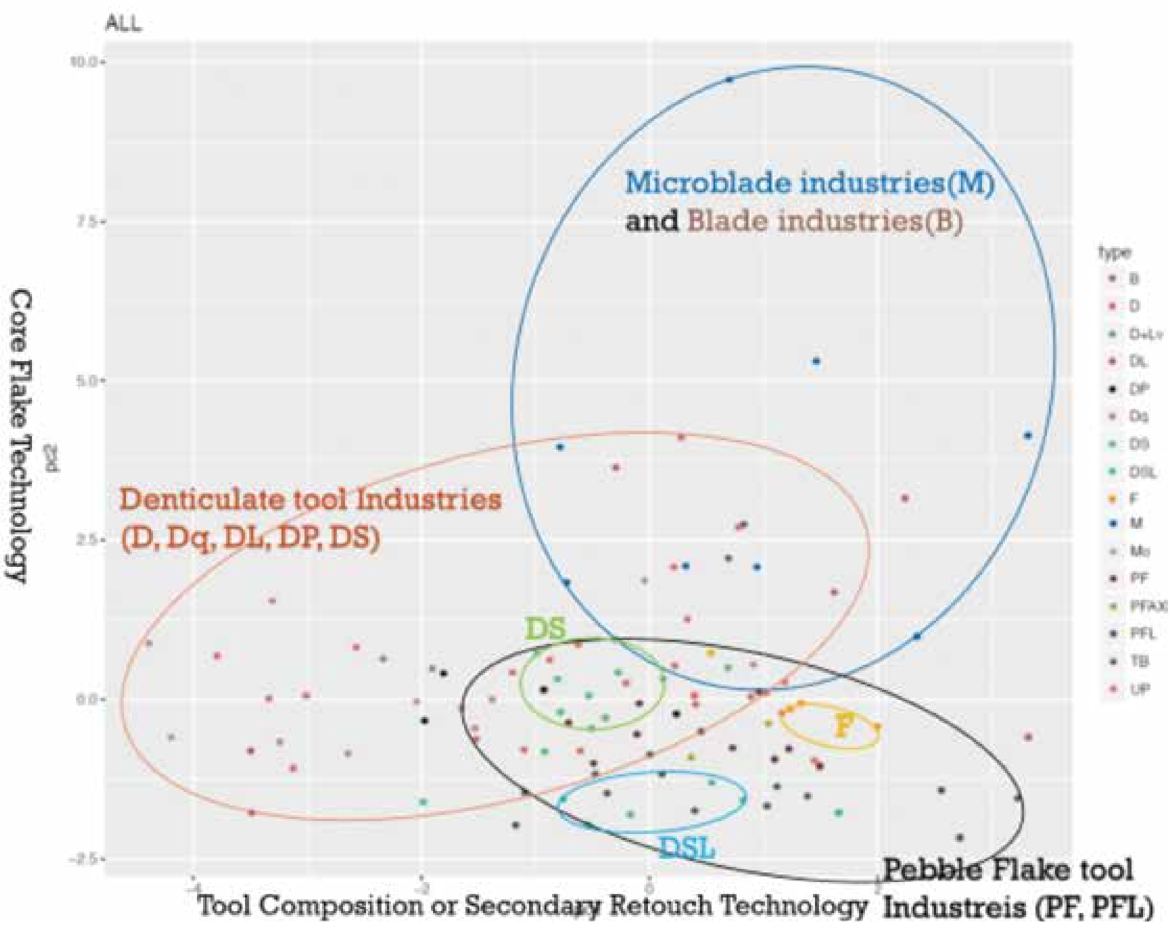

Fig. 2. PCA on PAMs of the Chinese Paleolithic Industries.

	NE.China	East of N.China	West of N.China	Basin of Changjiang	Yun-Gui Plateau	East of S.China	
OIS2	Linfu (20.7)M *ShibazhanC(24.7±1.7)B* NongdaHoushan L2(24.8±1.4)D Datong(25.7)M *Jinsitai Dong M.CL(27.3)D + B* XiaogushanXianren dong L3(21.0-28.2)Dq	Xishi(25.0)M Heilongtan L.CL(26.1)Dq Xiaonanhai L6(27.6)D DongfangGuangchang U.CL(28.3)D? D.G L.CL(29.0)TB	ShizitanS12A L3(22.0)M SZT S29 L7(24.5)M Simiaoyuantou (24.9)Dq Xiachuan U.CL(<26.0)M Youfang (27.0±1.2)M Longwangchan L6(27.5)M Xujiacheng L4A(27.5)Dq SZT S29 L8(28.2)D Tashuihe(28.9)D Shuidonggou 7 L10/11(27.2±1.5)D	Yaner dong(17.0)PF Shiligang(17.7)PF Fulin(20.0)DS Dongliang(28.9)DS Liyuqiao(29.2)DS	Laoya dong L2(21.3)DS Maanshan L3(23.2)DS, LYD L3(23.7), L4(24.1)DS LYD L5(26.8)DS LYD L6(27.6)DS LYD L7(29.6)DS	Bailian dong W4(25.3-30.0)PF Damei U.CL PF B.L.D W5(28.8-31.1)PF B.L.D W7(>28.0±2.0)PF	
OIS3	XGX L2(33.0-39.8) Dq ShoushanXianrendong UCL(38.9)D *JST L7(39.1)D + LV*, LCL(40.9)D, *JST L8(43.1-45.2)D+LV* *Sanlongdong(4.3)Mo* *Huangshan (> 31.2) Mo* *XGX L2L(44.8)Lv* NDHS L4(50.6±2.9)?	Sifangdong L.CL(31.1)DP Huangdikiu L5(34.0)Dq Dazhushan(45.0)D Zhaocun(48.0±2.0)DP Zhijidong L7 (49.7±5.8)DqorD ZJD L8-9(>49.7)PF Fangjiagou(50.0)Dq	Changweigou(30.4) ? *SDG2 CL2(29.9-31.3)B* XC M.CL(26-36)TB Longquandong(30.8-41.1)Dq SDG8 L2(31.1)D? Beiyaowandong(32.9)Dq *SDG2 CL5a(32.8-34.4)B* SDG2 CL5b/6(32.8-34.4)TB? Shiyu(36.2)D Majidong (37.2)D *SDG2 CL7* (37.9)B *SDG1 L.CL* (40.9)B XJC L4B(41.5)Dq? *SDG9* (42.5±3.2)B XJC L4C (41.2-45.1)Dq? Liujiacha(43.0)D Xibaimaying (46.0±3.0)D Niujiaogou(48.0)D Xigou(50.0)D	Xiaohekou(32.9±2.4)PFL Wuyashan(37.1±0.3)PFL Jigongshan U.CL(43.0) F Dashengmiao(48.0±5.0)PFL	LYD L8(30.3)DS MAS L4(33.4)DS? MAS L5(33.7)DS MAS L6(35.0)F *Xiaodong L6M(42.7-44.1)?-L(43.5)PFAX* Guanyindong L-A(42.0±2.0-57.0±3.0)DS	*Baojiyan (31.2) PFAX* Chuanfandong U.CL(34.2)PF CFD L.CL(37.5)PF	UP MP
OIS4	XinxiangZhuanchang(62.0±6.0)PF	Huangniliang(54.0-59.0)D	Wulanmulun1(50.0-60.0)D WLM2 (50.0-60.0)D	Jigongshan L.CL(60.0)DSL Jingshuiwan (67.8±3.9-75.9±3.7)PF	MAS L8(53.0)DS Zhangkoudong (58.0±3.0-110.0±8.0)DS		
OIS5	SSX(<162.1±18.0)D	Lingjing L11(104.0±6.0)Dq Xinqiao Lb(S1)DP	Banjingzi(86.0±4.0)D Fanjiagouwan(93.0-97.0)D Houjiayao (104.0-125.0)D or Dq	Zaoziping(80.0)PF Huanglongdong(79.0±6.0-104.0±1.6)PFL Xiniudong(100.0)PFL	GYD L-B(76.0±4.0-115.0±7.0)DSL Bianbiandong(110.0±8.0)DSL	Damei L.CL PFL? Zhirendong(100.0±14.1)?	
OIS6 ~	Miaohoushan L6(142.0±13.0)PFL MHS L5(247.0±83.0)PFL	Zhoukoudian15 L2(154.5±2.1)DL	Dingcun DL	Houfang L3(133.0±1.0-149.0±9.0)PFL Ranjialukou(143.0±12.0)PFL Daqiaoxi(164.0±12.0)PF Fangniushan L2 (162.0±32.0)PFL Jigongdang (180.0±13.0) PFL Chenshan L3 PF Heshangdun L5 PFL	Dadong(155.0±13.0,156.0±17.0)DSL?	Piaofengshan(150.0-223.0)DSL Dawugang(150.8±12.8-223.8±18.6)DSL Dengtaizhen(181.0±9.1)PFL	LP

Fig. 3. Chronological table of the Chinese Paleolithic assemblages (ca.20-300ka)

Workshop: Session 2
Archaeological Data from the Southern Arc

Workshop: Session 2

A world apart: Early human prehistory of the Maros Karsts in Sulawesi

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In this presentation I will discuss my team's ongoing archaeological research in the limestone karsts of Maros in the south of Sulawesi, the largest of the many oceanic islands between continental Asia and Australia – a region known as 'Wallacea'. The Maros karsts, as recently announced (Aubert *et al.* 2014), harbour some of the world's oldest known rock art, with hand stencils and figurative animal paintings dating back at least 39,900 and 35,400 years ago (ka), respectively. It was also reported (van den Bergh *et al.*. 2016) that stone tools from a site (Talepu) 80 km northeast of Maros date to between approximately 200 and 100 ka, with the antiquity of these findings indicating either that Sulawesi was host to an archaic hominin species or that *Homo sapiens* had colonised this island far earlier than previously thought possible(van den Bergh *et al.* 2016). My team's research in the lowland tower karsts of Maros is concentrated on deep-trench excavations in limestone caves (Brumm *et al.* 2018), with a current focus on the long sequence of stratified deposits at Leang Bulu Bettue. Investigations at this site are aimed at documenting a key aspect of the Pleistocene occupation record: the transition from the earliest cultural phase and associated fauna to the emergence of rock art and other evidence for 'modern' symbolic expression (Brumm *et al.* 2017). The answers we seek relate to one of the deepest enigmas in Wallacean prehistory: Who were the first human inhabitants of Sulawesi, when did they colonise this island, and what was the nature of their relationship, if any, with the people who were creating rock art there by 40 ka?

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Workshop: Session 2

Rethinking origins of EUP lithic technology in the Japanese Archipelago: Axe and blade technique

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Abrupt increasing of the number of archaeological sites in the early phase of Upper Palaeolithic (EUP) in the Japanese Archipelago indicates rapid growth of population size during the period. When migration of new population groups is considered as the essential background of such increasing, the origin and the route of migrant group would be the focal subject.

EUP lithic technology in the Japanese Archipelago consists of 3 technological components such as flake core reduction, blade core reduction (Morisaki *et al*. 2018), as well as unifacial/ bifacial stone axe production including edge ground technique (Tsutsumi 2012). It shows some similarity with neighbouring continental East Asia (Bae 2017), but not equal to. Therefore, simple direct comparison for identifying the origin and the route of migration is difficult.

The first key element for searching the origin and the route of migration of Japanese EUP is stone axe which isolatedly discovered both in the Paleo-Honshu Island and the Sahul. Stone axe from both regions show similar mechano-functional form as adze with asymmetry between dorsal and ventral sides. Possible explanation on such remote distribution is either independent innovation and parallel evolution, or synapomorphy-monophyly in a clade. Homoplasy or the founder effect (Clarkson 2014) are also considerable.

Apart from stone axe, the other key element is blade technique. Morisaki *et al.* (2018) categorizes Japanese EUP blade core reduction into 2 sub-divisions as following: BT-1 as narrow-faced blade core reduction sequence; and BT-2 as semi-rotated blade reduction on prismatic or semi-cylindrical core. They argue that BT-1 emerged earlier (around 36ka) than BT-2 (34ka or later). They also pointed out that simultaneous sequence is recognized in the southern Korean Peninsula but likely no link with the northern China.

The author examines technological features of EUP blade technique in the northern Tohoku region of the Paleo-Honshu Island with 3D morphometric analysis both on archaeological and experimental materials. Preliminary result reveals that EUP semi-rotated blade core reduction (BT-2 by Morisaki *et al*. op. cit.) is different from the late Upper Palaeolithic blade core reduction in techniques of platform and working surface preparation. The objective form of debitage of EUP blade core reduction is convergent blade for pointed tool. Preparation of dorsal ridge and fixing percussion point are key controls for acquiring objective form. Flaking method of narrow-faced blade core reduction seems different from semi-rotated core reduction, but both are coexisting in a same nodule (and sometime with flake core reduction as well). This indicates that different blade core reduction sequences developed within single technological system or merged after encountering different tradition of technologies.

In combination of analyses on two lithic technological elements, the origin and the migration route of Japanese EUP will be discussed.

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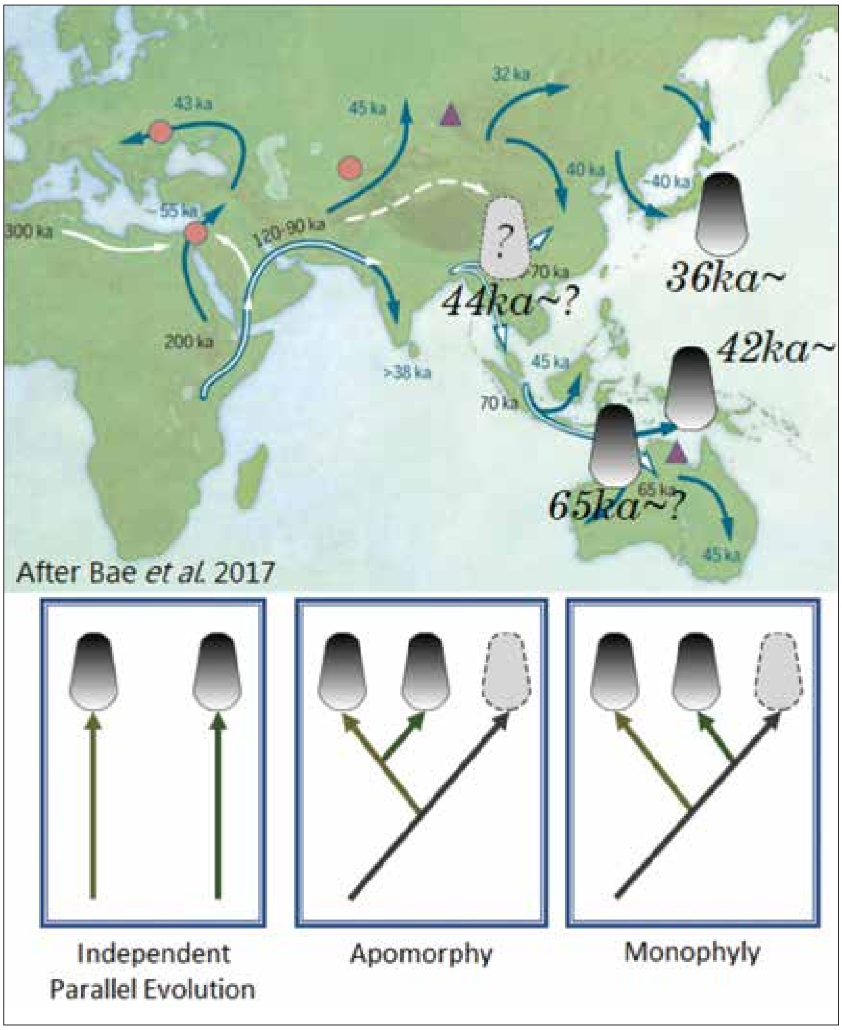

Fig.1. The oldest stone axes in Asia-Oceania region and hypothetical evolution pattern.

Workshop: Session 2

Resource use and tool technology during the Late Pleistocene to Holocene in Wallacea-Cases from North and Central Sulawesi, Indonesia

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The colonization of Sahul (Australia and New Guinea) represents the earliest evidence of intentional and relatively long-distance, over 80 km seafaring by Homo sapiens or anatomical modern human (ANH), now possibly back to 65,000 to 50,000 years BP(cf. Clarkson *et al.* 2017). Recent archaeological studies and findings in Wallacea region support the hypothesis that such early maritime migration by modern human to Australia/Sahul continent could be done from islands in Wallacea. For such early migrations by ANH, mainly two major migration routes have been discussed hypothetically as (1) Northern route from Sulawesi- Maluku- the Bird Head's of New Guinea and (2) Southern route from Sumatra/Java to Banda Islands and Timor to Northern Australia (cf. Birdsell 1977; Irwin 1992; Sondaars 1989). In terms of island to island visual connectivity, Northern route has much higher connectivity than that in Southern route. On the other hand, recent archaeological studies found much older traces by AMH along the Southern route and so far all the early sites over 40 kya in Wallacea region are located along this Southern route. Overall, the specific pathways, gateway regions, level of maritime adaptation and rate of migration remain unknown.

With such understanding and current situation, we have conducted our archaeological research on the past environments and pattern of both marine and terrestrial resources use in the Paleolithic sites mainly along the northern routes in Wallacea. The major sites along this route are yet very limited as less than 10 sites which include Golo cave on Gebe Island (37kya-), Leang Sarru on Talaud Islands (35kya-), Maros caves including Leang Leang on South Sulawesi (35kya-) and Topogaro cave complex on eastern coast of Central Sulawesi (30kya-). Among them, Lang Sarru and Topogaro caves were or have been excavated by Ono and Pusat Arkeologi Nasional Indonesia, and we report the detail results of our excavation and current analysis here.

Interestingly, Leang Sarru only provided large number of marine shellfish and stone artefacts (cf. Ono *et al*. 2011, 2015), while Topogaro caves provide both freshwater, estuarine and marine shellfish with small sized invertebrates as well as large number of stone artifacts. We also confirmed stone flakes and bone tools dramatically increased after the Holocene in Topogaro, and more variety types of shell ornaments and flake tools appear in the Holocene layers. Such archaeological results clearly show more active resource use and development or changes of tool production during the late Pleistocene and the Holocene. On the other hand, the limited number and volume of large to middle sized mammals against the larger number of shells may indicate the past human subsistence strategy with strong relay on aquatic resources rather than terrestrial resources around the site. Such resources use and subsistence strategies may cause the selection and use of lithic tools in Wallacea nad Island Southeast Asia since the Pleistocene time.

Workshop: Session 2

When did anatomically modern humans first colonise the continent of Sahul?

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Since the 1960s when professional archaeology was established in Australia the greatest challenge has been to excavate a site that will reveal the date of first human arrival in Australia. This is the 'Holy Grail' of Australian archaeology (Mulvaney & Kamminga 1999). In 1962, the 'Father of Australian archaeology', John Mulvaney, announced a date of 16,000 years for evidence of earliest human occupation in his excavation at Kenniff Cave in central Queensland (Mulvaney & Joyce 1965; see Fig. 1). The first human presence in Sahul is currently dated to before the Last Glacial Maximum, when Australia and New Guinea were part of the Sahul continent.

Over the last decade several archaeological sites have been dated between about 42–52,000 years ago by radiocarbon dating, thermoluminescence, luminescence and single grain luminescence methods. In 2017 the claim was made that Madjedbebe rockshelter, which I originally test-excavated in 1973, has evidence of human occupation dating back to possibly as old as or older than 65,000 years ago (Clarkson *et al.* 2015, 2017; Fig. 2). It represents an outlier date for human arrival as much as 15 millennia or more than previously held (Fig.3).

This recent claim was widely publicised in Australia and internationally, and it is now widely accepted by the Australian public as a given truth. However, what the media have subsequently declined to publicise is that the date had been challenged by a team of experienced researchers representing the disciplines of archaeology, chronometric dating, entomology and DNA analysis.

A fundamental problem in being confident about the dating of archaeological sites claimed to be extremely ancient is that Australian archaeologists often rely on date determinations derived from small sedimentary particles, such as quartz sand grains and fine fragments of charcoal, and not from direct dating of reliably identified in-situ hearths, stone artefacts and manuports, or cultural shell and bone.

In the case of the site of Madjedbebe, which is a dating-outlier, the dispersal of single-grain OSL age determinations for sand grains is consistent with termite bioturbation. Termites are endemic to the area and their mounds surround the site (Fig. 4). There are other identifiable and inferred agencies of disturbance as well, for instance, tree roots grown into the site, and the excavated area of archaeological deposit represents the densest Aboriginal burial ground professionally excavated in Australia; in fact, in 1973 I unearthed skeletal remains of at least four individuals from less than a one-square-metre test pit at the site (Kamminga & Allen 1973). Importantly, there are also stone artefacts deep in the sand sediment that appear to be mid-Holocene or more recent in age.

So, when did anatomically modern humans first arrive on the shores of Sahul? The jury is still out, and it is time to reassess even the longstanding claim of Late Glacial Maximum age for the ground stone axes excavated in the mid-1960s from a rockshelter close to Madjedbebe in Kakadu National Park.

It is likely that the quest to discover and excavate Sahul's most ancient archaeological sites is not yet ended. I believe it is prudent to take a step back and carefully reassess the evidence for the various claims already made.

Fig. 1. Excavation of Kenniff Cave in 1962. This excavation provided the first Pleistocene date for human activity in Sahul (Mulvaney & Joyce 1965).

Fig. 2. Madjedbebe rockshelter, claimed to reveal human presence in Sahul 65,000 years ago (Photo: Jo Kamminga).

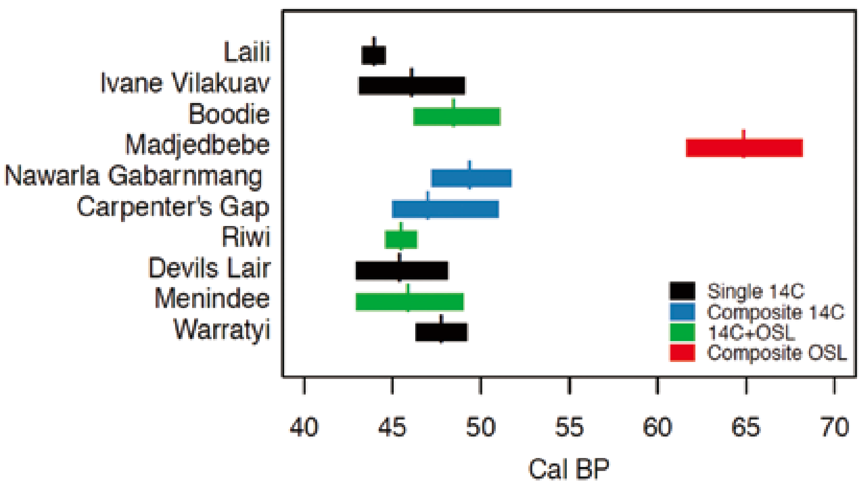

Fig.3. Radiometric ages (ka) for the nine oldest dated archaeological sites in Sahul and eastern Wallacia vs. Madjedbebe (O' Connell *et al*. 2018).

Fig.4. Example of a termite mound in the vicinity of Madjedbebe rockshelter (photo: Jo Kamminga).

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Workshop: Session 3
Modelling of the Geographic Patterns

Workshop: Session 3

Environments during the spread of anatomically modern humans across Asia: What do we know and what would we like to know?

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Various national and international research projects with a focus on anatomically modern humans (AMH), their dispersions, subsistence strategies, technical innovations and interactions with local and regional environments during the Middle and Upper Paleolithic would benefit from better knowledge of Late Quaternary vegetation and climate variability. The interval between 130–11.7 kyr BP is of particularly great interest, as it covers the Penultimate Interglacial and the Last Glacial epochs when modern humans spread to all continents except Antarctica. It has been suggested that climate change and its effects on ecosystems may have played a key role in human evolution (deMenocal, 2011). However, did past changes in climate (and environments) influenced hunter-gatherer population dynamics, cultural traditions, prosperity, continuous existence and collapses, and if so, in which way(s)? Could we see major differences or similarities between large regions? These and similar questions were raised in both archaeological and paleoenvironmental studies published elsewhere (e.g. Tarasov *et al*., 2013; Wagner *et al*., 2014). Though, substantial progress has been made in the archaeological and environmental sciences during the past two decades, not least due to implementation of the Earth system and human population modeling (e.g. Timmermann and Friedrich, 2016), ancient DNA research (e.g. Willerslev *et al*., 2014), more accurate dating (e.g. Bronk Ramsey *et al*., 2012) and quantitative vegetation and climate reconstruction techniques (e.g. Melles *et al*., 2012), the list of questions did not become shorter and the gap between "what do we know and what would we like to know" is still far from being closed. Eurasia – the largest and the most populated continent – offers a wealth of archaeological information and environmental data archives, thus providing great opportunities for multidisciplinary research, as the currently running Cultural History of PaleoAsia Project (e.g. http://paleoasia.jp/en/) clearly demonstrates. By uniting an interdisciplinary and international team of researchers, this and other similar projects are leading the way in gaining new knowledge and in testing a number of working hypotheses. One such hypothesis developed by Timmermann and Friedrich (2016) on the basis of fossil and archaeological data suggests that the migration of AMH out of Africa and into Eurasia occurred in several episodes (so called Human Dispersal Windows) around 106-94, 89-73, 59-47 and 45-29 kyr ago. In order to verify this hypothesis and to evaluate the role which orbital-scale global climate swings and millennial-scale abrupt climate changes such as Dansgaard-Oeschger events played in shaping Late Pleistocene environments and human population distribution, in-depth archaeological and environmental research in key regions of our planet is essential (e.g. Liu *et al*., 2015). High resolution environmental (in particular pollen) archives stored in lake sediments serve well for a better understanding of late Quaternary vegetation and climate changes and contribute to the debates on their timing and driving factors (e.g. Melles *et al*., 2012; Nakagawa *et al*., 2012; Litt and Anselmetti, 2014). It is important that archaeological communities worldwide also recognize the vital necessity of paleoenvironmental studies and overcome inter-disciplinary borders by actively helping to promote and shape joint geo-archeological projects (e.g. Weber *et al*., 2013; Leipe *et al*., 2018).

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Workshop: Session 3

Climatic-induced migration of early modern humans across Asia

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Modern human (*Homo sapiens*) first evolved in southern or eastern Africa ~200,000 years ago (ca. 200 ka) and dispersed out of Africa between 120 ka and 50 ka, based on fossil, archaeological, and genetic evidences (Groucutt *et al*., 2015; *Evolutionary Anthropology* 24, 149-164), and subsequently across Asia by 40 ka. Central questions to the study of modern human dispersal across Asia are how and when they spread and colonized over Eurasia. In idealized circumstances, there are no impediments to modern human dispersal into a new environment at a uniform rate. In reality, new environments offer friction that impedes, directs, and modifies the modern human dispersal. Modern humans that dispersed across Asia have to traverse and inhabit an immense variety of environmental condition (or landscapes). Here I attempt to place the three types of terrain (: refugia, barriers and corridors) in climatic prospective for the dispersal of modern humans across Asia at the last glacial and present conditions. In this study, the climate circumstances in different parts of Asia are classified using a clustering technique to simplify the spatial variability of climates into a form that is more meaningful and easier to analyze. The climatic classification map showing the areas with climatic similarity are generated as clusters calculated using 19 climatic parameters from the simulations with the Global Climate Models (GCMs) and the interpolations of instrumental observed data, representative of 1960-1990, consisting of annual trends (e.g., mean annual temperature, annual precipitation), seasonality (e.g., annual range in temperature and precipitation) and extreme or limiting environmental factors (e.g., temperature of the coldest and warmest month, and precipitation of the wet and dry quarters) which are biologically meaningful variables (Hijmans *et al*., 2005; *International Journal of Climatology* 25, 1965-1978). The climatic classification map provides intuitive and valuable insights into the relationships between climate and the disposal of modern humans, and also identifies the potential refugia, barriers and corridors which can place a restraint on human dispersal across Asia. In this presentation, I discuss the climatic-induced migration of early modern humans across Asia with reference to the climatic classification map.

Workshop: Session 3

Human dispersal and adaptation for livelihood: Hunting style changes with dogs

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One must understand the dispersal of humans (*Homo sapiens*) throughout Asia and their environmental and cultural adaptation from three perspectives in light of diverse environments: technology/subsistence, society, and symbol. The author has described social adaptation (relationships between hunter–gatherer groups) and symbolic adaptation (pursuit of beauty from the viewpoint of beads) in earlier reports, but has never reported techniques and adaptation for livelihood (Ikeya 1994). Here, particularly addressing the relationship between human beings and dogs (Shipman 2015), which has drawn attention in the debate over shifting behaviors of human beings from Neandelthal to *Homo sapience*, a new technology and subsistence model of adaptation will be established accompanying the dispersal of human beings.

A study of this subject by Lupo, an American ethno-archeologist (Lupo 2017), is well known. Nevertheless, a useful research framework for cultural–historical research of PaleoAsia must be presented. This study elucidates the following points. (1) How have hunting methods and efficiency changed by the introduction of dogs? (2) Can humans keep dogs surviving for long times? (3) What social changes (e.g., movement of residential and social relationships) occurred by the introduction of dogs? Various hunting-related changes occurring with the introduction of dogs will be recognized by regions of diversified environments in Asia (Guagnin *et al*. 2018). This research will also provide an effective framework for considering livelihood adaptation when humans were dispersed in times before dogs were domesticated.

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Workshop: Session 3

Ethnoarchaeological projections of Neolithic crop adoption among Late Paleolithic foragers of Taiwan, the Philippines, and the SE China coast using the Binford hunter-gatherer database

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Taiwan has been home to modern H. sapiens for at least 20,000 years. A stable coastal foraging adaptation with some mountain hunting persisted until about 6,000 years ago, when agriculture appeared relatively quickly in both the north and southern parts of the island. Archaeological data indicate that rice and millet were introduced contemporaneously despite their distinctively different cultivation requirements. Taro was also introduced, and chenopodium domesticated, although Neolithic archaeological signatures are not clear. Emerging evidence for the Middle to Late Holocene suggests a complex interplay of cultural adaptations including migration, diffusion, adoption, and innovation in the region, that likely preceded the onset of agriculture and influenced its tempo and mode. This paper offers a frame of reference for pre-Neolithic foraging lifeways and presents an hypothesis for variable crop adoption according to behavioral ecological decision-making among hunter-gatherers. The Binford database is used to make basic projections for foraging subsistence, mobility, and land use in Taiwan, the Philippines, and SE China that are based on ethnographic data linked with appropriate environmental conditions, in order to frame basic predictions in a way that has potential to be assessed with archaeological data.

Fig. 1. Bifacial chopper and cobble tool from the Dapenkeng Neolithic Type Site, northern Taiwan. Used by permission of the Museum of Anthropology, National Taiwan University. Photo: P. Yu.

Fig. 2. Amis kitchen garden showing several Neolithic era crops and cultivated weedy annuals. The inclusion of commensal weeds in the diet may have originated with Neolithic agriculture in Island SE Asia.

Workshop: Session 3

Social and cultural change in the indigenous population after contact with colonizers: Historical ecology of Taiwan's people in the 18th -20th century

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Based on an ethnographic case study, this paper discusses the dynamics of assimilation and cultural preservation when human populations come into contact with one another. Specifically, the author analyzes the contact between the indigenous peoples and colonists that occurred in Taiwan from the 18th to the 20th century. The author analyzes the phenomena caused by this kind of contact and proposes an ethnographic model for the reconstruction of populations and cultural transformation.

Prior to the Han people's migration of the 17th century, Taiwan was populated by indigenous peoples whose native languages belonged to the Austronesian group of languages. Within the population, the groups living in the western plain area began the process of Sinicization through contact with the Han peoples who had migrated to the area mainly during the 18th century. This advanced the transformation of their language and material culture. These groups were called Pingpu peoples, and although they had homogeneous cultural and social characteristics, the population had dispersed, with some groups continuing to inhabit the original areas of residence, while others had migrated elsewhere.

Meanwhile, the groups who lived in the Central Mountains and eastern part of Taiwan had contact with the Han peoples through trade with merchants or agents. As a result, the influence of this external culture was limited to their material culture. Their original subsistence activities and social organization were maintained.

Japan, which began governing Taiwan as an imperial colony in 1895, controlled the mountainous regions by establishing police stations in each of the indigenous villages, and provided agricultural guidance, medical care and education. This accelerated the process of intervention into the lives of indigenous peoples in the mountainous areas. In particular, the Japanese migration policy changed the indigenous residential situation; the previously dispersed population living at high altitude began to congregate into communities in lower altitude areas. However, the integration of the same or related populations did not dramatically alter the material culture or social relations.

Under the government of the Republic of China after World War II, the monetary economy penetrated the indigenous peoples' society. In a broad sense, this was as a significant change of niche, which rapidly accelerated the modernization of the indigenous society and its assimilation into Taiwanese society as a whole. When considering why there is such diversity of culture in Taiwan, it is important to understand that the influence from external groups received by indigenous groups was not historically uniform. The main point to note here is that each group had different reactions to its contact with the Han or Japanese. In this presentation, the author advocates an ethnographic model which proposes that the indigenous and colonist groups are not uniform, and that the groups' reaction to their contact with the other varies depending on the combination of populations involved.

		The Indigenous populations	
		Pingpu	Yuanzumin
The Colonizers	Han, small population 17-19c	Niche Invasion Sinicization	No Niche Invasion Social continuity
		Han Pingpu	
	Japan, middle population 1895-1945	Niche Invasion Dualization	No Niche Invasion Social continuity
	China, middle population 1945-	Niche Invasion Vernacularization	Niche Invasion Modernization

Contact between the indigenous and colonizer

Workshop: Session 3

How do migration and acculturation shape between-group cultural variation? Insights from modern migration and cultural psychology

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Migration has been a permanent fixture of our species ever since we first left Africa and dispersed across the planet. Humans also show extensive between-group cultural variation, for example in languages, customs, norms and psychological traits. How is this cultural variation maintained in the face of frequent migration? I will talk about recent empirical and theoretical work that has addressed this question in contemporary societies, which may provide potential insights into the past. Key to this issue is *acculturation*, defined as the psychological or behavioural change that results from migration. First, I describe an empirical study of acculturation in psychological traits (e.g. individualism, collectivism, social attribution) in different generations of British Bangladeshi migrants in the UK (Mesoudi, Magid & Hussain, 2016). We found that second generation British Bangladeshis (born in the UK to first generation parents born in Bangladesh) often exhibit psychological traits intermediate between their first generation parents and local non-migrants. This partial acculturation indicates a mix of parental (vertical) and peer (horizontal) influence. Second, I review the acculturation literature across psychology, sociology, economics and anthropology to show that this partial acculturation is a common finding (Mesoudi 2018). Rarely do migrants become immediately identical to the local non-migrant population, showing the influence of heritage culture either via developmental 'sensitive' periods or via vertical transmission from parents. Equally, however, some level of acculturation is universally observed, suggesting some degree of peer influence or other kind of horizontal cultural transmission. Third, I present a simple model (Mesoudi 2018) showing that conformity may be one mechanism by which acculturation may occur, and is thus one potential explanation for the maintenance of between-group cultural variation in the face of migration. Conformity is just one such mechanism; others include punishment, cooordination and one-to-many transmission. Empirical work is needed to determine what acculturation is, and how it maintains cultural traditions despite frequent migration. The study of contemporary migration and acculturation may provide insights into how past human cultural traditions were maintained between groups of early hominins.

Workshop: Session 3

Analysis of archaeological data based on 0,1-vector models

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Team B02 of the Paleo-Asia project has been developing modeling frameworks to study cultural evolution. One of the frameworks, which we call 0,1-vector models, was originally developed to understand how the cultural diversity of a population is produced through individual processes of innovation and transmission (Strimling *et al*., 2009), but it is potentially applicable to the analysis of data on cultural diversity to make inferences about underlying individual processes (e.g. about the mode of transmission). The goals of the present study are to introduce the basic mechanics of 0,1-vector models, to summarize recent theoretical and empirical applications of 0,1-vector models, and to discuss some promising future directions.

The 0,1-vector modeling framework represents the absence and presence of a character by 0 and 1, respectively, and the entire cultural profile of an individual by a vector of 0's and 1's. For example, an individual with "profile vector" (0,1,1) lacks the first character but carries the second and the third. The state of a population is described by a matrix of 0's and 1's, where each row gives the profile vector of an individual. This population-state matrix varies over time, following a stochastic process which depends on the mode of transmission. The process undergoes qualitatively different phases depending on the extent to which the population is connected in terms of cultural contacts. The phases $C<1$, $C=1$, and $C>1$ are called the subcritical, critical, and supercritical phases, respectively, where C is a parameter characterizing the degree of cultural contacts. In the subcritical ($C<1$) and critical ($C=1$) phases, most of traits are negligibly rare and only very few attain visible frequencies. On the other hand, in the supercritical phase ($C>1$), a majority of traits attain quite high frequencies (Fogarty *et al*., 2015). A backward-time approach suggests that samples with supercritical features might contain extremely long-lived, stable traits, while those with subcritical features would contain mostly ephemeral, volatile traits (Kobayashi *et al*., 2018). This is because the expected lifetime of a cultural trait diverges in the supercritical phase, while it is generally short in the subcritical phase (Kurokawa *et al*., in prep.).

Predictions of 0,1-vector models can be in turn used to evaluate the theoretical soundness of archaeological or ethnographic hypotheses. For example, Aoki (2018) used a 0,1-vector model to point out that population size should have a positive effect on the cultural diversity irrespective of transmission modes, dismissing earlier criticisms against the "demographic hypothesis" of cultural complexity (Henrich, 2004). The 0,1-vector framework has also been applied to the analysis of archaeological data. In the 0,1-vector framework, a profile of a group rather than an individual may be represented by a vector. This approach is suitable for archaeological or ethnographic data, in which individual-level data are usually unavailable. Coding absence/presence of Shea's modes (Shea, 2017) into 0's and 1's and applying PCA yield a crude view of the spatiotemporal dynamics of lithic technologies in the space-time range covered by the database. In addition, direct comparison of cultural profiles between different regions reveals an unequal spatial distribution of the number of Shea's modes. Further, model-based analyses suggest that data from East Asia e.g. China show features of the critical phase, while West Asia e.g. the Levant show those of the supercritical phase. This result suggests that, perhaps in the latter region, cultural contacts between local populations were frequent enough that stone-tool technologies spread over the entire region.

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Workshop: Session 4
Synthesis

Workshop: Session 4

Patterns in the formative processes of modern human cultures in Asia

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Asia is a huge continent, naturally encompasses greatly diversified different ecological conditions by regions, which inevitably affected the cultural formation processes among modern humans during their dispersals. It would be too ambitious to aim to explain every detail of these processes within any particular project like ours, or even those to be organized in the coming decades. Instead, the present project intends to provide a general framework to interpret the observed cultural patterns. As other speakers in this session will elaborate on such attempts, this paper provides a factual basis to define the different patterns in the formative processes of modern human cultures.

The most important evidence for this project is derived from archaeological records. In order to analyze the available records, we have been constructing a large-scale site database to compile data from the literature survey and the field and material studies carried out by the project members. The database thus constructed, termed PaleoAsiaDB(Figs. 1 and 2) now stores information on the characteristics, geochronology, and cultural remains from Middle and Upper Paleolithic sites dated from a period of 100 and 20ka. Since the database incorporated data from Africa and Europe accumulated in the RNMH project, it covers the entire regions of the Old Continent for the Paleolithic sites of the period in concern. The major items in this database are available under the headings (1) site, (2) cultural layer, (3) radiometric dating, (4) lithic industries and (5) bibliographical reference, each containing further details such as the GIS information for locational information of the site and detailed contents of the cultural remains. It is particularly significant that this database is concerned with the description of the lithic assemblage from each layer, whose characteristics have been recorded according to a unified scheme of "modes", originally defined by Clark (1969) and later developed by Shea (2017). The mode system employed in this database is one adapted by us to the Asian lithic industries.

This presentation shows the major patterns identified in the formative processes of modern human cultures in Asia during the analysis of this database are shown. The patterns include cultural differences that might have been related to the "Movius Line," the north-south latitudinal variability, the founder effect of the cultural dispersals from Africa to the east, and so on.

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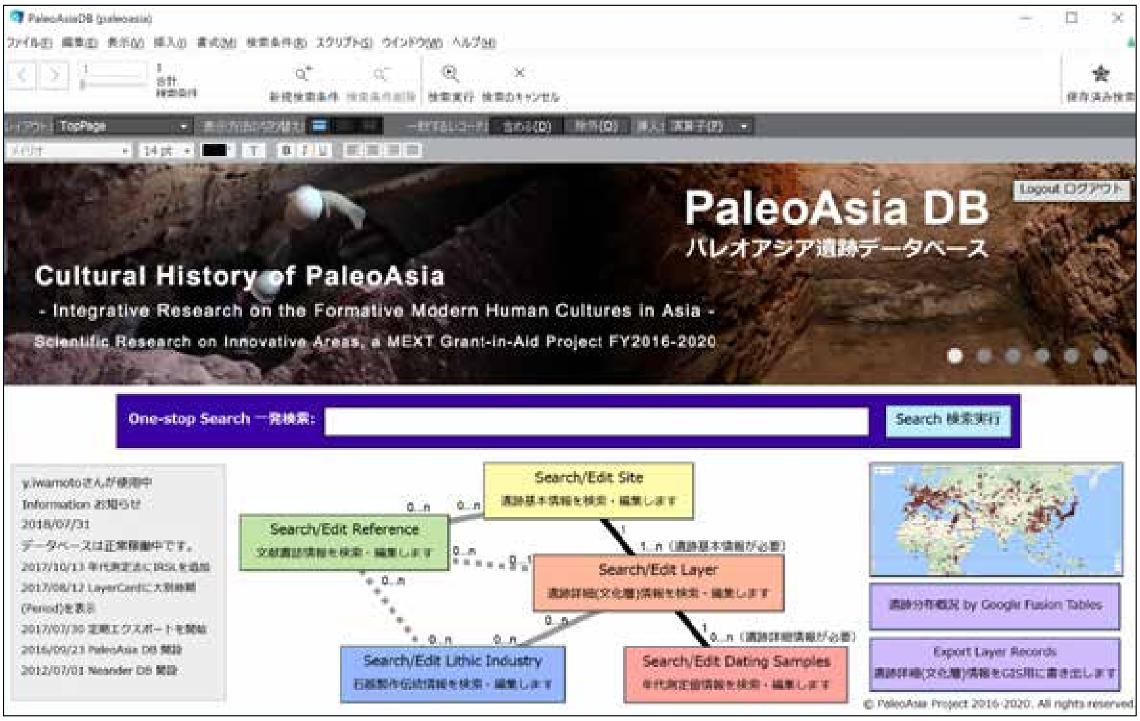

Fig. 1. Portal page of the PaleoAsia DB

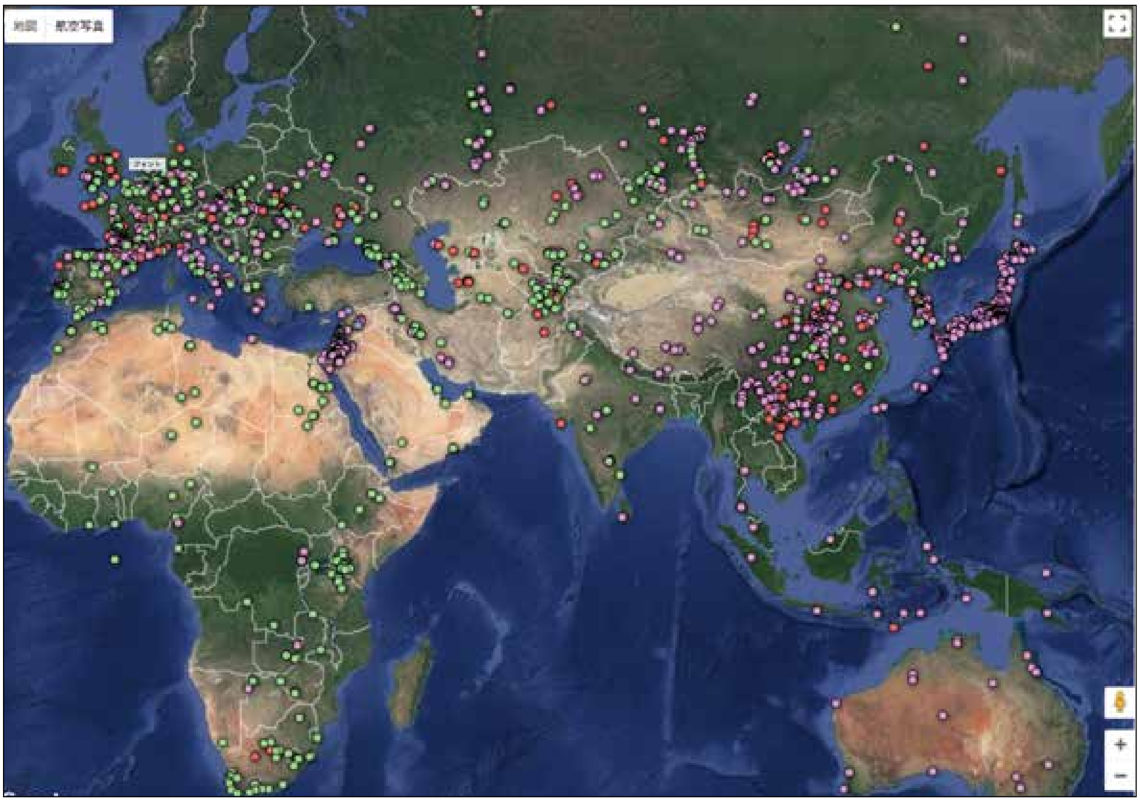

Fig. 2. Middle and Upper Palaeolithic sites recorded in the PaleoAsia DB, as of October 2018.

Workshop: Session 4

Ecocultural range-expansion models of modern humans with ecological competition with Neanderthals

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Recent archaeological and anthropological findings and analyses suggest that modern humans overlapped with Neanderthals in Europe between about 45 and 40 kya, after which the latter disappeared from Europe. Hence, Neanderthal extinction cannot readily be explained by climate change per se, and given that the two species overlapped and likely exploited similar niches, the most plausible cause of the replacement of the indigenous Neanderthals by the intrusive modern humans is interspecific competition.

Here we propose a mathematical model in which ecological competition between modern humans and Neanderthals are spatially explicitly described. The model assumptions are summarized as follows:

A) Niche overlap between modern humans and Neanderthals results in ecological resource competition.
B) Genetically determined levels of demographic abilities (e.g., fertility and mortality) and cognitive abilities (e.g., learning and innovation) are the same in both species.
C) Each species has independent cultural dynamics, which is described by the number of "skilled" individuals. The dynamics is spatially local, that is, the number of "skilled" can be different at different locations in the same species.
D) Having more local "skilled" individuals increases local carrying capacity, and hence a local population of the corresponding species can grow.
E) Without interspecific competition, culture-population dynamics have two stable equilibria; the low-culture-low-population ("low-low") equilibrium and the high-culture-high-population ("high-high") equilibrium.
F) Both "skilled" and non-skilled individuals randomly migrate. Spatial spread of culture is solely due to this migration.
G) Environment is both temporally and spatially homogeneous.
H) Model structure is completely symmetric between modern humans and Neanderthals. We assume that the "high-high" equilibrium is realized by modern humans at some time at some location, and consider the spatial dynamics of the resulting range expansion.

Mathematical analysis and numerical simulations revealed various patterns of population dynamics. In general, modern humans and Neanderthals coexisted for a relatively long time. When niche overlap is very small, they can coexist even when modern human population realizes high population density by reaching the "high-high" equilibrium. On the other hand, when niche overlap is medium or large, Neanderthals are outcompeted by modern humans at the "high-high" equilibrium. Local Neanderthals go extinct in such a region. The region of the monopoly by modern humans propagates indefinitely until the whole Neanderthal population dies not. In this propagation process, there exist a transient region where modern humans and Neanderthals coexist at low densities. For most parameter values we have used, the speed of ecological invasion of modern humans into Neanderthal region (first wave) is faster than the speed of propagation of the high-culture-high-population modern humans (second wave). Since the first wave is faster, a temporal coexistence region spatially expands.

If we observe this dynamics at a given location, the first wave arrives (the first appearance of modern humans) and both species start to coexist at low densities with similar low-level technologies. The waiting time until the second wave arrives is longer if the observation point is further away from the original point of the emergence of the "high-high" modern human population. Once the second wave arrives, local Neanderthals go extinct, and modern human at the "high-high" equilibrium becomes the winner. Since modern humans were already existent after the arrival of the first wave, this phenomenon should be observed as the cultural and demographic shift in modern human population, instead of the arrival of modern humans.

We will discuss the application of our model to the range expansion of modern humans from the Levant to Europe. Assuming the bladelet technology as "skill" in our model, we can view the range expansion of modern humans in Initial Upper Paleolithic as the first wave and that in Early Upper Paleolithic as the second wave. More detailed analysis and possible applications to the spread into Asia will be provided by the next talk by Prof. Kadowaki.

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Wakano, J.Y., W. Gilpin, S. Kadowaki, M.W. Feldman, and K. Aoki (2018) Ecocultural range-expansion scenarios for the replacement or assimilation of Neanderthals by modern humans. *Theoretical Population Biology* 119, 3-14.

Workshop: Session 4

Discussion toward further application of the ecocultural range-expansion model to the PaleoAsia cultural diversity

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Recent studies in genetics, paleoanthropology, and archaeology collectively suggest that biological and cultural origins of *Homo sapiens* (or anatomically modern humans, AMHs) do not necessarily coincide with each other. Although it is widely accepted that biological features of AMHs are mostly derived from a part of populations in Africa ca. 300–200 kya, there are ongoing debates about how AMHs can be characterized by their cultures/behaviors. The PaleoAsia project aims at clarifying the formative processes and dynamics of cultural/behavioral characteristics of AMHs during their spread into Asia. For this purpose, collaborative works in the PaleoAsia project led to a proposal of the eco-cultural range expansion model (Wakano *et al.* 2018), which analyses dynamics of range expansions of AMHs and Neanderthals by incorporating demographic, ecological and cultural parameters that are mutually related. As a first approximation of the model to archaeological records, the model was applied to the Initial Upper Paleolithic (IUP) and the Early Upper Paleolithic (EUP) in the Levant and central/eastern Europe, and we proposed a possible scenario for the relationship between the cultural changes and the range expansion of AMHs (and the decrease in Neanderthals) during these periods.

In this presentation, I will address several issues in applying the eco-cultural range expansion model to relevant archaeological records. The issues will be explained by referring to our case studies in the Levant, where relatively rich human fossil and archaeological records allow us to have an overall framework for space-time distributions of AMHs and Neanderthals as well as cultural/behavioral changes from the Middle Paleolithic (MP) to the Upper Paleolithic (Table 1).

The first issue is how we identify significant cultural shifts that correspond to the demographic growth of AMHs. In our case study of the Levant, we proposed a cultural shift from the IUP to the EUP as corresponding to the first and second waves of AMHs (Wakano *et al.* 2018). In the model, a significance of cultural shift is measured by the density of individuals with a skill that helps to increase the carrying capacity of human populations in their surrounding environment. We proposed that such a skill may be the bladelet technology that developed from the IUP to the EUP (Fig. 1) on the basis of an increase in the number of sites from the IUP to the EUP. However, it is widely known that AMHs were present in the Levant much earlier since the early MP, raising a question of whether more than two waves should be modelled or we should combine the IUP and EUP as the second wave. From a perspective of the bladelet technology, there is a minor technological development of bladelets from the MP to the IUP. So, we may have to model three waves of range expansion by AMHs in the Levant. On the other hand, areas without the IUP records, such as the Zagros and Caucasus regions, may have only two waves. In any case, this task requires an establishment of chrono-cultural framework of study areas.

The second issue is how we can demonstrate a causal link between a certain skill and an increase in carrying capacity. In the case of the bladelet technology, several advantageous performance characteristics have been proposed, such as portability, versatility, standardization, maintainability, and efficiency in raw material consumption. In addition, we need paleoenvironmental records to explain how a certain skill turns out to be advantageous in the surrounding environment. For example, decrease in food resources due to environmental fluctuation and concomitant increase in residential mobility have been suggested as potentially common conditions for the adoption of backed microliths (Clarkson *et al*. 2018). Ethnographic records, such as Binford (2001), may also help us examine the validity of correlations among technological, environmental, demographic factors.

The third issue is the origin of the second wave of AMHs' range expansion that is a "cultural invasion by moderns who utilize their increased carrying capacity, which is supported by high skilled density" (Wakano *et al*. 2018). The second wave results in the extinction of Neanderthals. In the current version of the model, the second wave comes from the origin place of AMHs, or Africa. However, there is no evidence for an African origin of the bladelet technology that accompanied AMHs in the Levant and Europe during the EUP (the Early Ahmarian and the Protoaurignacian). Instead, the bladelet technology is likely to have emerged locally in the Levant. It is a subject of debate whether the bladelet technology in Europe originated from the Levant or emerged independently in Europe (Kadowaki *et al*. 2015). We have a similar controversy on the origin of backed microliths that occurred in Africa, Eurasia, and Australia. A recent review of this issue suggests their multiple origins, i.e., behavioral convergence, on the basis of their occurrences in discrete timings and areas (Clarkson *et al*. 2018). In any case, the examination of this issue requires inter-regional comparisons of lithic technology and its chronology.

The forth issues is that the current model does not incorporate a factor of environmental changes, which can affect the range dynamics of Neanderthals and AMHs by changing the distribution of niches exploited by the two groups. In the model, a slight difference in niche between Neanderthals and AMHs is assumed, and such a difference allows the first wave of AMHs, which is an "ecological invasion by moderns who exploit the niche that is not used by Neanderthals" (Wakano *et al*. 2018). Paleoenvironmental records are also necessary to explain selective forces for a certain skill that contributes to the increase in carrying capacity, resulting in the second wave of AHMs.

In this way, there are several challenging issues in applying the eco-cultural range expansion models to archaeological records even in the case of the Levant, where human fossil and chrono-cultural records are relatively well established. Although an effort to solve these issues may not produce immediate success, such attempts should at least help us guide a variety of multi-disciplinary collaborative research in the PaleoAsia project in organized manners and hopefully lead to our better understanding of the formative processes and dynamics of cultural/behavioral characteristics of AMHs during their spread into Asia.

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Table 1. Archaeological chronology and human fossil records in the Levant

Periods	Phases	Dates (ka)	Hominin remains
Upper Paleolithic (UP)	Early (EUP)	45/40–25	*Homo sapiens* (Ksar Akil XVII, Qafzeh D)
	Initial (IUP)	50/45–45/40	*Homo sapiens*? (Ksar Akil XXV, Ücağızlı)
Middle Paleolithic (MP)	Late	75–50/45	Neanderthals (Amud, Dederiyeh, Kebara, Shukba, 'Ein Qashish) *Homo sapiens* (Manot)
	Middle	160–75	*Homo sapiens* (Qafzeh, Skhul)
	Early	250/200–160	*Homo sapiens* (Misliya)

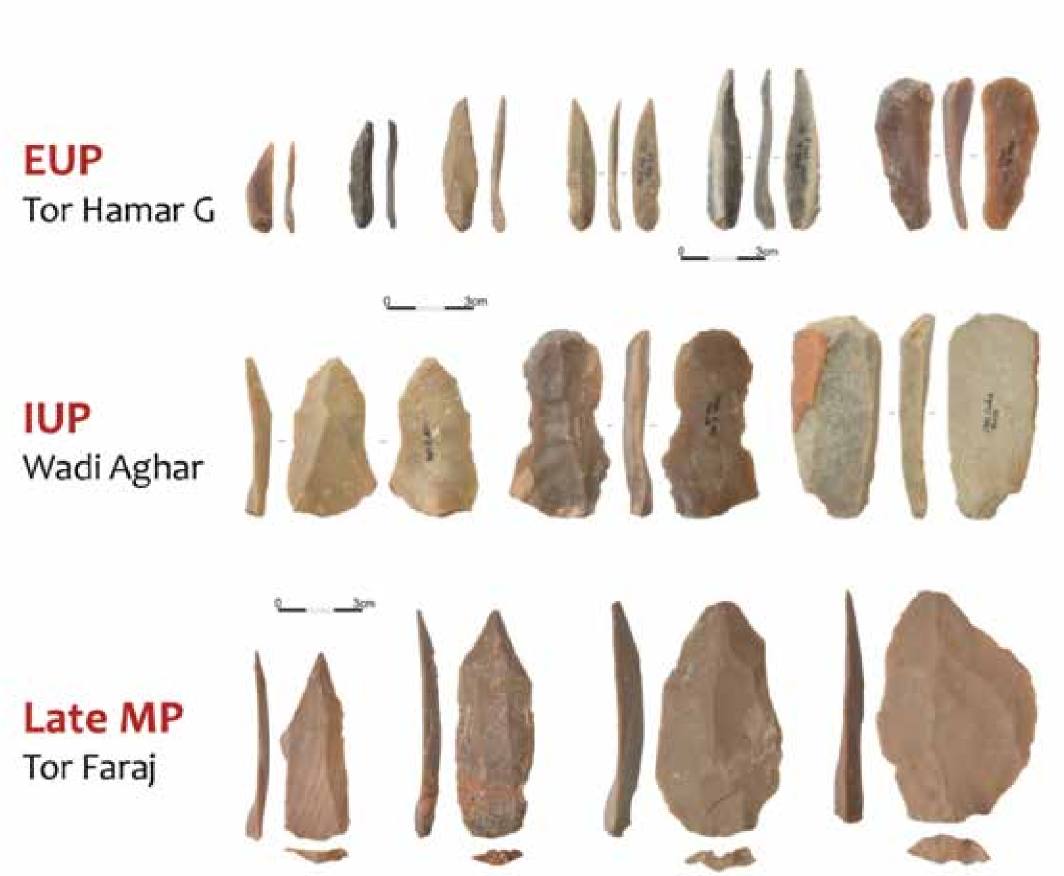

Fig. 1. Lithic artifacts from the late MP, IUP and EUP periods in the Levant (the Jebel Qalkha area, southern Jordan). Note that bladelets increased significantly in the EUP.

Poster Presentations

Poster 1

Excavations of Upper Paleolithic sites in southern Kazakhstan

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Kazakhstan is indispensable area for the argument of diffusion and fixation of Homo sapiens in Asia, because Kazakhstan is in the geographically important area which connects between Altai mountains and Caucasus area, Uzbekistan. Upper Paleolithic culture in the eastern Kazakhstan were developed together with the northern Altai Mountains. It is consistent the result of investigation of Ushbulak-1 site (Shunkov et al.2017) which were discovered in 2016 that Initial Upper Paleolithic (IUP) industries were excavated from the lowest layer with this idea.

Therefore, in the next argument, it is assumed that it is with the point at issue whether Altai IUP industry is a common aspect of the whole Central Asia or not. In other words, it is the point at issue which makes Altai IUP industry relativization.

Based on the above, I conducted general surveys in the north foot of Tianshan Mountains and Karatau Mountains in south of Kazakhstan by a joint investigation with Kazakhstan as PaleoAsia project. In this investigation, 15 Upper Paleolithic sites were discovered, and multi-stratified sites in less sediment were recognized in two sites of them (Kunitake et al. 2018).

In south of Kazakhstan, three Paleolithic sites were excavated from July to October in 2018. In this poster presentation, an outline of this investigation will be reported.

Chokan Valikhanova(Стоянка им.Ч.Ч.Балиханова) site in Turkestan region is situated in the west of the foot of Karatu Mountains. In this site, six Upper Paleolithic layers have been recognized by investigation from 1958 to 2015. The sixth cultural layer was dated to 39.5ka±3.8ka by polymineral plR-IRSL analysis (Fizsimmons et al.2017).

In our 2018 investigation, three cultural layers were newly discovered under the sixth cultural layer that had been the oldest so far.

Biryokbastau･Bulak(Буйрёкбастау･Булак) -1 site in Jamble region that is situated in the east foot of Karatau Mountains was discovered in our general survey of October 2017. In the preliminary investigation of October 2017, artifacts were recognized that were stratigraphically contained in less sediments. In our 2018 excavation, two cultural layers were stratigraphically recognized. The second cultural layer is estimated to belong to Early Upper Paleolithic age in term of its assemblage.

Kyzylaus(Кызылауз)-2 site in Almaty region that is situated the north foot of Tien Shan Mountains was discovered in our general survey of November 2017. In the preliminary investigation of April 2018, artifacts were recognized that were stratigraphically contained in less sediments. In our 2018 excavation, four cultural layers belonging to Upper Paleolithic age were stratigraphically recognized in about 3m less deposition.

OSL and 14C dating samples have been extracted from every cultural layer of these sites and they are under analyses now. These analyses will reveal the precise period when each assemblage belonging. Those will be very important to the Paleolithic study in Kazakhstan because of the lack of materials stratigraphically excavated so far. These materials will be indispensable to pursuit the formation process of Upper Paleolithic culture in Kazakhstan. In future, these assemblages will be compared to those of other regions and I will explore furthermore new Paleolithic sites in Kazakhstan.

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Fig. 1. Multi-stratified Upper Paleolithic sites excavated in 2018 Japan-Kazakhstan joint expedition

Fig. 2. 2018 excavation at Chokan Valikhanova

Poster 2

Replacement or assimilation? Plant exploitation in the Mesolithic-Neolithic contact period of the South Caucasus

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Food-producing economy started at around 6000 BC in the South Caucasus by introducing barley and wheat cultivation from southwest Asia. This poster discusses the continuation and changes in plant use before and after the Neolithization in western Azerbaijan as viewed from the plant macro-remains.

Food plant assemblages changed dramatically during the 7th–6th millennium BC. In the Mesolithic period (Damjili Cave), tree fruits like *Celtis* sp. were only food plants. In early Neolithic period, first introduced domesticated cereals were hulled type (Hacı Elamxanlı Tepe). But a few hundred years later, in Göytepe, naked wheats became popular and use of tree fruits declined drastically. Such preference on naked cereals in as early as the 6th millennium is a characteristic local to the South Caucasus, while in the southwest Asia, naked wheats do not appear as an independent crop until Bronze Age.

On the other hand, non-food plants exploitation showed continuation from Metholithic to late Neolithic. *Artemisia* sp. (wormwood) is now one of the most important medicinal plants throughout Eurasia, distributed on dry steppe and rocky hills. Utilization of this plant is recorded in a number of ethnopharmacological studies, for gastrointestinal disorders and respiratory diseases, malaria, diabetes and so on. Its strong aroma is also used to flavor alcohol and juice. A macro-botanical analysis on a late Neolithic site Göytepe suggested intentional gathering of this plant. Large quantity (more than 700 items) of *Artemisia* seeds were excavated at the bottom of a clay bin. Micro-morphological observation, components of phytolith and scarcity of fecal spherulites indicated that the bin was dedicated to storing cereal chaff (Kadowaki et al. 2015), and *Artemisia* plant was probably put together as insecticide and/or fungicide.

Such large amount of *Artemisia* is remarkable, for this species rarely appears as macro-remains in southwest Asian sites despite its high occurrence in pollen diagrams. However, in the prehistoric South Caucasus, Göytepe is not a sole example of discovery of *Artemisia* seeds in abundance. Its seeds are very common in macro-remains from Mesolithic and early Neolithic layers of Hacı Elamxanlı and Damjili in Azerbaijan. Furthermore, exploitation of *Artemisia* can even trace back to the Upper Palaeolithic, as shown in pollen analysis of four cave sites in Georgia; two of *Artemisia* sp. and three other medicinal plants were recognized in these caves in high quantity (Martkoplishvili and Kvavadze 2015). Such evidences suggest a long and continuous tradition of use of *Artemisia* in the South Caucasus.

These changes and continuation are probably the result of contacts between the indigenous population and immigrant groups. Custom of plant gathering kept its importance among the local people even after the adoption of food crops, and/or the farmers from southwest Asia adapted the local knowledge of *Artemisia*, which they may not have used in their home country.

Fig. 1. Location of the sites

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Poster 3

The microblade technology in the early Upper Paleolithic of Asia: Convergence or diffusion?

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The term microblade has been widely used not only to describe lithic artifacts but also to compare the lithic assemblages technologically in the research of the Eurasian Upper Paleolithic. An identification of microblade technology results in the recognition that technologically similar assemblages are distributed across vast geographic scale in Asia. The evidence currently available from the Near East, central and northern Asia supports that the emergence of the microblade technology occurred during the Early Upper Paleolithic, about 40,000-28,000 years ago. Understanding why this technological phenomenon is so widespread, and whether it is a direct consequence of diffusion (migration) or independent invention, can provide important insights into the overland dispersals of the Early Upper Paleolithic and regional variability of modern humans' adaptations. This raises very similar questions about the mechanisms behind the vast geographic distribution discussed in the studies of the Acheulean bifacial technology or the blade technology with Levallois elements in the Initial Upper Paleolithic in Eurasia (Lycett 2009; Kuhn 2018; Kuhn and Zwyns 2018).

The scenario that the microblade technology emerged during the Early Upper Paleolithic, however, is not unanimously agreed on among Paleolithic archaeologists investigating techno-typological features and human behaviors in Eurasia. Although the term bladelet has been traditionally applied for similar technological phenomenon in western Eurasia, few has attempted to characterize a distinction between microblade and bladelet technologically. The narrower concept of microblade, such as Gómez Coutouly (2018) which regards microblades as those artifacts produced systematically from the pressure knapping techniques, may offer a different perspective on the course of microlithization occurred during the Upper Paleolithic. Apparently, it is necessary for us to re-think how the concept of microblade technology should be defined in terms of technological meaningfulness and practical usability. Resolution of this debate can only be achieved by highlighting that there is a substantial variation among the microblade reduction methods and knapping techniques related to the systematic production of the standardized microblades and by broadening our perspective to consider evidence from western and eastern Eurasia.

This paper reviews what we know about the production of microblades in the Early Upper Paleolithic of Asia and synthesizes this information to evaluate whether commonalities recognized in lithic assemblages across the vast area can represent a broad sharing of technological procedures or not.

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Poster 4

A study of the quartz lithic industries in Paleolithic Eurasia

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Foreword This study uses the techno-typological methodology developed by Professor Henry de Lumley in 1964, for the site of Caune de l'Arago, France. This is the most precise and systematic method for research into Lower and Middle Paleolithic, quartz industries. We apply this method to the study of five lithic industries from China and South Korea. The Caune de l'Arago lithic industries are all knapped on quartz. Seventy percent of recovered pieces appear primitive even though they coexist with the Middle Acheulean in Western Europe. The Caune de l'Arago assemblage lacks typical Acheulean tools, most notably the biface and cleaver while flakes are used as tool blanks. In this respect, it is similar to some of the Far East lithic industries.

Outline of studied sites

Mansuri. Locality-1 Site lies close to the city of Osong, in Cheongwon, Chungcheongbuk-do Province, 108km south-south-east of Seoul and around 12 m above of the Miho-Beyong Cheon river, tributary of the Geum River. The full stratigraphic sequence is in normal magnetic polarity, that is, above the Matsuyama-Bruhnes limit, in other words, more recent than 780ka. Though some OSL dates gave an age of between 44,000 and 104,000 years, this does not correspond with the stratigraphy of the site (Lumley *et al*. 2011.pp.294-295).

Houjiayao Site, also known as Xujiayao, is located near the border of the provinces of Shanxi and Hebei, in North China. Archaeological research began in the Nihewan Basin in 1970. Systematic survey and excavations was organized by the I.V.P.P. (Institute of Vertebrate Paleontology and Paleoanthropology) in Beijing and this resulted in the discovery of several archaeological sites. This site is situated on the western bank on the Liyigou River, tributary of the Sanggan River. It was discovered in 1974 by the I.V.P.P. survey team, then test pitted in 1976 and 1979. These test pits recovered about twenty human remains and twenty thousand quartz lithic pieces and others from the lacustrine deposits of the Datong Basin. U-Th dates were made on teeth coming from an upper archaeological level. They date the site to between 100,000 and 120,000 years BP. This matches the loess stratigraphy and paleontological data that place this layer at the end of the Middle Pleistocene or beginning of the Upper Pleistocene. Here, we studied a sample of 613 artefacts recovered by the Cultural Relics and Archeology Research Institute of Hebei Province (Lumley *et al*. 2004)

Xibeimaying Site lies 80 km to the East in the same geological configuration as Hebei Province. It was discovered during systematic surveys in 1985. Excavations were organized by the Cultural Relics and Archeology Research Institute of Hebei Province in 1986. The 1,546 recovered archaeological pieces come from a lacustrine deposit in the upper part of the Nihewan formation in association with mammalian fossils 6-3 m from the surface. U-Th dates on teeth coming from an archaeological level are between 18,000 ± 1,000yrs BP and 15,000 ± 1,000yrs BP. More recently, a C14-AMS date on the peaty sediment gave an age of 28,240 ± 120yBP. All recovered pieces are stored in the

Cultural Relics and Archeology Research Institute of Hebei Province.

Majuangou Site is situated on the left bank of the Sanggan River in the basin of Nihewan, in Hebei Province where the Lower and Middle Pleistocene layers were identified within a geological stratigraphy. The site was discovered in 1992 during systematic survey. Wei Qi and others noted three archaeological levels among the 22 geological layers. The site is in a natural valley that has about twenty Lower Pleistocene sites up to a million years old. This site is one of the most important of these. We examined, 593 pieces of the 800 pieces recovered during the excavation. Here, we present the assemblage from cultural level III (359 pieces). It is about the concerned age that is younger the Olduvai normal staleness to 1,800,000 years that are the most former site in the basin of Nihewan from 1,950,000 years of his origin. With regard to the elephantine fossils discovered at the level III in the Majuangou site one was identified as a Steppe Mammoth (***Mammuthus trogontherii***) who is a more former specimen of the world. It is at least 1,360,000 years old.

Ling-jing Site is located at Xuchang city, in Henam Province, China. A large number of mammalian fossils, quartz tools, pebble-tools and other artefacts were found in 1965. The Cultural Relics and Archeology Research Institute of Henam Province have been surveying since 2005. A whole human skull was discovered in 2007 and identified by its prominent orbit as a Homo erectus type. This discovery attracted worldwide attention and it is now known as the Xuchang-Man. This human fossil comes from an Upper Pleistocene paleosol dating to between 80,000 - 100,000 years BP. The Cultural Relics and Archeology Research Institute of Henam Province allowed us to examine the archaeological pieces recovered in 2012 and 2013.

The **Caune de l'Arago** is situated near Tautavel village, Pyrenees-oriental Prefecture in France. This immense chalky cave has a deposit over thirteen metres deep that was formed after the Matsuyama reversed geomagnetic polarity epoch (2,500,000 to 780,000 yrs. BP). We examined an assemblage of 6,431 quartz pieces from layer H of the Lower Ensemble, which dates to 500,000 years BP. The used data have been given the reference of a quote of the doctoral thesis in 1991 (Takehana 1991).

Conclusion The five Far Eastern lithic industries discussed here have been dated to between 40,000 and 1,600,000 years BP using several different methods. This represents the first techno-typological studies and statistical analyses of these lithic industries. We would like to show our results of the concerned studies below that we wish henceforth to evolve them with like these systematic processes.

Poster 5

Houjiayao Denticulate industry

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Houjiayao(Xujiayao) site is located at southwest of Houjiayao village, Dongjinjizhen, Yangyuang district in Hebei Province, and is known as a site representing Middle Paleolithic in the northern part of China. It was found in 1974. The excavations for the site were carried out in 1976, 1977, 1979and 2007-2008 by IVPP (Institute of Vertebrate Paleontology and Paleoanthropology) in Beijin and Hebei Provincial Institute of Cultural Relics. Through these five times excavation, more than 20,000 stone artifacts have been found. The raw materials are vein-quartz and quartzite mainly, and include a small of flint, agate and so on. The flaking method owed mainly to direct percussion, but bipolar technic was also used.

According to our technotypological analysis, this assemblage contains lots of small size (2 to 4cm in length) tools and is mainly characterized by denticulates, becs, notches, scrapers and spheroids (bolas or polyhedrons). And large stone artifacts such as hand-axes, chopping-tools and choppers are lacking. Such stone assemblage exist widely all over China North China.

In 1970's, researchers believed that the age of the Houjiayao site is ca.100ka on the base of the fauna and U-series dating. Thereafter the partial IRSL dating for the cultural layer and the pollen analysis with high resolution indicate that this site was probably remained during the last glacial. Its age is presumed 60-70ka, it is younger than 100ka supposed before.

The stone assemblage of Xibaimaying site located in the same Nihewan basin as Houjiayao site are similar to that of Houjiayao site. The age of this site is thought to be about 50ka. In addition, there are many similar sites in northern China such as stone assemblages of Xiaogushan site in Liaoning Province and Salawusu site in Inner Mongolia Autonomous Region.

In China, Denticulate industries might originate from industry of more than 1 million years ago, which contains small tools such as notches, becs and denticulates. However, these industrys increasing Spheroids are limited to MIS5-3. Stone artifacts like Limace point, Quinson point and Tayac point are extremely few, but they are contained in these industrys (Houjiayao Denticulate Industry) and suggest relations with the western end of Eurasia Continent.

Fig. 1. Stone artifacts from Houjiayao site

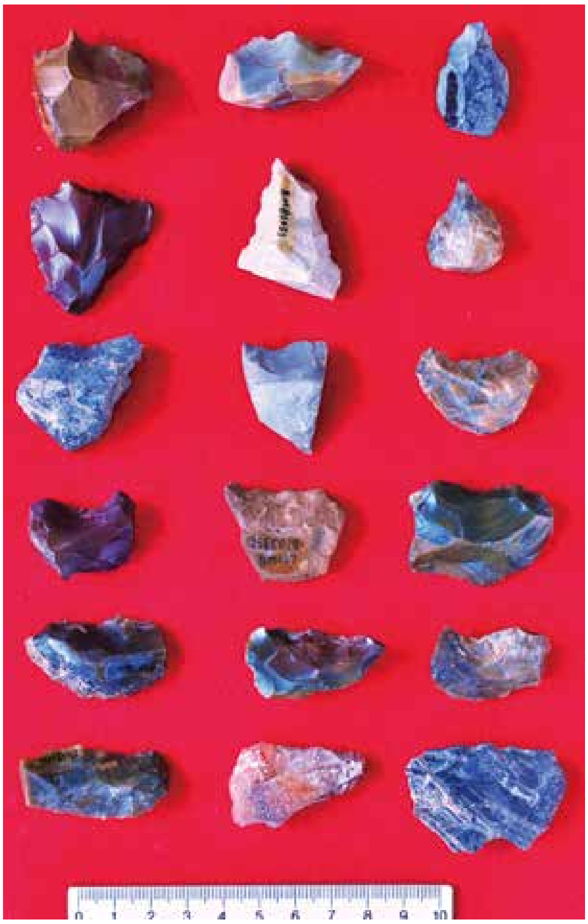

Fig. 2. Stone artifacts from Xibaimaying site.

Poster 6

Middle-Upper Paleolithic transition in northern China: Current research and perspectives

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The transition of lithic industry and the cultural dispersal in various regions of Eurasia, especially regarding around Middle-Upper paleolithic boundary has been the attractive issue for the archaeological research to write our history as the great journey from Africa. Modern human behavior, a suite of behavioral and cognitive traits that distinguishes *Homo sapiens* from other hominins represented in the use of blades, symbolism, remote resources and watercraft, is the key concept in such kind of research. In this presentation, I will summarize my research in PaleoAsia project regarding the age of the emergence of modern human behavior in Northern China and the incipient aspect in archaeological evidence.

Shuiliandong site, my main target in 2017, is the cave site located in Wuwushui ecology scenic area, the western part of Shijiazhuan city, Hubei province, China. Cultural Relics Institute Hebei Province excavated the site in 2010 to collect over 40,000 quartz artifacts and over 50,000 bones from fluvial sediment deposited in the part of the cave (see Figure). I tried 3 analyses as described below; a. ^{14}C dating of the bones as the cross-check on the ^{14}C date measured by Peking University. Collagen extracted from the bones of Shuiliandong site by Dr. Takashi Gakuhari, Kanazawa University were analyzed using the compact ^{14}C AMS facility (NEC 1.5SDH) in the Paleo Labo Co., Ltd (Kobayashi *et al.* 2007). The measured values were calibrated by Oxcal 14.3. b. The chemical composition of an obsidian flake (5 of figure)was analyzed with the portable XRF (Bruker Tracer 5i) for sourcing study. c. Large amount of quartz artifacts and bones of Shuiliangdong and related sites (Xibaimaying and Xujiacheng) were observed to classify the types and species and identify the trace regarding the manufacturing and using as tool. The age of Xibaimaying site, Hubei province was a controversial issues (Guo *et al.* 2017). Xujiacheng site , Gansu province were dated about 42,000 to 46,000 cal BP (Li *et al.* 2013).

It was found the ^{14}C date of Shuiliandong site were in near 41,000-44,000 cal BP, about 5,000 years older than the previous measurement. The chemical composition of an obsidian of Shuiliandong did not match any obsidian source sample of East Asia including Baitoushan on the boundary China and north Korea. From archaeological findings from Shuiliandong, 3 polished bone tools (1-3), a blade and some end-scrapers (4) with round edge were identified. Such kind of artifacts were not found in Xibaimaying and Xujiacheng site.

The result described above suggests the element related Upper-Paleolithic culture were emerged approximately 43,000 cal BP in Northern China. Although Some evidence related to modern human behavior were found in Xianhushan site of Lianning province, but the assortment among ^{14}C date and lithic and bone artifact needs more consideration (Magara et al. 2013). The skeleton of Tianyuan Cave (Zhoukoudian, China) that has the defined evaluation as anatomically modern human was radiocarbon-dated to near 40,000 cal BP (Shang *et al.* 2007). My result indicates the appearance of the modern human behavior in the region older than the conventional assumption (Tongli *et al.* 2013) and the correspondence between the archaeological and anatomic data.

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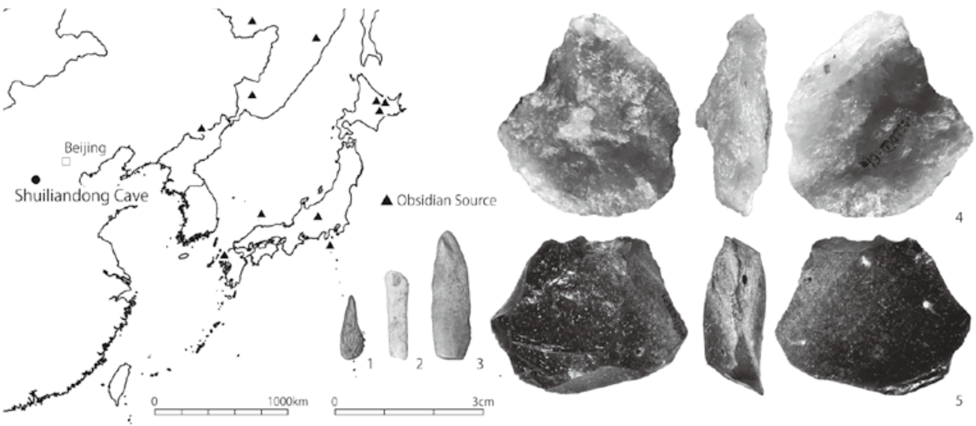

Fig. 1. Location and artifacts related modern human behavior in Shuiliandong site.
1-3 polished bone tools, 4 end scraper, 5 obsidian flake

Poster 7

The Late Palaeolithic assemblages and used raw materials in South Korea

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The study of the late Paleolithic in South Korea began with excavation of Seokjang-ri site(1964). In this excavation, blades and micro blades were discovered, and the similarity with China and Japan was confirmed. Many Late Paleolithic sites have been discovered and the cultural content has been revealed. As a result of accumulation of samples, the Late Paleolithic culture is divided into 3 phase due to differences in hunting tool.

Phase Ⅰ (~42ka) : The stone hunting tool was not found.

· **Raw materials**	Quartz and quartzite in a near area
· **Other tool**	Atypical small tools.
· **Characteristic core**	Small core with one unfaceted platform

Phase Ⅱ (42ka~27ka) : The stemmed point was used for a hunting tool.

· **Raw materials**	Quartz and quartzite in a near area. Shale and tuff from a remote area.
· **Other tools**	Typical scraper with a convex edge Atypical small tools.
· **Characteristic core**	Blade core.

Phase Ⅲ (27ka~?) : The micro blade was used for a hunting tool.

· **Raw materials**	Quartz and quartzite in a near area. Shale ,tuff and obsidian from a remote area.
· **Other tools**	Typical scraper with a convex edge and typical burin. Atypical small tools.
· **Characteristic core**	Blade core and micro blade core.

At Phase Ⅱ, it is unknown whether Homo sapiens left the stone tools. Because large stone tools such as hand axe included in the lithic assemblages before MIS5 are not seen in this stone artifacts group, I place it in the late Paleolithic period. The stone hunting tool that was the evidence of the positive predator lacked, but organic hunting tools might exist from the example of the bone tools of Xiaogushan Cave site (China).

At Phase Ⅱ, an aspect of the stone implement group varies according to the environment of stone resources. In the area without tuff and shale near sites, they were used for the stemmed point but quartz and quartzite which I obtained nearby is used many for other stone tools.

In the area having abundant tuff or shale, they are used for not only the stemmed point but also other stone tools. Quartz and quartzite were less likely to be used selectively.

At Phase Ⅲ , the blade technique and microblade technique are accepted. Raw materials except the quartz and quartzite were used for microblades, blades and typical burins selectively. these were used for atypical stone implements. The consumption of obsidian is lower than tufa and shale.

The atypical small stone implements include a scraper, notch, bec and awl. Material flakes are also amorphous. This type stone tool existed in the assemblages before MIS5. These stone implements may show influence of the indigenous human. However, there is not superiority of quartz and quartzite in raw materials choice and should think about the resemblance that the characteristic of these stones causes.

Poster 8

Human migration and technological diffusion of the early Late Palaeolithic in Japan

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Most recent evidence from archaeology, anthropology and Paleogenetic studies reveal the diversity of interaction between Homo sapiens and other hominin groups in Palaeolithic Asia. There has been increasing focus on the peopling of Asia, especially the diffusion of lithic technology as well as the dispersal pattern of early modern humans. Japanese Archipelago is located in most eastern side of Eurasia, so the understanding of archaeological record from this region will provide deep knowledge on the dispersal of modern human across Eurasia and ultimately contribute to the history of human evolution in Eastern Asia. This poster examine the route and timing of human migration into Japanese Archipelago, using the archaeological record with a focus on the early Late Paleolithic industry (ca. 38-30ka). Although the existence of hominin earlier than Late Palaeolithic is controversial issue, general model suggests that the human migration into the mainland of Japan and Ryukyu islands occurred at 38ka before and after. Here, I discuss two topics to provide perspective for this presentation: 1) chronological relation between lithic industries during the early Late Palaeolithic, 2) human migration route and population size from the viewpoint of archaeological evidence. As the preliminary result, I propose that the early Late Palaeolithic industries consist of several characteristic lithic industries with different origin, and that the rapid increase of archaeological sites since 38ka suggest high population density, whereas it is possible that small site size reflect the occupation by small human groups.

Poster 9

Edge-ground stone axes and *"circular settlements"* of the early Upper Palaeolithic in the Japanese Islands

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It is well known that the edge-ground stone axes are the characteristic tools of the early Upper Paleolithic period in the Japanese Islands. Also characteristic of this period are the stone assemblages, called *circular settlements,* with the extraordinarily unique arrangement of lithic concentrations. The *circular settlements* refer in the present research to the allocations of the lithic concentrations in circular patterns. The lithic concentrations measure 2 to 5 m in diameter, and the diameters of the *circular settlements* themselves are some 20 m in most cases, ranging from 15 m to more than 50 m in the largest. The number of the stone tool concentrations which form the *circular settlements* ranges from less than 10 to more than 50. The *circular settlements* in the Japanese Islands appeared at around 35,000 B.P. and disappeared at around 32,000 B.P. The time-scale of these settlements almost agrees with that of the edge-ground stone axes. More than 90 *circular settlements* have been unearthed so far, and more than 60 of them yielded stone axes including the edge-ground stone axes, indicating that they existed at more than 70 % of the *circular settlements.* This led some archaeologist to point out that there was a close relationship between the edge-ground stone axes and the *circular settlements* (Hashimoto 2006, Sato 2006). On the other hand, there are differences in the number of the stone axes unearthed from the *circular settlements*, 1 to 2 in most cases and more than 10 in some cases. Although quite exceptionally, the stone axes totaling 57 were unearthed from the Hinatabayashi B site located at the shore of the Lake Nojiri in the Nagano prefecture.

The purpose of the present research is to investigate the relationship between the edge-ground stone axes and the *circular settlements* with a due consideration of the research situation above. Specifically, the classification of the distribution patterns of the edge-ground stone axes at the *circular settlements* is attempted.

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Poster 10

Use and maintenance of leaf-shaped points in the Late Upper Paleolithic of the Japanese Islands

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This paper presents a case study about leaf-shaped points from the Late Upper Paleolithic in the Japanese Islands. Based on an examination of the leaf-shaped points from the Mattobara site in Nigata Prefecture, I discuss formation factors associated with breakage patterns of leaf-shaped points, as well as use and maintenance of them. Results indicate that leaf-shaped points were designed to be basally hafted and used as hunting weapons (Fig.1, Fig.2, Fig.5). They also indicate that broken leaf-shaped points were formed in two behavioral contexts. Some were broken during manufacture at the site (Fig.4), while others were broken during hunting activies (Fig.3). Broken leaf-shaped points during hunting activites were brought back to the site and replaced and discarded at the site while retooling hunting weapons, suggesting the reoccupation of the site during planned hunting activities. A refitting group including a leaf-shaped points with impact fractures shows that it was manufactured, used and discarded in a very short term (Fig.6). These results provide clear evidence of logistical mobility of hunter-gatherers during the Upper Paleolithic. Experimental studies about manufacturing, shooting and stabbing supported these results as well as show some implications of leaf-shaped points use in hunting activities.

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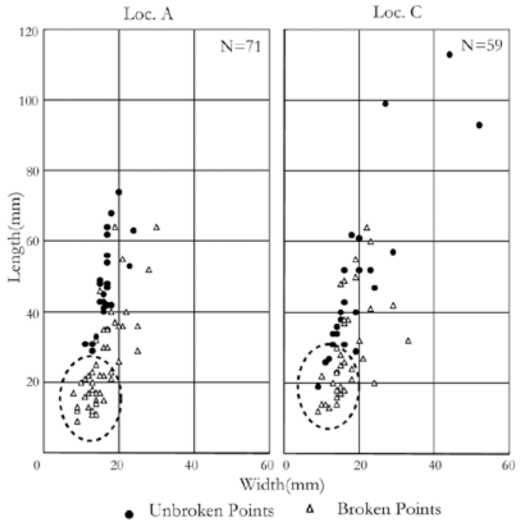

Fig.1 Length-Width distributions of points from the Mattobara Site

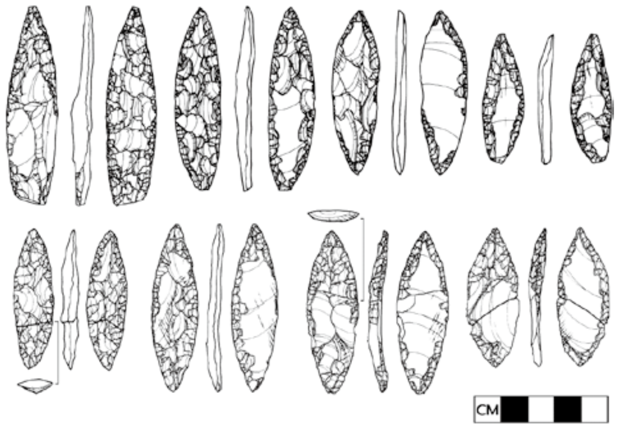

Fig.2 Unbroken points from the Mattobara site (upper from Loc.A, lower from Loc.C)

Fig.3 Broken points from the Mattobara site (1) (upper from Loc. A, lower from Loc. C)

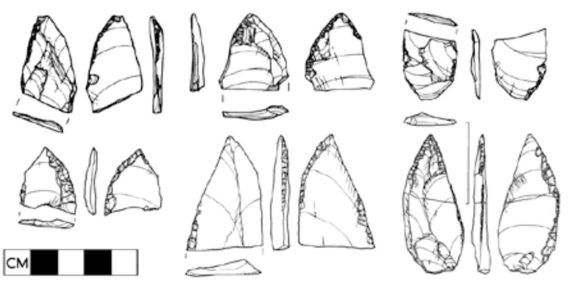

Fig.4 Broken points from the Mattobara site (2) (upper from Loc. A, lower from Loc. C)

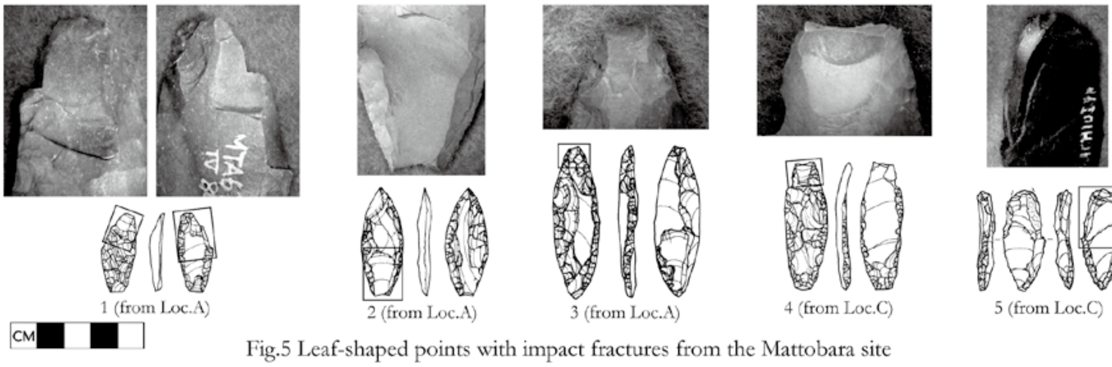

Fig.5 Leaf-shaped points with impact fractures from the Mattobara site

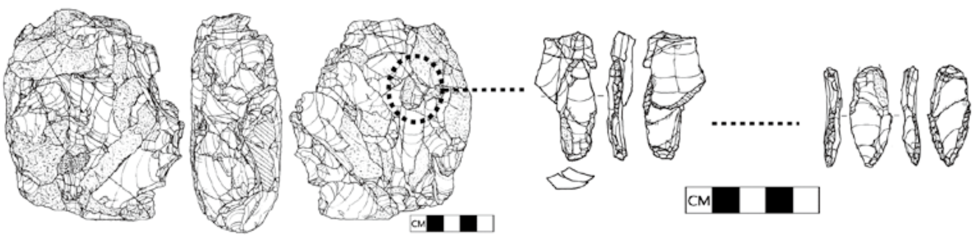

Fig.6 A Refitting group including a broken point with impact fractures from the Mattobara site Loc. C

Poster 11

Genome analysis of ancient humans in the Lake Baikal area

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We obtained ancient bone and tooth specimens of 29 individuals that were excavated from archaeological sites in the Republic of Buryatia, Russia, and dated from Neolithic to Medieval periods. To identify well-preserved specimens, we extracted DNA from the specimens, prepared DNA libraries, and sequenced them using next-generation sequencer MiSeq. Among the 15 specimens sequenced, those with more than 10% mapping rate to the human genome were 4 out of 9 Neolithic specimens (37.5%, 27.1%, 24.9%, 11.6%), 3 out of 4 presumptively Bronze or Iron Age specimens (34.3%, 14.8%, 13.3%), and 2 out of 2 Medieval specimens (64.6%, 17.3%). For the best-preserved specimen in each period, we are now sequencing using high-throughput sequencer Hiseq, aiming to obtain an average on-target coverage depth of x30. As for the other specimens, we plan to perform the exon capture for concentrating certain human sequences before sequencing. In addition, radiocarbon dating will be performed to determine the ages of these specimens.

Poster 12

Human genetic diversity and peopling history in East and Southeast Asia

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New discoveries of archaeology have changed our conventional view of human expansion in the Indo-Pacific region. However, the migration and peopling history of the East and Southeast Asian populations and the interpretation of their genetic diversity remain unclear. For example, Pagani *et al*. (2016) demonstrated that at least 2% of Papuans genome originates from an early and largely extinct expansion of anatomically modern humans (AMHs) out of Africa. On the other hand, other previous studies, such as Mondal *et al*. (2016) and Mallick *et al*. (2016), support that all the Asian and Pacific populations share a single origin and expansion out of Africa. There are also questions that how, where, when and how many times Homo sapiens in Asia admixed with Neanderthals or Denisovans. We will review the latest research of modern and ancient genomes in East and Southeast Asia including Japan, and discuss the human migration (e.g., Lipson *et al*. 2018; McColl *et al*. 2018).

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Poster 13

Os pubis in Dederiyeh infant Neanderthals

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It has been reported that the supero-inferiorly flat and medio-laterally long pubic morphology is characteristic of Neanderthals. The reason is still ambiguous in terms of function or evolutionary significance, whether it relates to several constraints during pregnancy and childbirth, or to parameters of standing posture and walking gait. In terms of ontogenetic changes, several immature Neanderthal pubes also have reportedly exhibited the medio-lateral elongation of the superior ramus. Infantile skeletons from Dederiyeh Cave in Syria retain both sides of pubes (Dederiyeh no.1) which are long relative to their femoral lengths and therefore assumedly representative of Neanderthal traits. We here aim to assess their immature pubic morphology in terms of ontogenetic variation of *H. sapiens* and *H. neanderthalensis*. For that purpose, we first reconstruct the ontogenetic trajectory of pubic morphology based on the modern museum collections in various growth stages, which are digitized by micro-CT scanner. Some adult Neanderthal casts are digitized and the 3D CT images of Dederiyeh infant Neanderthals are used and interpolated in the 3D morphometric space. In addition, the pubis of Dederiyeh no. 3 infant will be added which should be digitally reconstructed in advance.

Poster 14

Early pottery in East Asia: Origins and dispersal

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For much of the Palaeolithic period, stone tools represent the primary category of artifacts available to archaeologists for examining the cultural aspects of human dispersals and technology. The invention of pottery in East Asia by 18,000 years ago introduces a new body of evidence, with particularly early pottery coming from sites in Japan, southern China and along the Amur River in the Russian Far East. A number of recent studies have provided important information about this early pottery, including its chronological age, function and environmental contexts. Another key issue concerns the number of centers of ceramic innovation. Was pottery independently invented in multiple East Asian locations or was it invented at a single-center with subsequent dispersals into other regions?

Proponents of the multiple-center argument cite various lines of evidence to support their position. First, some point to a lack of technological and stylistic similarity between centers of early pottery production, suggesting that there was no direct connections between them. Second, the areas between these centers do not have similarly early pottery. Notably, there is currently no evidence for comparatively early dates for pottery in Korea or northern China. Third, the earliest pottery in each region tends to be low-fired and simple, which may be consistent with expectations of independent experimentation and invention. To explain the broadly contemporaneous emergence of pottery in at least three parts of East Asia, the multiple-center argument suggests that pottery was invented independently by hunter-gatherers developing along similar economic or cultural paths.

However, given the gaps in existing knowledge, it may be too early to dismiss the single-center argument. Through a consideration of how hunter-gatherers integrate innovations into their existing technological traditions, possible routes of technological dispersal, pottery function and environmental evidence, this poster argues that more evidence is needed to resolve the debate. For example, given recent evidence from residue analyses for a strong association between pottery and the use of aquatic resources, it is possible that early pottery spread along coastal routes that are now submerged as the result of rising sea levels following the end of the last glacial period.

The importance of studying possible dispersals of hunter-gatherer pottery is not restricted to East Asian contexts. A number of recent studies have suggested that pottery innovations in East Asia might be responsible for the appearance of pottery across Asia and as far away as northern Europe.

Poster 15

Gazelle hunting activities around Tor Hamar rock-shelter in Jordan viewed from carbon and oxygen isotopic compositions of tooth enamel

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The stable carbon and oxygen isotopic composition of gazelles unearthed from Tor Hamar a rock-shelter site of in southern Jordan, was measured for reconstructing hunting activities by Paleolithic humans in this area. Tor Hamar, is located in the Jebel Qalkha area and has archaeological deposits dated to the Upper Palaeolithic (38-30 ka) and Epipalaeolithic (24-14 ka) periods. Excavations at the site have yielded stone tools and remains of prey animals from which we selected gazelle tooth enamel fragments for isotope analysis on the carbonate fraction. Isotopic analysis on animal teeth from archaeological sites to estimates the diet and habitats of the individuals (open/closed, drier/wetter, etc.). Our results suggest that Paleolithic people hunted gazelles across a wide range of altitude in the nearby mountains, indicating more extensive human mobility than that observed at other sites of the Southern Levant. Also suggest that variations in carbon and oxygen isotopes of enamel can be used to distinguish gazelle species because some (e.g., *Gazella subgutturosa)* are highly migratory but others have limited home ranges (e.g., *Gazella gazella*).

Poster 16

Identification of animal species by mass spectrometry of collagen preserved in Neolithic and Paleolithic bone specimens

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Introduction

The time scale of collagen survival in archaeological specimens had been estimated to be much less than one million years (Nielsen-Marsh, C. 2002), before Schweitzer and coworkers reported the finding of peptide fragments derived from collagen in the fossils of 8-million-year-old dinosaur bones (Schweitzer *et al*. 2007). However, Buckley and coworkers have recently suggested that there remains the possibility of cross-contamination of collagen from modern ostrich (*Struthio camelus*) bone, in which peptide fragments showed the complete match of amino acid sequence with those reported as being endogenous to *Tyrannosaurus and Brachylophosaurus* (Buckley *et al*. 2017). In any case, we need to allow for the longevity of collagen in our study of Paleolithic bones for the identification of animal species.

Neolithic Bone Specimens

In the analysis of bone specimens from two Neolithic sites, Göytepe and Hacı Elamxanlı Tepe, in the Republic of Azerbaijan, we could distinguish between the species between goat (*Capra hircus*) and sheep (*Ovis aries*), based on the mass spectrometry of tryptic peptides of collagen extracted from the bone specimens. The success of our analysis owes to the findings of a few diagnostic MALDI peaks at *m/z* 3036 for sheep and at *m/z* 3096 for goat (encircled peaks in Figure 1), corresponding to the residues 934-966 of the type I α2-chain (GTAGPPGTPGPQGLLGAPGXLGZPGSRGER), in which a pair of residues 953/956 (X/Z) are L/A for sheep and F/P for goat, respectively. Another diagnostic peak specific to sheep appeared at *m/z* 2216 in MALDI-MS, corresponding to the residue 918-933 in α1-chain peptide (AGEVGPPGPPGPAGEK), in which A at residue 918 is unique to sheep because almost all the other animal species have P (data not shown). With the exception of Goy-10, our specimens have been identified to the respective animal species of goat and sheep in agreement with morphological observations (Kadowaki, S. *et al*. 2017). In the case of Goy-10, the spectrum showed diagnostic peaks for goat at *m/z* 2216 and sheep at 3036, while it did *not exhibit* the peak characteristic of goat at *m/z* 3096. Because the latter peak was still unrecognizable in the analysis of collagen from the 10-fold increased quantity of the bone specimen. The results of species identification are summarized in Table 1. We are now examining the possibility of natural occurrence of sheep-goat hybrid (Mine, O. M. et al. 2000).

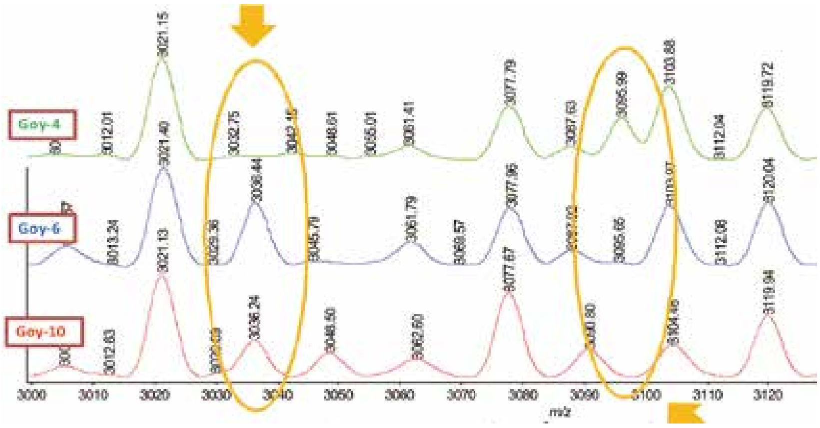

Figure 1. Expanded MALDI mass spectra of tryptic peptides obtained from the specimens Goy-4 (goat), Goy-6 (sheep), and Goy-10 (sheep/goat) in the range *m/z* 3000 – 3130.

Table 1. Identities of animal species of selected specimens from Neolithic sites in Azerbaijan.

Specimen ID	Goy-2	Goy-3	Goy-4	Goy-6	Goy-10	Goy-11	Hac-18
Morphology	*Capra*	*Capra*	*Capra*	*Ovis*	*Capra*	*Ovis/ Capra*	*Ovis/ Capra*
mtDNA	*Capra*	ND	*Capra*	ND	ND	ND	ND
Collagen (MS)	*Capra*	*Capra*	*Capra*	*Ovis*	*Ovis/ Capra*	*Ovis*	*Ovis*

ND: Not determined; *Ovis/Capra*: Indistinguishable between *Capra* (goat) and *Ovis* (sheep).

Paleolithic Bone Specimens

We also analyzed Paleolithic specimens including animal bones and teeth from Tor Hamar in the Jebel Qalkha area, southern Jordan. Unlike the Neolithic animal bones described above, the Paleolithic samples dated to 45,000 years before present did not show any evidence for the existence of collagen in MALDI mass spectrometry. In one of the samples JQ16-T12 (goat or sheep according to morphological observation), however, one peak was detected at m/z 1091.83 in nanoLC/ESI mass spectrometry, having matched with the peptide GETGPAGPPGAPGAPGAPGPVGPAGK (2184 Da with 4 hydroxyproline in 8 proline residues) corresponding to residues 1036-1061 of the α1-chain of type I collagen. Unfortunately, this peak is not diagnostic to any particular animal species. The search for the peptides enabling us to find unique amino acid sequence to identify the animal species of these Paleolithic specimens is now in progress.

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Poster 17

Some thoughts on the terminal Pleistocene stone tool cache: A case study from the Tomamu-daichi site, eastern Hokkaido, Japan

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Despite the fact that caches are the salient feature recovered from archaeological sites of prehistoric hunter-gatherers to complex societies, their implications are ambiguous. This is probably because caches are often sporadically found but not ubiquitous enough to deliver a significant pattern other than their spatially distinctive occurrences. To narrow down the multiple interpretations on prehistoric caching behavior, we analyze various aspects of the stone tools from rare example of the terminal Pleistocene stone-tool cache from the Tomamu-daichi site in eastern Hokkaido, Japan. Aspects of this stone-tool cache are scrutinized not only by the discovery context and date of cache, but also morphological and technological analysis, use-wear analysis, raw-material provenance analysis of the cached stone tools. This allows us to discuss the use-lives of cached artifacts and will give a prospect for understanding terminal Pleistocene caching behavior in Hokkaido and beyond.

Poster 18

Pollen analysis of a submerged forest during the last glacial period on the Dekishima coast, Aomori Prefecture, northern Japan

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(2) Nagoya University, Japan

There are buried forests along the Dekishima coast of the Tsugaru Peninsula, Aomori Prefecture, that were submerged during sudden environmental changes at the end of last glacial period. The outcrop containing these buried forests is divided into two layers; the top layer in the Dekishima Formation, which was deposited in the Holocene, and the lower layer is the Tateoka Formation, which was deposited in the last glacial period. The outcrop contains three tephra layers, including the Aira-Tn (AT) and Towada Ofudo (To-Of) tephra. The buried forests include coniferous trees such as *Picea jezoensis* and *P. glehnii*. Currently, these species occur farther north in Hokkaido, the South Kuril Islands, and Sakhalin. At that time, the temperatures were colder than at present and the climate of the Dekishima coast ranged from subarctic to boreal. This study analyzed pollen from a pear layer in the outcrop and reconstructed the paleoenvironment at the time when *Homo sapiens* reached Japan.

The Dekishima coast is located about 20 km northwest of Tsugaru, and the outcrops are distribute over 1 km. The surrounding vegetation includes with *Pinus thunbergii* and *Quercus dentata* coastal vegetation, and Japan cedar (*Cryptomeria japonica*) and Japanese cypress (*Chamaecyparis obtuse*) plantations, and many paddy fields, wetlands, and swamps immediately inland, with deciduous broad-leaved forests with *Quercus crispula* farther inland.

A 280-cm-long sample of the peat sediments was collected from the outcrop (N40° 51'54.92", E140° 17'07.90"). The peat sediments could be divided into three facies: sandy peat with organic matter (0–52 cm); black peat (52–78 cm); and brown peat (78–280 cm). Tephra layers were seen at 63, 150, and 198 cm. The submerged forest was at 170–175 cm.

The AMS radiocarbon dating of wood from 175 cm was 28,480 ± 100 BP, and the calibrated ^{14}C date was estimated to be about 32,000 cal yr BP, while that of wood from 55 cm was 5,290 ± 30 BP, and the calibrated ^{14}C date was estimated to be about 6,000 cal yr BP. The pollen analysis detected many fossil pollen grains of *Picea* and *M. gale*, along with fossil *Selaginella* fossil spores, which indicate a cold climate. The composition of the fossil pollen grains changed suddenly at 60 cm, and coniferous and *M. gale* fossil pollen grains disappeared above 60 cm. The discordance was at the boundary between the Dekishima and Tateoka Formations; the Tateoka Formation layer below 60 cm corresponded to the last glacial maximum, while the Dekishima Formation layer above 60 cm corresponded to the Holocene. It was believed that the unconformity was at the boundary between the two formations, and the sedimentation was discontinuous, as the composition of fossil pollen grains changes suddenly.

At that time, *Picea jezoensis* and *P. glehnii* grew around Dekishima, and the climate was very cold. The lower layer contained many fossil pollen grains of the deciduous broad-leaved trees, implying wet conditions. Subsequently, deciduous broad-leaved fossil pollen grains decreased and conifer fossil pollen grains increased, indicating that the climate became very dry and cold. Although the age is still uncertain, it was thought that deciduous broad-leaved forests, similar to the current vegetation consisting mainly of *Fagus crenata* and *Quercus crispula*, became established in the Holocene.

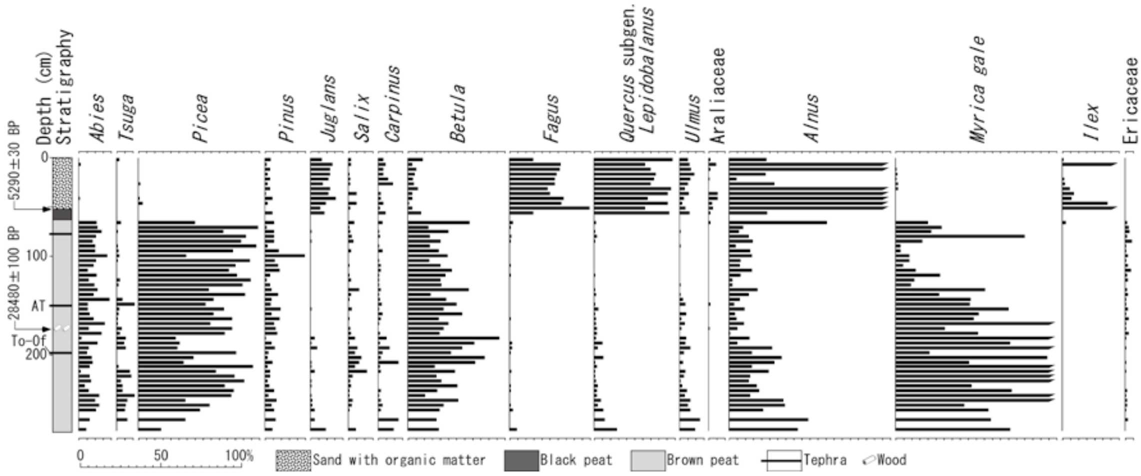

Fig. 1. Tree fossil pollen diagram for the Dekishima coast, Aomori Prefecture.

Poster 19

Quantitative reconstruction for paleoenvironmental changes in southern Mongolia during the *Homo sapiens*'s migration: new evidence from Orog Lake sediment core

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An aim of the present study is to understand detailed environmental/climatic changes in Mongolian region, an end-points of the northern route of the *Homo sapiens*'s migration toward Northern Asia. Archaeological evidences have suggested the possible migration of *Homo sapiens* in northern Mongolia and southern Siberia at around the Initial Upper Paleolithic age (ca. 45-40 ka; e.g., Zwyns *et al*., 2014; Rybin *et al*., 2016; Izuho *et al*., in press). However, the environmental/climatic changes of this period in Mongolian region is largely unclear.

We show new record of paleoenvironmental changes in southern Mongolia since ca. 50 ka. In January 2017, we successfully took two sediment cores (22.5 m length of OROG01, and 21 m length of OROG02) from Orog Lake, southwestern Mongolia. The high-resolution geochemical analysis of major and minor element composition were performed continuously at 0.5 mm interval using an μXRF core scanner (Cox, Itrax). The Si, Ca, S, Fe, As were apparently influenced with lithology changes. It is remarkable that the Ca concentration is higher in upper 4 m succession, compared with lower succession. With reference to the age-depth model of the sediment cores form Orog Lake (Yu *et al*., 2017), it is thought that the Ca shift at 4 m deep occurred at the transition form the last glacial to Holocene, and the age at 20-m deep of OROG01 and OROG02 was approximately 60-50 ka BP. The periodic variations of the Ca concentration during the last glacial can be synchronized to Dansgaad - Oeshger Cycle recognized in the oxygen isotope record form the Greenland Ice core. On-going study on OROG01 and OROG02 would confirm characteristics of environmental changes during the period of *Homo sapiens*'s migration in Mongolia.

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Poster 20

Chemical and mineralogical analyses for lacustrine sedimentary sequences of Darhad basin (northern Mongolia)

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The Darhad basin, northern Mongolia, is located in the southernmost parts of the Baikal rift valley basins, which was thought to have been dammed by a glacier during the late MIS 5 (Krivonogov *et al*. 2005) or during early to middle MIS 3 (Gillespie *et al*. 2008). In 2010, the International Darhad Drilling Project (DDP-2010) was conducted to investigate environmental changes in intracontinental Asia (Krivonogov *et al*. 2012). Geological surveys report that the Darhad lacustrine layer contains higher resolution records due to a high rate of sedimentation, as compared with records of the Baikal and Hovsgol. To extract the environmental records from the Darhad cores, we conduct the nondestructive μ-XRF mapping analyses of the sedimentary sequences (Katsuta *et al*. 2007).

We used the sediment cores DDP10-1 (96.3 m, 1553 m asl), 10-2 (139 m, 1543 m asl) and 10-3 (164.5 m, 1554 m asl), collected by DDP-2010 from the deepest parts of the Darhad paleolakes. For the μ-XRF analysis, sediment samples were continuously taken using paleomagnetic u-channels (2×2×40 cm), freeze-dried and then embedded in epoxy-resin. After grounding the analytical surface on resin-embedded samples with abrasives, the element distribution maps of the smooth surfaces were acquired using a Horiba XGT-2000V scanning XRF analytical microscope (SXAM). On the other hands, sediment samples for bulk-analyses were taken in about 3~5 cm intervals, which then were freeze-dried and homogenized in an agate mortar for the XRF and XRD analyses. Concentration of major elements (Al, Si, K, Ca, Ti, Mn and Fe) in sediment samples were quantified conventional XRF methods on glass fusion beads with a WD-XRF analyzer. Mineral compositions were quantified by methods of Fagel *et al*. (2003) based on the XRD patterns. Radiocarbon analyses for the TOC and macrofossils (woods and shells) for the cores were conducted with an accelerator mass spectrometer. The paleomagnetic measurement was performed SQUID-3 cryogenic magnetometer. In the poster presentation, we mainly report the analytical results of the DDP 10-3 core.

A tentative age model for the DDP10-3 core indicates that the sedimentation rate is approximately constant with about 1.13 m/kyr and bottom of the sediment has an age of ca. 125 ka. Desalination of Darhad paleolake inferred from the carbonate-free sediments occurred at 82~78 ka and 35~15 ka. It is considered that the Darhad paleolake have appeared in the late Pleistocene when the Tengissiin glacier dammed the valley of the Shishhid River in the northwestern part of the basin. Therefore, the two periods of the desalinations possibly suggest the glacier advances in association with severe cold and humid climate. The unit of the last glacial/Holocene transition consists of Ca-rich and Fe-rich couplets that we interpret to be annual laminations (i.e., varves). The total number of varves was at least about 270. The Greenland ice core δ^{18}O record indicate that transition from the late glacial to Holocene took about 3200 years (14.7~11.5 ka) in the Northern Hemisphere (NGRIP members 2004). Our results suggest that the climate of intracontinental Asia was rapidly changed from the glacial to interglacial state as compared with that of ocean and ice sheets.

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Poster 21

Optically-stimulated luminescence (OSL) dating of Paleolithic sediments in Jebel Qalkha, southern Jordan

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Several Palaeolithic archaeological sites occur in the Jebel Qalkha area, southern Jordan, providing valuable records of the cultural dynamics and palaeoenvironment during the dispersal of *Homo sapiens* out of Africa. However, their radiometric dating has not been successful yet. We carried out optically-stimulated luminescence (OSL) dating for sediment samples taken from Mushabian (Epipalaeolithic), Qalkhan (Epipalaeolithic) and Early Ahmarian (Upper Palaeolithic) layers at Tor Hamar site. Quartz and K-feldspar grains of 62–90 μm diameter were extracted from the samples for OSL measurements. Protocols of quartz SAR OSL and K-feldspar post-IR $IRSL_{50/150}$ were used for determination of the equivalent doses (*De*) of these grains, and *De* was then divided by annual dose rate to obtain final OSL ages. Tests showed that quartz OSL leads to variable *De* depending on preheat temperature and does not result in an appropriate dose recovery. In contrast, post-IR $IRSL_{50/150}$ was associated with good dose recoveries and its *De* does not highly depend on preheat and measurement temperatures. post-IR $IRSL_{50/150}$ also showed modest fading rates, which if remarkable potentially lead to large uncertainties in dating results. While quartz OSL is usually the first choice for dating sediments younger than 50,000 years, in this site K-feldspar post-IR $IRSL_{50/150}$ protocol is considered as more appropriate for dating. *De* of eight samples was determined by K-feldspar post-IR $IRSL_{50/150}$ with appropriate fading correction to determine the depositional age. A sample from the Mushabian was dated as 13.9±0.7 ka, and seven samples collected in Qalkhan and Early Ahmarian layers were dated as 23.4−41.7 ka in descending order, being concordant with the stratigraphic order and approximate age of cultural layers. The problem in the quartz OSL properties is ubiquitous at other sites in Jebel Qalkha, of which ages range from the Mushabian to the Middle Palaeolithic. An extensive application of K-feldspar post-IR IRSL dating should thus be critical for establishing the consistent chronology of the archaeological sites in Jebel Qalkha.

Poster 22

Past hydrological changes in south Siberian region for the last glacial to the Holocene based on radiocarbon dating

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In south Siberia, especially Transbaikal region belong to Lake Baikal watershed, numerous number of Paleolithic sites were observed (Fig. 1, Buvit *et al*., 2011 and 2016). The established ages of these archaeological sites are estimated at the climate transition between the Pleistocene and Holocene (Buvit *et al*., 2011). During this climate period, there are significant climate changes, such as the last glacial maximum (ca 19-20 ka, Ishiwa *et al*., 2011) and global warming (ca. 10 ka). Therefore, the precise reconstruction of the paleoclimate changes in the south Siberian region during the Pleistocene-Holocene transition could be important to understand the cultural response to the climate change.

Lake Baikal, which is located in the south Siberian region (Fig. 1), is the world oldest (at least 30Ma) and deepest (1648 m) lake with the largest water volume (23,000 km^3), which represents ~20% of the total unfrozen freshwater on the earth. Since, the long, continuous past environmental records (Kashiwaya *et al*., 2001) in the south Siberian region are preserved at its basin, numerous studies using the lake sediment cores have been carried out to understand the past climate and environmental histories in the south Siberian region (e.g. Shichi *et al*., 2013). The inseparably

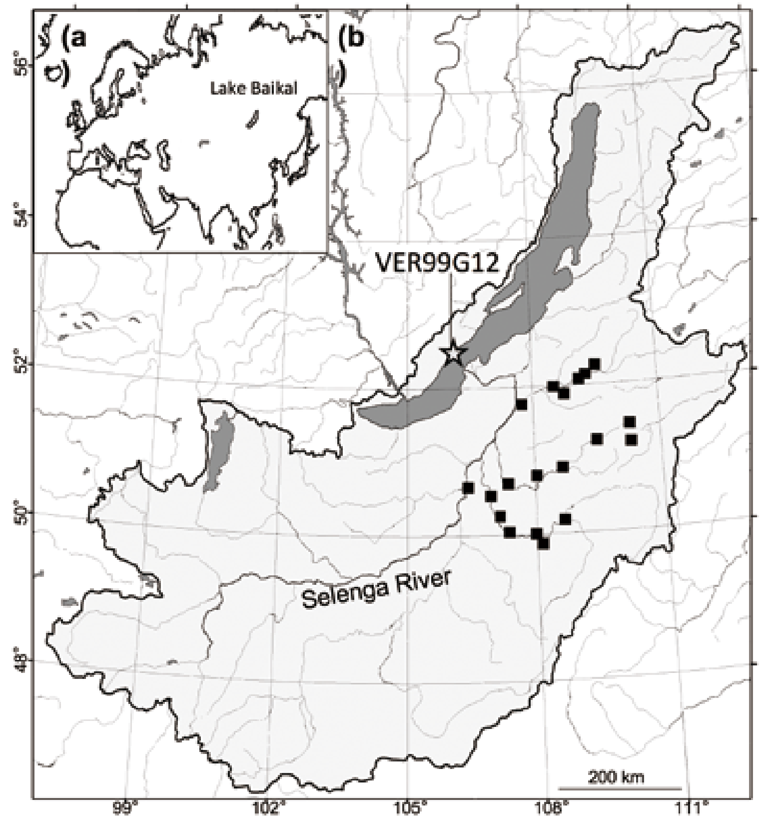

Figure1. Map showing Lake Baikal and its watershed. Star and square show the sampling site of VER99G12 and the locations of Paleolithic sites in trans-Baikal region.

linkage to the global climate changes and orbital climate forcing, such as glacial and inter glacial climate cycles and the Milankovitch cycles, respectively, have been revealed (Kashiwaya *et al*., 2001). Therefore, Lake Baikal has been respected as the iconic site in the Siberian region for scientific study (Arzhannikov *et al*., 2018).

In this study, the hydrological changes during the Pleistocene-Holocene transition, especially at the LGM, were reconstructed based on the radiocarbon age model of the core VER99G12. Lake level of the Lake Baikal decreased significantly during the late Pleistocene cold stage. This resulted in the significantly slow sedimentation rate at the LGM. Then the sedimentation rate at the transition period between the Pleistocene and Holocene was dramatically increased. The sedimentation rate of the Lake Baikal sediment from the Bugldeika saddle could be strongly influenced from the hydrological changes, such as the lake level change and the river input volume. These results show that radiocarbon age of total organic carbon sensitively response to the hydrological changes, which are corresponding with the precipitation changes in the Lake Baikal watershed area.

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Poster 23

Lexical analysis of the concept of culture in the PaleoAsia project

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The PaleoAsia project aims to interpret the nature of distinct patterns in the formation of modern human cultures across Asia. To this end, over 50 researchers from diverse backgrounds such as archaeology, cultural anthropology, mathematical biology, and palaeoenvironmental sciences work in collaboration. Thus far, discussions in the project's meetings and workshops have revealed that the meaning of 'culture' (*bunka* in Japanese language) seems to mean different things to researchers from different backgrounds, and the term is often used without an explicit definition. This problem, left untreated, may negatively affect the interdisciplinary collaboration, and it is a serious concern for us. With this as our motivation, we envision discourses concerning 'culture' in the PaleoAsia project, which will build a baseline for the intra-project collaborative research on the quantification of culture and its diversity.

We applied an ontological approach to this issue. First, we retrieved 486 sentences that included the word 'culture' from the full text of the project's conference proceedings, annual reports of sub-groups, and the project's website (https://paleoasia.jp). Co-occurring words, synonyms, and antonyms were listed, and the occurrence pattern was analysed with respect to the authors' backgrounds. No sentence directly defined the concept of culture, although it was observed that the term was used in the context of materials (e.g., lithic culture, ceramic culture, etc.), geography (e.g., cultural zones), temporality (e.g., Aurignacian culture) and dynamics (e.g., cultural ecology). Through dialogue between researchers from different backgrounds, we will attempt to develop a shared ontology of 'culture' in the project.

Note: The earlier version of this poster was presented as oral presentation at the 46th annual conference of Computer Application and Quantitative Methods in Archaeology, held at Tübingen, Germany, on March 19–23, 2018.

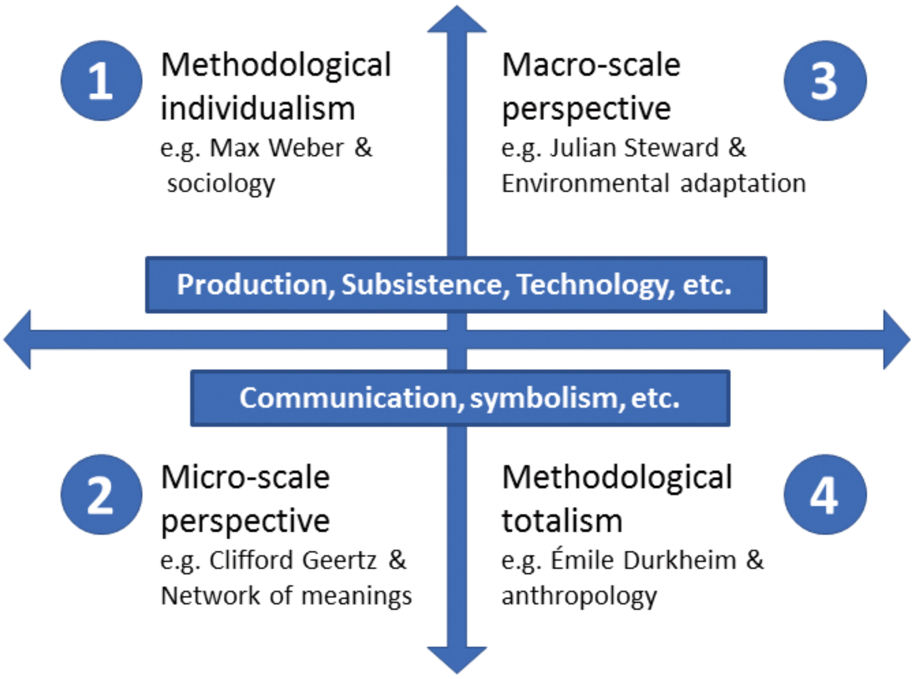

Fig. 1. Definition of culture in social theories

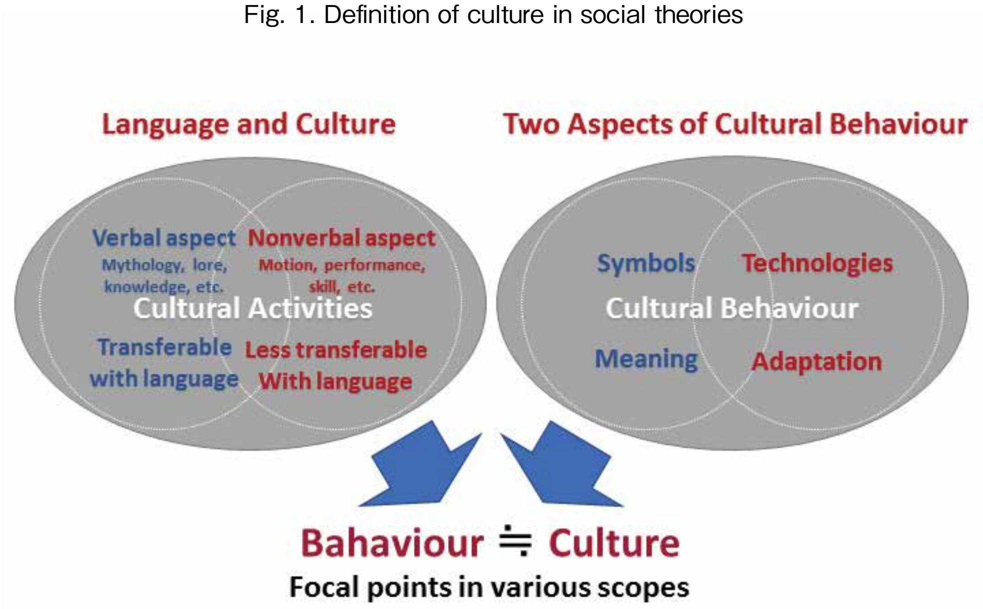

Fig. 2. Behaviour as a focal points of different thoughts and theories.

Poster 24

Network analysis of the interdisciplinary co-authorship of the PaleoAsia project

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The PaleoAsia project aims to interpret the nature of distinct patterns in the formation of modern human cultures across Asia. To this end, over 50 researchers from diverse backgrounds such as archaeology, cultural anthropology, mathematical biology, and palaeoenvironmental sciences work in collaboration. A previous study (Kondo, Onishi & Iwamoto in this volume) has highlighted that the conceptual meaning of culture is different among researchers from different backgrounds. How can researchers span their conceptual boundaries and work together towards the achievement of a shared research objective? To this end, the progress of interdisciplinary co-authorship was monitored and analysed by means of a network graph in the following manner.

To begin with, authors from the proceedings of the first to the sixth domestic conferences were listed, and network graphs of authors (nodes) and co-authoring relationships (edges) were drawn. In total, there were 148 authors, 228 presentations, and 718 co-authoring relationships, from the first to the sixth conference. The average number of co-authors per presentation was 1.39 in the first conference, 1.72 in the second conference, 1.46 in the third conference, 2.49 in the fourth conference, 2.26 in the fifth conference, and 2.89 in the sixth conference. A remarkable increase in the number co-authors was observed in the fourth conference, held in December 2017. The number of co-authors is high in the archaeology groups and low in the cultural anthropology group. Co-authoring relationships will continuously be monitored to analyse the development of interdisciplinary collaboration, as well as its outcome and impact.

Note: The earlier version of this abstract was submitted to the 47th annual conference of Computer Application and Quantitative Methods in Archaeology, to be held at Krakøw, Poland, on April 23–27, 2019.

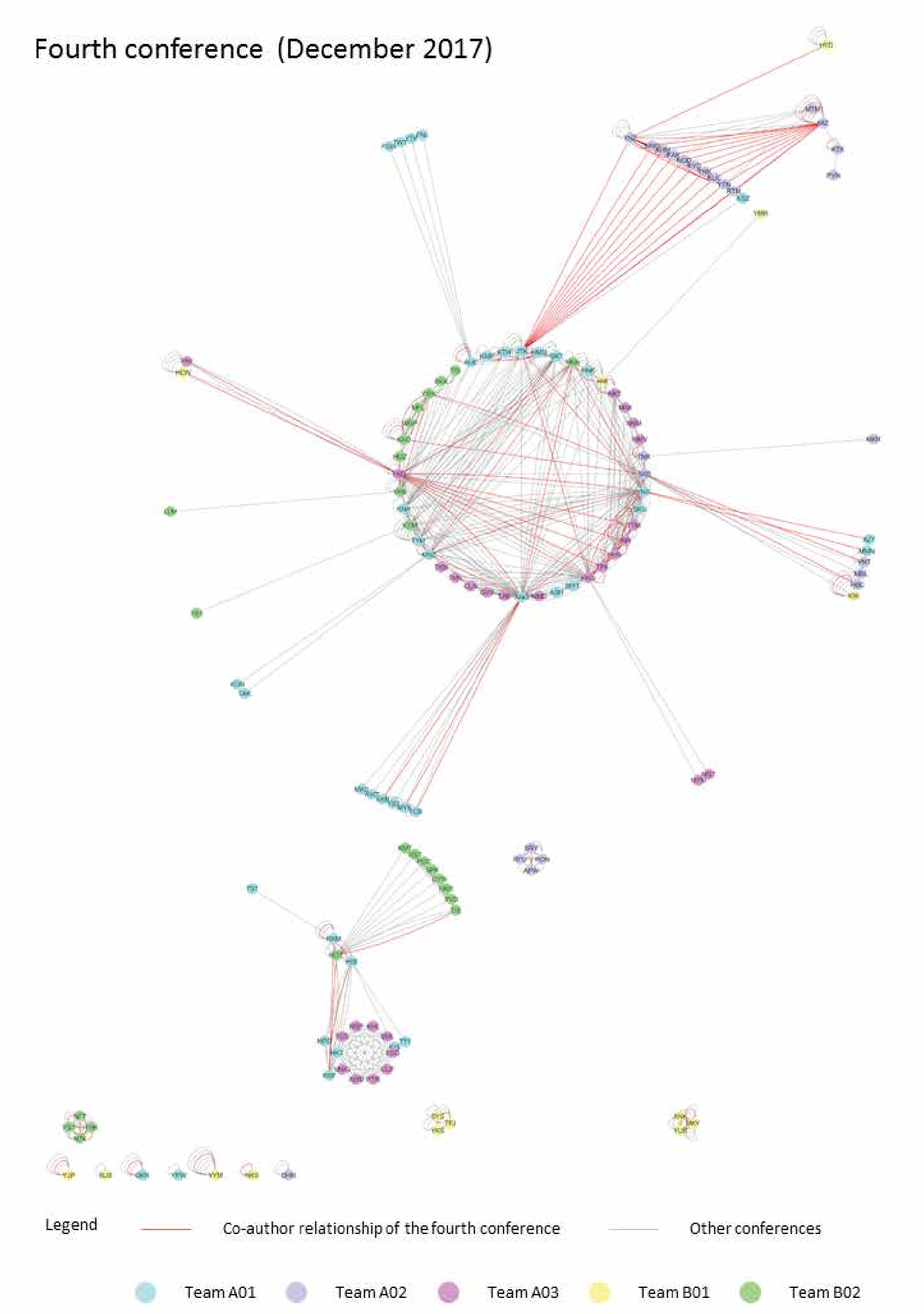

Fig. 1. Co-authorship relationship of the PaleoAsia project members at the fourth domestic conference (December 2017, red) and other five conferences (grey).

Poster 25

LOUD and FAIR Norwegian archaeological data

Mieko Matsumoto, Espen Uleberg, Steinar Kristensen, and Jakob Kile-Vesik
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Archaeological collections are curated at the five university museums in Norway: Oslo, Stavanger, Bergen, Trondheim, and Tromsø. These museums also conduct archaeological research and rescue excavations. In Oslo, there are six agents that contribute to the archaeological collections—five institutions and public collectors.

MUSIT databases

The Norwegian university museums have developed a national infrastructure for Archaeology that provides freely available data. This infrastructure is organised as a cooperation between the university museums under the name of MUSIT (MUSeumIT). MUSIT is responsible for maintenance over several databases, including Archaeology, Ethnography, Numismatics, and Photography. For Archaeology, MUSIT has developed authoritative lists for artefacts, raw materials, period names, and find contexts for the purpose of establishing a highly standardised query function. In the future the MUSIT archaeological database will be available online once the new IT-architecture project is completed.

Georeferenced museum objects

All archaeological finds that are registered in the database with field documentation are georeferenced, a process that uniquely combines the flow of data and institutional cooperation (Fig. 1).

The georeferenced museum collections with photographs, catalogue texts and maps, are published as open data through the portal unimus.no. As of now, almost 1.4 million objects and around 750,000 photographs are published on this portal. The photographs are published with a Creative Commons license (CC 4.0 BY-SA), while excavation reports are uploaded at the research archive duo.uio.no for free access.

ADED

From 2018, the Museum of Cultural History at the University of Oslo is leading a national project that will collect and publish excavation data (Fig. 2). The ongoing 3-year project titled "ADED" (Archaeological Digital Excavation Documentation) will make it possible to query across single projects nationwide. ADED will later be a part of the MUSIT infrastructure, and link objects with contexts and excavations.

The primary objective of ADED is to increase the accessibility of archaeological and scientific documentation through a common, open digital infrastructure. This will create new opportunities for quantitative and qualitative research as it opens up new ways for existing resources to be easily accessed and used across regions.

Since 2011, the five university museums have used a standardised documentation system via a GIS Database software named Intrasis (intrasis.com). This gives a good starting point for the work in ADED.

All new digitally generated geodata across institutions will be integrated with the database and old data will be converted and uploaded during the project's life span. Through ADED, students and researchers will be able to compare structures from different excavations and undertake larger quantitative analysis than has hitherto been possible.

LOUD and FAIR data

The overall aim for the work in ADED and MUSIT is to comply with the idea of providing data standards as LOUD (Linked Open Usable Data) and FAIR (Findable, Accessible, Inter-operable, Retrievable).

In MUSIT, the acronyms FAIR and LOUD imply that the data gathered in the database should be easy to find, access, and use. This means that the data uses unique identifiers, a rich set of metadata, and is written in an accessible language. The protocol is open, free, and indexed allowing for easy searching and readily available links. However, too much data in a database can make it hard to read, use and comprehend. The LOUD principle tries to define the amount of data that goes in to a database before it becomes too insurmountable to use efficiently. LOUD strives to make sure that the data is easy to use and manage by an external participant.

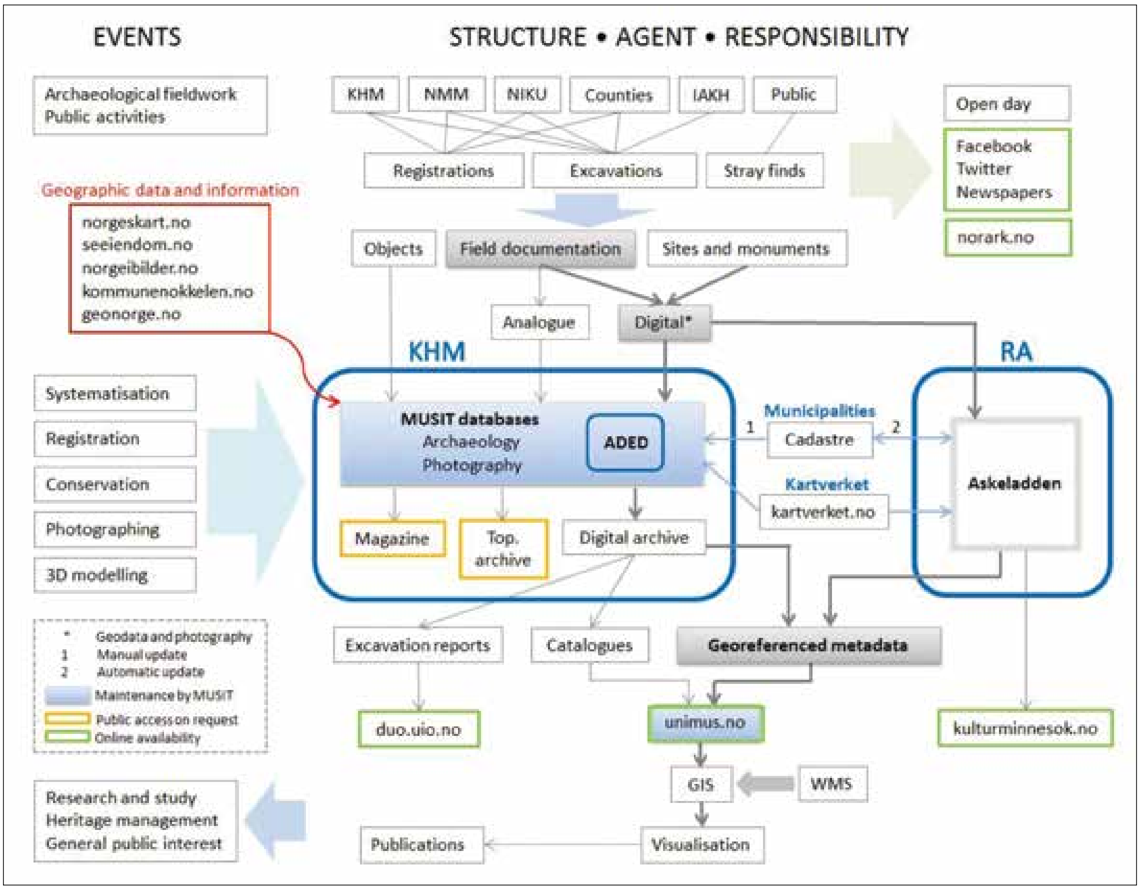

Fig. 1. Georeferencing museum collections in Norway. Modified after Uleberg and Matsumoto (in print). Abbreviations: KHM (Museum of Cultural History, University of Oslo); NMM (Norwegian Maritime Museum); NIKU (Norwegian Institute for Cultural Heritage Research); IAKH (Department of Archaeology, Conservation and History, Faculty of Humanities, University of Oslo); RA (Directorate for Cultural Heritage).

Fig, 2. Collecting data for ADED in the field.
(https://www.khm.uio.no/forskning/prosjekter/humgis/index.html)

Poster 26

Social change and behavior patterns in the course of contacts between the previous inhabitant group and migrant group: A case study from the Kazakh steppe

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The purpose of this study is to examine social change and behavior patterns, especially residential patterns, in the process of contacts among ethnic groups, based on cultural anthropological fieldwork in the steppe zone in Central Asia. Central Asia is located on the northern route, which modern Homo sapiens were believed to have followed when they advanced from West to East Asia. One of the roles of anthropological research in the "Cultural History of Paleo Asia" project was to identify patterns of social change that occurred in the course of contacts among different groups, and which related to changes in material culture. This study focuses on the contact between the Kazakhs, the group of previous inhabitants, and the Russians, the migrant group. The following points will be discussed:

1) Population change in the course of contact between groups

How did contact between the previous inhabitant group and migrant group influence the population of each group respectively? According to statistical data, the migrant group of Russians started to gradually migrate to the steppe during the 19^{th} century, the population of the previous inhabitant group of Kazakhs declined during the 1930s, and then the migrant group came in huge numbers to the steppe in the 1950s. Analysis of the population change from the 19th to the mid-20th century is useful in understanding the process of how the migrant group invaded the steppe, which had previously been occupied by a different group.

2) Environment use and seasonal mobility of the two groups

The previous inhabitant group had high mobility and depended on animals as the main source of food in the steppe; the migrant group, on the other hand, had low mobility and depended mainly on plants in forests, as well as reclaimed lands in forests, for food. It would seem that these two groups could potentially coexist, because the main sources of foods were different. However, the migrant group occupied the riverside forests in the steppe, which had been used as winter campsites by the previous inhabitant group. The inhabitant group lost their seasonal mobility due to the occupation of land by the migrant group. Following this, the population of the previous inhabitant group declined due to a shortage of animals caused by social and natural disasters.

3) Change of residential patterns

The previous inhabitant group of Kazakhs sedenterized as a result of contact with the migrant group of Russians. In the sedentarization process, small Kazakh patrilineal kin groups, which had previously been units of seasonal camps, gathered and formed settlements. Following this, larger graveyards were formed near to the settlements. The dwellings changed from yurts (portable round tents covered with felt) to wooden houses and/ or sun-dried brick houses. Some prominent people from the previous inhabitant group built wooden houses, which had formerly been used by the migrant group. However, for many it was not possible to gather enough wood in the steppe.

Therefore, the majority of people in the previous inhabitant group used sun-dried bricks, made of soil from the steppe, to build houses. Thus, the loss of seasonal mobility is manifested in the changes in settlements and graveyards, as well as in the style of houses.

To sum up, this case study suggests the following model. In the steppe zone, a migrant group, which has low seasonal mobility, gradually oppresses a previous inhabitant group, which has high seasonal mobility. As a result, the residential patterns of the previous inhabitant group changes. The seasonal mobility and different uses of the same environment is important in understanding the contact process and population change of the two groups. A further study, which focuses on the contact between previous inhabitant groups, is required in order to better understand the social change and behavior patterns, which affect material culture.

Poster 27

The vital role of "cordage" in food acquisition and other aspects of human life

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(2) National Museum of Ethnology, Osaka, Japan

As Hardy (2008:271) rightly argues, "string, cordage, or something that ties things together is such a fundamental part of everyday life that it is taken completely for granted." Since every language has a wide variety of denominations for different types of tying devices, we use the term, "cordage," as a more neutral option. Cordage can be defined as "a perishable structure consisting of one set of elongate fibrous elements twisted or spun together to form a uniform, cylindrical, and generally flexible strand of potentially unlimited length" (Adovasio *et al*. 2001: 49).

It has been pointed out that archaeologists, especially pre-historical archaeologists, have paid very little attention to this type of artifact. This is primarily because such organic artifacts are not easily found in archaeological sites. But there is a growing body of archaeological evidence discovered by archaeologists who pay particular attention to the role of strings or cordage in prehistoric societies (Fig. 1, 2).

Fig. 1.

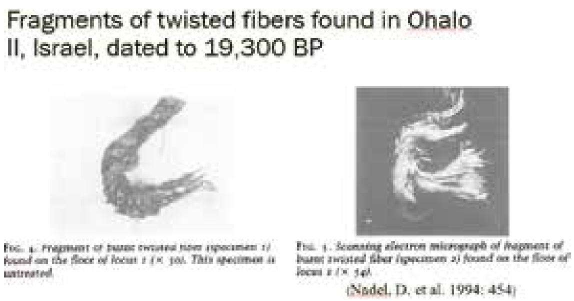

Fig. 2.

Aside from the perishability of the materials, the conspicuous absence of cordage from archaeological records and subsequent analysis can also be attributed to "preservation bias" and "gender bias" (Adovasio *et al*. 2001). Barber, who coined the term "string revolution," argues that "[M]aking string···opened the door to an enormous array of new ways to save labor and improve the odds of survival···" (Barber 1994: 45) for humans.

Ethnographic evidence validates her argument. In the traditional ways of life among indigenous populations in the Northwest Coast of Canada and Hokkaido, Japan, we see numerous examples of tools and utensils that incorporate cordage as binders, fishing and hunting tools, and containers. Most of these tools are made for food gathering purposes, but they are also widely used for house building, cooking, and clothing.

People made cordage from a variety of plant and animal resources such as the bark, withes and roots of trees, human hair, animal sinews, hides and intestines; but in the case of the Northwest

Coastal peoples, the Western red cedar (*Thuja plicata*) was by far the predominant source of material for cordage. There are both practical and cultural reasons to explain the preferential use of this tree (Stewart 1984). By comparison, the Ainu people had a much wider repertoire of plant and other natural resources; in particular, they meticulously differentiated between plants according to their specific properties and there were widely held beliefs associated with each one of them (Kayano 2014:17).

All in all, such ethnographic evidences strongly suggest that cordage played a vital role in food acquisition technologies, which can be summarized as follows:

- Binding, holding, and hanging functions increase efficiency in food acquisition, transportation and storage.
- Cordage provides a wide range of binding tools, with differing thickness, strength, and length.
- Cordage also produces both flexible surfaces (two-dimensional planes) and solid, three-dimensional containers (three-dimensional forms). (cf. Sekijima 1986)

Furthermore, from the perspective of technological advancement in human history, cordage assumes a decisive role in increasing the complexity of artifacts (cf. Oswalt 1976).

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Poster 28

Hybridization of two different cultural groups in the Ainu history

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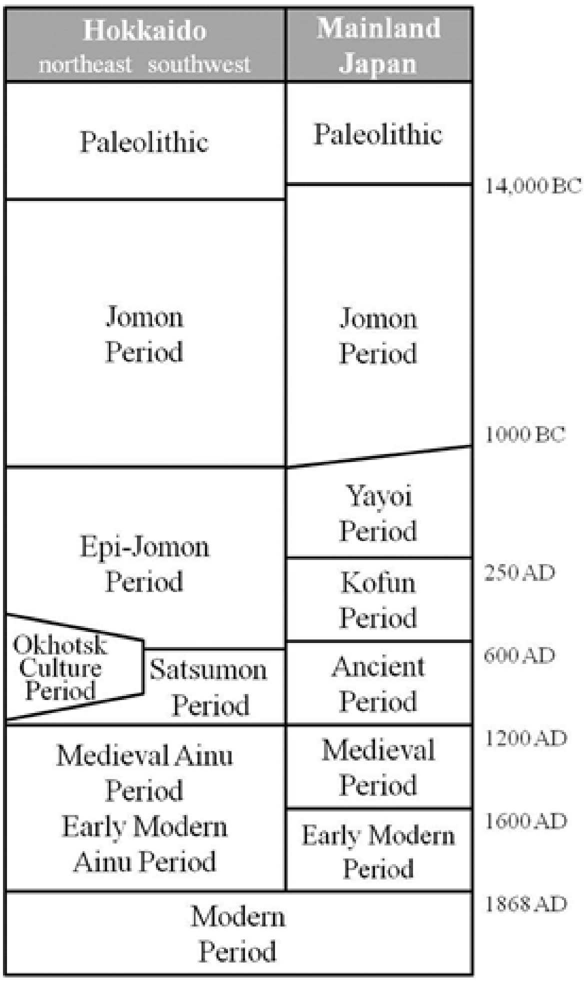
Doshisha Women's College of Liberal Arts

Before the medieval Ainu period, two different cultures had come into existence and spread across Hokkaido. Archaeologists have termed them the Satsumon and Okhotsk cultures. The material cultures of these two groups are completely different from one another and their populations are also regarded as heterogeneous. This therefore raises the very interesting question of how these different cultures and groups related to each other, and how they contributed to the formation of the Ainu in the next period.

The Satsumon culture was distributed across Hokkaido and the northern end of Honshu from 700 until 1200 A.D. The population of the Satsumon culture is mainly regarded as indigenous groups descended from the Epi-Jomon population, so until recently they have been identified as the direct ancestors of the Ainu people. Meanwhile, the Okhotsk culture is one of the most unique prehistoric cultures, not only in Hokkaido, but in the Japanese archipelago as a whole. The Okhotsk culture was distributed around south Sakhalin, north-eastern Hokkaido and the Kuril Islands from 600 until 1000 A.D. In addition, the Okhotsk culture had kept the relationship with Amur Land via Sakhalin and introduced many kinds of artifacts and/or cultures from this route. Furthermore the population of the Okhotsk culture is regarded as a different genetic group from the autochthonous people, including the Satsumon culture.

The Satsumon and Okhotsk cultures coexisted in Hokkaido from 700 until 1000 A.D., but they occupied different areas and basically had no relationship with one another. However, these two groups suddenly hybridized around the 10th century. Such hybridization occurred separately in the eastern and the northern parts of Hokkaido. This presentation focuses on the case



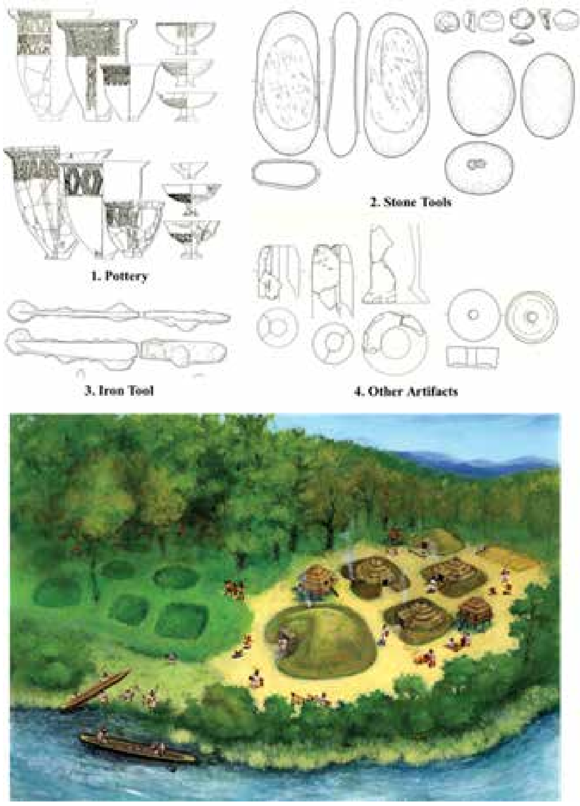
Chronological chart for Hokkaido

of hybridization in the eastern part, which resulted in the creation of the Tobinitai culture, because sufficient archaeological data exists.

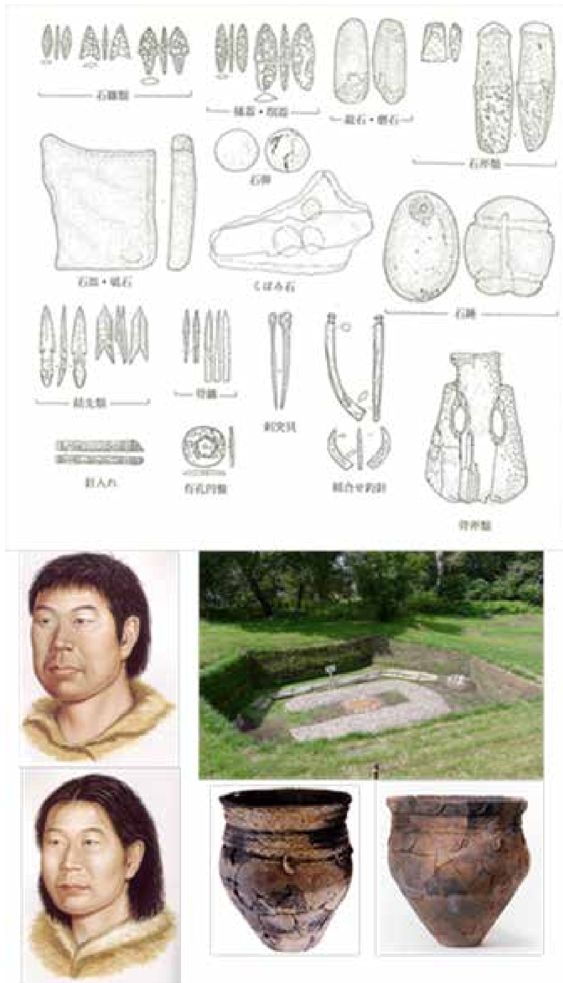
It has been generally assumed that the Okhotsk culture initially incorporated many different elements from the Satsumon culture, including artifacts, technology, settlement patterns and subsistence strategies, before eventually becoming completely integrated with it. For example, the Tobinitai pottery initially imitated the patterns, ornamentation and form of Satsumon pottery, but was made using techniques from the Okhotsk culture. At a later stage, however, the Tobinitai group had completely assimilated the manufacturing techniques of the Satsumon culture and produced pottery identical to Satsumon pottery. This phenomenon can also be observed in house structure, tool components and so on.

From these cases, it can be assumed that the Tobinitai culture, at least in its material culture, finally transformed into and became indistinguishable from Satsumon culture. However, there is no evidence to suggest that the original formation of the Tobinitai culture was in any way initiated from the Satsumon culture side. Therefore, the Tobinitai culture can be considered the result of an integration process, through which the Okhotsk culture group actively converted to the Satsumon culture. Incidentally, this kind of hybridization of two cultures can also be verified on the genetic level.

Finally, this paper examines how the hybridization of these two cultures related and contributed to the formation of Ainu culture in the next period. Through this examination, it attempts to demonstrate the role that the Okhotsk and the Satsumon cultures played in the process of Ainu cultural formation during the medieval period.



Satsumon culture



Okhotsk Culture

Poster 29

An exploratory quantitative analysis of tool use behaviors: In the case of cutting among Baka hunter-gatherers

Yujie Peng
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Cutting can be regarded as one of the most fundamental physical techniques among non-industrialized societies, including hunting-gathering-fishing societies, pastoralists, and farmers. In hunting-gathering-fishing societies, it is particularly difficult to imagine how humans would survive without cutting. Cutting can be simply described as the practice of dividing one piece of something into several pieces, or removing one or more parts from a body they previously belonged to. It encompasses everything from cutting meat and logging, to stripping the hide off prey and shaving hair. This paper looks at cases of cutting among the Baka people, a group of Pygmy hunter-gatherers in the Congo Basin rainforest, and uses quantitative analysis to determine the correlation between the morphology of tools and behavior of tool use.

1. Morphology and target object

In the case of the Baka, there are only four types of tool used in cutting. The axe is generally used for targets far from the practitioner's body. Blades are the smallest of the cutting tools and their use for activities, such as healing, tattooing, cutting hair or shaving, directly targets the body. Mid-sized tools are used most frequently and for the most diverse range of activities, from logging small trees to cooking.

Fig. 1. Baka' s cutting tools

2. Morphology and body movement

With cutting tools, the predominant tendency is for their morphology and associated body movements, to be determined by the size and requirements of the body parts involved in their use. In the particular case of axes, practitioners need to hold them with both hands, whereas they only use one hand for holding machetes of any size, even when being used for the similar purpose of cutting. Although several fingers of both hands are used for holding a blade, the muscle groups involved are relatively smaller than those involved in the use of an axe or even a knife. In other words, using a bigger tool may require more strength, while using a smaller tool may require more precision.

3. Tool size and technique in use

Through a moment by moment observation of two Baka women's cutting behavior, the following tendencies were found in cutting behaviors that may be influenced by the tool's size.

1) Age and strategy: the younger woman spent a longer time in continuous and vigorous cutting, namely the step that highly depending on individual's physical ability. Whereas the user of the larger machete spent a longer time aiming (light cutting with the machete) before delivering a powerful cut, i.e., the step of considering 'how to cut it efficiently'.
2) Cutting rhythm: the time period between two cuts of the smaller machete's user was shorter (i.e., faster in tempo) than the larger machete's user, particularly during powerful cutting.

Fig. 2. Nut cutting work among Baka women

Poster 30

Evolution of religion and mythology: Its role in intergroup dynamics

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The evolution of religion has been one of the foci of scholars for years. Earlier theories were based more or less on the *Achsenzeit* (Axial Age) concept by Jaspers (Jaspers 1949, Bellah 1964, Wallace 1966, Nakamura 1960, 1974–77), and this emphasis is still found in Bellah's later work (Bellah 2011). With the development of paleoanthropology, archaeology and genetics, however, our knowledge on the earlier stage of religion has grown. Consequently in the 21st century, more attention has been paid to the modern human "cognitive evolution" around 50,000 years BP, or roughly at the beginning of the Upper Paleolithic (Bulbulia et al. 2013, Singh & Chatterjee 2017, Purzycki et al. 2017, Turner et al. 2018). This trend has led also to theorizing the evolution and diffusion of mythology among modern humans (Witzel 2012, Berezkin 2013).

In this paper I explore religious and mythological concepts especially among the hunting-gathering peoples, such as "master of animals" and "trickster." These elements reflect their existential situation, or their *Ergriffenheit* condition, as Frobenius put it (Frobenius 1938), which is metaphorically implied by Eliade in his hypothesis on the origin of religion (Eliade 1976). The above concepts are then examined in the context of confrontational circumstances with animals, natural disasters and out-groups. Finally, I suggest the evolution of the mentioned symbolization ability is critical in the process of intergroup dynamics, when we also take into account the "supernatural sanctioning" and the origin of moral discussed by Boehm (2012).

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Poster 31

Complexity and “environmental adaptability” of imaginary creatures

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Imaginary creatures such as dragons, mermaids, *qilin*, or tengu, which appear in mythology, folklore, and in some cases pre-modern encyclopedic works and travelogues, are often hybrid or composite beings that do not occur in the natural world, combining elements that are normally ecologically incompatible. For example, fish (water) + human (land) = mermaid. Their hybridity or complexity gives them “environmental adaptability” in a figurative sense.

In this presentation, we take select samples of ethnological artifacts from around the world which represent imaginary hybrid creatures from the collection of the National Museum of Ethnology. We will break the images down into anatomical components and “environmental” attributes (water, sky, earth) and identify patterns in the way they are combined, thus exploring the possibility of numerically evaluating the connection between the human mind and the environment.

Poster 32

Speculating PaleoAsian culture from genomic signatures of selective sweeps

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Backgrounds

Genome-wide scans for detecting selective sweeps – local reduction in the extent of DNA polymorphism by positive Darwinian selection – revealed that cultural processes have had a profound effect on human evolution: hundreds of genes have been subject to recent positive selection, often in response to human activities (Laland *et al.* 2010). This causal relationship may permit us to speculate ancient culture from signatures and biological functions of genomic regions under selective sweeps.

Methods

We have developed a new inference method for detecting signatures of incomplete selective sweeps in single nucleotide polymorphism (SNP) data (Fujito *et al.* 2018a). Based largely on the traditional site frequency spectrum (SFS), the method additionally incorporates linkage disequilibrium (LD) between pairs of SNP sites and uniquely represents both SFS and LD information as hierarchical "barcodes." This barcode representation allows the identification of a genomic region surrounding a putative target site of positive selection, or a core site. Sweep signals at linked neutral sites are measured as the proportion (F_C) of derived alleles within the core region that are linked in the derived allele group. In measuring F_C or intra-allelic variability (IAV) in an informative way, certain conditions for derived allele frequencies are required, as illustrated with the schizophrenia-associated *ST8SIA2* locus. We have also investigated the underlying two-dimensional SFS of the F_C statistic with special reference to the role of recombination and the distinction between "hard" and "soft" selective sweeps. We demonstrate that the F_C -based method is powerful and robust to non-equilibrium demography and nuisance effects of recombination on gene genealogy within IAV. Although F_C depends noticeably on the frequency of a positively selected allele at a core site, we can compare the P-value in testing multiple SNP sites with different allele frequencies and evaluate the statistical significance by controlling the false discovery rate (FDR).

Schizophrenia-Associated Loci

Schizophrenia is a mental illness that causes marked social impairment and results in considerable negative fitness effects on human populations. Genetic variants at schizophrenia-associated loci are classified into risk and non-risk types under given environmental conditions. ST8SIA2 is a sialyltransferase that is involved in mental activities and three SNPs in the promoter region regulate the gene expression level that is directly associated with schizophrenia. We found ongoing positive selection on a non-risk promoter type with the increased frequency in Asia during the past 20~30 thousand years. Based on this evolutionary finding together with the biological function, we speculated that the environmental risk factor has been acculturative, psychosocial stress arising from tension during adaptation to alien culture or changing social environments in post-glacial Asia (Fujito *et al.* 2018b).

Currently, we further study 108 schizophrenia-associated SNP sites in Africans, Europeans and East Asians (Schizophrenia Working Group 2014). The preliminary results show that out of 624 multiple tests = 104 SNP sites (excluding deletion polymorphisms) x 2 (derived and ancestral alleles at each SNP site) x 3 (populations), 29 SNP sites have rejected the null hypothesis of selective neutrality with 5% FDR. Of these, 11, 10 and 2 SNP sites have undergone local selective sweeps in East Asians, Europeans and Africans, respectively, and only three are shared between East Asians and Europeans. We ask if the origin and world-wide prevalence of the illness are linked to modern human-specific traits such as the development of language and the high consumption of energy in the brain (Preuss 2012).

Other Applications

We have also applied the F_C statistic to genetic loci such as *LCT* (lactase persistence), *ASPM* (brain development), *OCA2* (eye-color), *EDAR* (hair thickness), and *SLC24A5* (light skin pigmentation). The first two are related to dairy farming and complex cognition, and the last three are related to mating preference, all consistently suggesting strong culture-driven positive selection.

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Poster 33

Time to extinction of a cultural trait

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Culture is information which is transmitted through social transmission mechanism and affects the behavior. Taking it into consideration that many of adaptation of human beings and variation of behavior are explained by culture, studying cultural evolution is essential for understanding for human beings (Cavalli-Sforza and Feldman, 1981; Boyd and Richerson, 1985). Cultural evolution is that there are variety types of cultural elements (e.g., how to make a stone tool, see O'Brien, *et al*., 2001) in a population and cultural components in a population change as time goes by. Hence, studying how long a cultural element which is innovated or is imported from another population stays in a population contributes to the understanding for cultural evolution, obviously. However, while many previous studies investigated the change of frequency of cultural element by time and the change of average element by time, thus far there have been few studies which examined how long a cultural element continues to last.

Role of random drift cannot be ignored when considering the change of frequency of cultural elements and their extinction as well as when considering the change of frequency of genes and their extinction. To the best of our knowledge, there are two theoretical studies which are related with time to extinction and have taken random drift into account.

One is Strimling, *et al*. (2009). They assumed that each cultural element can be regarded as either present or absent for simplicity. Empirical studies also regard cultural element as either present or absent. For example, even if trait is actually continuous and seems unlikely to be able to be regarded as either present or absent, if we ignore the detailed information and regard trait discrete, mathematical models which assume that each cultural element can be regarded as either present or absent are applicable and meaningful. In addition, Strimling, *et al*. (2009) took into consideration that cultural transmission can sometimes fail (note that the probability that culture is transmitted from an individual to another individual is not always one), which is important and specific to culture (i.e., gene is always successful in transmission from an individual to another individual). They assumed that each individual introduces a new element with a constant probability by innovation into a population and analyzed the dynamics of the number of cultural elements in a population and the number of cultural elements which one individual possesses. In addition, they showed that expected time to extinction of cultural element can be calculated by the number of cultural elements in a population at a stationary state and by using the result, revealed the relationship between the efficiency of cultural transmission and expected time to extinction of trait. Although these results are epoch making, their research interest for time to extinction is supplementary and therefore, they analyzed only "expected" time to extinction. Moreover, they dealt with only random oblique transmission (i.e., an individual refers to only one role model and learns something from only one role model) and we consider that there is room for improvement in this sense.

The other is Aoki, *et al*. (2011). They calculated mean fixation time of a cultural trait and mean absorption time of a cultural trait, which can be said highly relevant to time to extinction of a cultural trait. However, pitifully, they did not obtain the result upon time to extinction of a cultural trait.

In this conference, we report the detailed theoretical works which focus on time to extinction of cultural elements. In our model, culture is transmitted from role model whose number can be more than one and cultural transmission can fail sometimes. Moreover, in this study, we calculate not only expectation of time to extinction but also distribution of time to extinction. Based on them, we obtain the following biological knowledge: one is that as the initial number of individuals with culture increases, the time to extinction becomes longer; another is that as connectivity increases, the time to extinction becomes longer; the other is that as transmission efficiency increases, the time to extinction becomes longer.

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Poster 34

Statistical Analyses of archaeological cultures based on 0,1-vector models

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How human cultures spread and why did in such a way during the Paleolithic are fundamental questions in the fields of archaeology and evolution of human behavior. PaleoAsia DataBase (PADB), developed by Research Team A01, is a rich source of information to answer these questions. PADB contains information about Shea's modes (Shea, 2017), variations of stone-tool technology, found in various regions and periods of Asia. Analyzing the statistics of the modes will tell us how stone-tool technologies evolved and spread over Asia and what mechanism drove it.

To understand how, we conduct a model-free analysis using the principal component decomposition of the modes: Each cultural layer in each archaeological site is characterized by a vector that indicates whether the layer in the site contains each mode, called the 0,1-vector in the theoretical studies of cultural evolution (Strimling *et al.*, 2009). The 0,1-vectors are high-dimensional and thus difficult to understand in their raw form. To summarize the 0,1-vectors, we decompose them into principal components and visualize their spatiotemporal dynamics. Doing so enables us to draw a rough sketch of how cultures spread over in PaleoAsia.

To understand why, we conduct a model-based analysis assuming that the 0,1-vectors evolve and diffuse via a Markov process in which innovation provides new variations and demographical death/birth and cultural transmission between local populations stochastically drive the time evolution of the frequencies of the modes. We find that the obtained theoretical distribution functions of the modes well predict the empirical counterparts. The model has two phases: in the subcritical (supercritical) phase, the frequency of cultural transmission between local populations is insufficient (sufficient) so that high-frequent modes tend not to appear (tend to be frequent). East Asia e.g. China shows the critical phase, which is the boundary between the subcritical and critical phases. West Asia e.g. Levant shows the supercritical phase, implying that frequent cultural transmission between local populations helped the spread of stone-tool technologies in Paleolithic West Asia.

Another statistical analysis reveals that the heterogeneity of the modes in different layers is larger in East Asia than in West Asia; in other words, patterns of co-occurrence of the modes are more homogeneous in West Asia than in East Asia. This observation is consistent with the model prediction.

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Poster 35

Genome-wide SNP analyses of ethnic groups in Thailand

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Genetic diversity of human populations has been formed by non-biological factors such as lifestyle, culture, and social systems. Oota and colleagues reported a clear contrast in the genetic diversity of mitochondrial DNA and Y-chromosome between ethnic groups (hill tribes) with patrilocal and matrilocal residential patterns in northern Thailand (Oota *et al.* 2001) . The results suggested that the sex-biased migration pattern had significantly affected genetic diversity of genetic markers with sex-specific inheritance. To investigate the influence of the sex-biased migration and lifestyle to the genetic diversity of autosomes, we performed genome-wide SNP analyses of the ethnic minorities in Thailand.

We studied three patrilocal slash-and-burn [Akha, Lisu (Mae Hong Son) and Lisu (Chiang Rai)], three matrilocal slash-and-burn [Kayah (Red Karen), Karen (White Karen) and Lahu], and two hunter-gatherer groups (Mlabri and Maniq) in Thailand. In total, 192 people from eight populations of seven ethnic groups were genotyped for about 600,000 SNPs in leukocyte genomic DNA using Infinium Global Screening Array (Illumina).

After checking the marker quality and removing kinship, we obtained 575,395 autosomal SNPs for 135 people. Merging the data with published datasets such as Human Genome Diversity Project(Li *et al.* 2008), 1,000 genomes project(The 1,000 Genomes Project Consortium 2015) and others(Chaubey *et al.* 2011, Metspalu *et al.* 2011, Mörseburg *et al.* 2016), resulted in 74,305 autosomal SNPs for 1,279 people from 43 populations.

Principle component analysis and ADMIXTURE analysis(Alexander et al. 2009) suggested genetic divergence of Mlabri and Maniq from other populations, probably due to strong genetic drift induced by their small population sizes. The five hill tribes formed independent clusters and showed some genetic divergence. We conducted f3 tests(Patterson *et al.* 2012) to investigate genetic similarities among the ethnic groups, and no evidence of gene flow to the eight subject populations was detected. We are performing further analyses to find the evidence of gene flow to the subject populations and planning to integrate more populations living nearby area.

Together with the results, phylogenetic analysis showed inconsistency between language and genetic similarities that indicated the complicated history of human populations in different part of Thailand.

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