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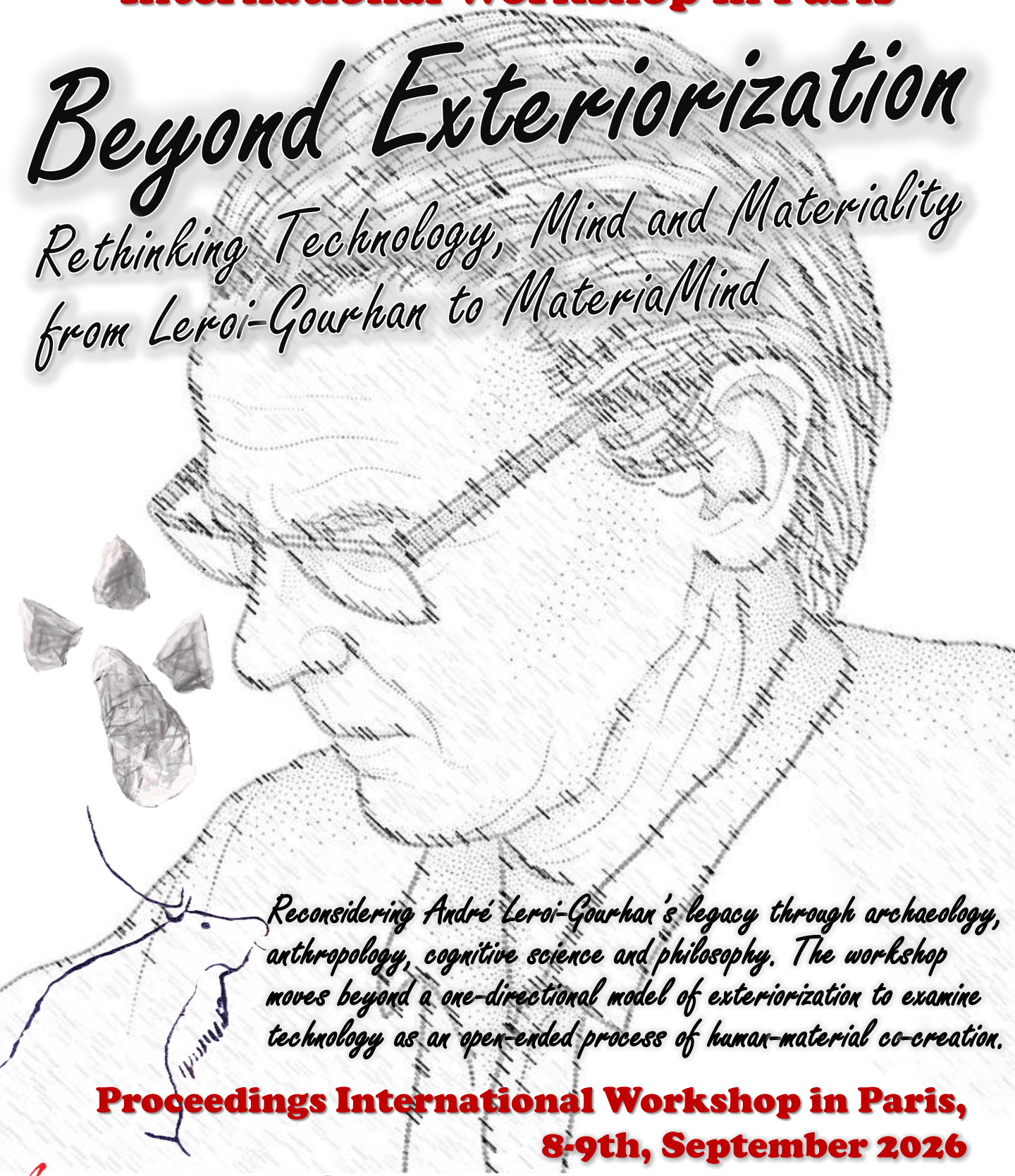
## International Workshop in Paris

# Beyond Exteriorization

## Rethinking Technology, Mind and Materiality from Leroi-Gourhan to MateriaMind



*Reconsidering André Leroi-Gourhan's legacy through archaeology, anthropology, cognitive science and philosophy. The workshop moves beyond a one-directional model of exteriorization to examine technology as an open-ended process of human-material co-creation.*

## Proceedings International Workshop in Paris, 8-9th, September 2026

SAINSBURY INSTITUTE
for the Study of Japanese Arts and Cultures
セインズベリー日本藝術研究所

Materia-Mind
Constructing a New Human Historical Science of the Co-creation of Material and Mind

École nationale des chartes

UNIVERSITÉ PARIS SCIENCES & LETTRES

Grant in Aid for Transformative Research Areas (A) 2024-2028

**Materia-Mind:**

**Constructing a New Human Historical Science of the Co-creation of Material and Mind**

**International Workshop in Paris,**
**8-9 September**

# Beyond Exteriorization:

## Rethinking Technology, Mind and Materiality from Leroi-Gourhan to Materia-Mind

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## Beyond Exteriorization:

### Rethinking Technology, Mind and Materiality from Leroi-Gourhan to Materia-Mind

## Paris 8-9 September 2026

The international workshop is co-organised by the Sainsbury Institute for the Study of Japanese Arts and Cultures, the United Kingdom (www.sainsbury-institute.org), the Materia-Mind project, JSPS Grant-in-Aid for Transformative Research Areas (A), Japan (https://materiamind.ridc.okayama-u.ac.jp/en/), and École nationale des chartes, France on September 8-9 2026.

The workshop will explore themes of shared interest through the lens of André Leroi-Gourhan, about whose work on technology professor Nathan Schlanger, one of the organisers of the workshop has recently published https://www.cambridge.org/core/books/invention-of-technology/6757BBD5D668C8983A5374B6F7A861A7.

## Tuesday 8 September

**10:00 Opening Remarks**

Simon Kaner

Welcome Address

Nathan Schlanger

Introduction to the École nationale des chartes

Naoko Matsumoto

From Exteriorization to Material Co-Creation: Reframing Leroi-Gourhan's Theory of Technology through Materia-Mind

**10:30 Keynote Lecture**

Nathan Schlanger

André Leroi-Gourhan on Behaviour, Technicity and Human Evolution

**12:00 Lunch**

**13:00 Session 1: Many Plausible Paths: Leroi-Gourhan, Technics, and the Path Integral Approach**

Atsuhi Iriki and Sander van der Leeuw

Many Plausible Paths: Leroi-Gourhan, Technics, and the Path Integral Approach

**Discussion**

**14:30 Coffee Break**

**15:00 Session 2: Clay Technology**

**15:00–15:25**

Hiromi Hirakawa, Satoru Nakazono, Maki Tarora and Naoko Matsumoto

From Containers to Cognition: Rethinking Technological Evolution through Pottery and

Lacquer

**15:25–15:50**

Simon Kaner

Revisiting the Invention of Ceramic Containers: A Leroi-Gourhanian Perspective

**15:50–16:15**

Toru Miyao and Yasunari Nitta

How to Make a Flame Pot

**16:15–16:40**

Hisashi Nakao

Cultural Variations of Clay Boards with Handprints and Footprints in the Jomon Period

**16:40 Break**

**17:00–17:30 Discussion**

**Discussant:** Liliana Janik

**18:00 Dinner**

## Wednesday 9 September

### 10:00 Session 3: Lithic and metal technology

**10:00–10:25**

Kenji Nagai

Technique, Design, and Experiment in Lithic Technology: From Experimental Flaking to Archaeological Interpretation

**10:25–10:50**

Jun Takakura

Materiality and Technology: Palaeolithic Views on Exteriorised Memory

**10:50–11:15**

Wulf Hein

Art Effects: Palaeolithic Sculpturing from a Crafter's View

**11:15–11:40**

Woodae Kim

The Technological Lineage of the Single-Dragon Ring-Pommelled Sword and the Survival Strategies of Groups of Craft Specialists

**Discussion**

### 12:00 Lunch

### 13:00 Session 4: Interdisciplinary Approaches to Art and Technology

**13:00–13:25**

Aya Saito

Phylogeny and Ontogeny of Drawing Behavior

**13:25–13:50**

Asami Tsukuda

Changes and Continuities of Andean Pastoral Technologies under Globalization

13:50–14:15

Makoto Tomii

From In-Situ Excavation to the Minds of Prehistoric People: Revisiting Leroi-Gourhan's Palaeoethnographical Approach

Discussion

14:40 Coffee Break

15:00 Session 5: Revisiting Leroi-Gourhan

15:00–15:25

Tomo Ishimura

André Leroi-Gourhan and Japan

15:25–15:50

Marion di Santi

André Leroi-Gourhan Back from Japan: Tangible Collections and Intangible Recollections

15:50–16:15

Hideyuki Ōnishi

*Chaîne Opératoire* as an Ethnographic Theory in the Era of Globalisation: Reinterpreting André Leroi-Gourhan's Anthropology of Technology

16:15–16:40

Akira Goto

*Archéologie du Pacifique-Sud?*: A Re-evaluation Leroi-Gourhan's Concepts of Technology View from Austronesian World.

16:40–17:20 Discussion

17:20 Closing

# Abstract

*Opening Remarks*

# From Exteriorization to Material Co-Creation:

# Reframing Leroi-Gourhan's Theory of Technology through Materia-Mind

Naoko Matsumoto
Okayama University

This workshop reconsiders André Leroi-Gourhan's theory of technology from the perspective of Materia-Mind. Leroi-Gourhan's concepts of gesture, exteriorization, technical tendency, and *chaîne opératoire* remain fundamental for understanding the relation between body, tool, and society. However, Materia-Mind seeks to move beyond a one-directional model in which technology is understood primarily as the externalization of human capacities. Instead, it explores how materials, bodies, minds, landscapes, signs, emotions, and social relations co-create one another. From this perspective, tools and material environments are not merely products of cognition, but active conditions for the emergence of cognition, habit, memory, value, and social organization. By bringing Leroi-Gourhan into dialogue with cognitive archaeology, Peircean semiotics, niche construction, landscape archaeology, and contemporary questions concerning AI and distributed cognition, the workshop aims to develop a new theory of technology as an open-ended process of human–material co-evolution.

*Keynote Lecture*

## André Leroi-Gourhan on Behaviour, Technicity and Human Evolution

Nathan Schlanger
École nationale des chartes / UMR Trajectoires, Paris

This lecture aims to present the remarkably diverse intellectual career of the prehistorian, ethnologist and technologist André Leroi-Gourhan (1911-1986). Leroi-Gourhan's long standing fascination with a diversity of topics, spanning from philology and art history to palaeontology, orientalism and museology, resulted in a highly original form of "productive eclecticism". By 1950, once established as a lecturer at the University of Lyon, he began to use the key notion of 'behaviour' and also to draw on comparative psychology and cybernetics to reinforce his views on the evolution of human technicity. These views, brought to fruition in his 1964-1965 publication, Le Geste et la parole, have since become sources of concepts and inspiration for a wide range of disciplines and scholars, as the papers in this workshop will attest.

*Session 1:*
*Many Plausible Paths: Leroi-Gourhan, Technics, and the Path Integral Approach*

# Many Plausible Paths: Leroi-Gourhan, Technics, and the Path Integral Approach

Atsuhi Iriki[1] and Sander van der Leeuw[2]
[1] Teikyo University, [2] Santa Fe Institute

This session explores how a Path Integral perspective might open a new way of reading André Leroi-Gourhan's work on technics, gesture, exteriorization, and human evolution. Rather than treating technological and cognitive change as a single linear trajectory, or as the progressive selection of an optimal solution, we ask how multiple plausible pathways are generated, constrained, sedimented, and retrospectively made visible through embodied practice and material traces.

From the perspective of brain–body–tool co-evolution, technics may be understood as a field of latent possibilities in which gestures, artefacts, environments, and social habits mutually shape one another. From an archaeological perspective, material culture preserves not only actualized outcomes, but also indications of alternative pathways, constraints, and attractors in long-term socio-material dynamics. Bringing these perspectives into dialogue with Leroi-Gourhan, the session considers how the *chaîne opératoire*, technical tendency, and exteriorized memory may be reinterpreted as processes through which minds and materials co-create historically contingent but patterned trajectories.

*Session 2:*
*Clay Technology*

## From Containers to Cognition:

## Rethinking Technological Evolution through Pottery and Lacquer

Hiromi Hirakawa[1], Satoru Nakazono[2], Maki Tarora[3] and Naoko Matsumoto[3]
[1] Nara National Research Institute for Cultural Properties,
[2] International University of Kagoshima, [3] Okayama University

The emergence of pottery and lacquer in prehistoric Japan provides a unique opportunity to reconsider technological evolution from the perspective of cognitive archaeology. Building on the work of André Leroi-Gourhan on technology and exteriorization and Sander van der Leeuw on image schemas and technological cognition, we explore how new materials actively reshaped human cognition rather than merely expressing pre-existing ideas. Early pottery not only introduced the production of materials "made from" multiple ingredients through irreversible transformation but also reinforced embodied experiences associated with containers, cooking, and pyrotechnology. These long-term interactions created cognitive conditions for the later invention of lacquer technology. While the embodied processes involved in pottery making and cooking can be investigated experimentally and ethnographically, the long-term transformation from basketry to pottery and subsequently to lacquer technology unfolded over several millennia and can only be reconstructed archaeologically. This raises a fundamental methodological question: how can archaeologists relate long-term cognitive transformations, observable only through the archaeological record, to embodied processes documented at the scale of lived human experience? Beyond its implications for technological evolution, this case highlights a fundamental methodological challenge for cognitive archaeology: bridging experimentally and ethnographically observable embodied practices with cognitive transformations that become visible only through archaeological sequences spanning millennia. The archaeological record therefore provides not only evidence of technological change but also a unique perspective on long-term processes of human–material co-evolution that cannot be directly observed.

*Session 2:*
*Clay Technology*

## Revisiting the Invention of Ceramic Containers: A Leroi-Gourhanian Perspective

Simon Kaner
Sainsbury Institute for the Study of Japanese Arts and Cultures

Sander van der Leeuw, who inspired me to explore the notion of innovation, once asked me if I was a pottery person or a lithic person. Yamanaka Ichiro of Kyoto University, who did so much to elucidate the impact of Japan on the thinking of André Leroi-Gourhan, asked me something similar before encouraging me to study there. In order to appreciate the development of ceramic technologies in what was to become the Japanese archipelago, an understanding of both lithic and ceramics is necessary.

"The invention of ceramic containers is one of the major technological developments in human history, and involved new social practices based on culturally-informed decisions, what Marcia Dobres terms the social agency of technology (Dobres 2000) … These developments occurred in the context of a shift from human groups coping with the unpredictable conditions surrounding survival in the Pleistocene to a situation of increasing predictability in the Holocene, what Koji Mizoguchi eloquently terms the change from the 'certainty of uncertainty' to the 'certainty of certainty'. … Intertwined with this, the early appearance of pottery in northeast Asia can be understood as a process of invention followed by technological innovation (Gibbs 2015) involving accumulative changes in small-scale practices, each of which potentially had social meaning, eventually leading to the production of ceramic vessels becoming a thoroughly embodies technology (Kaner 2009)". (Kaner and Taniguchi 2017).

In this presentation I will re-visit my studies of the so-called Incipient Jōmon and some of the most ancient ceramic containers in the world (Kaner 2009, 2011, 2017), and suggest how Leroi-Gourhan's ideas around the *chaîne operatoire* can help us develop a more sophisticated understanding of the 'invention of pottery'.

*Session 2:*
*Clay Technology*

## How to Make a Flame Pot

Toru Miyao[1] and Yasunari Nitta[2]
[1] Niigata Prefectural Museum of History, [2] Nagaoka Municipal Board of Education

This will be supplemented by a discussion of how some of the most iconic representatives of the succeeding Jōmon ceramic tradition, the Flame pots from around 4500 years ago, were made (Kobayashi 2004). These pots were instrumental in gaining Jōmon ceramics the status of artworks in their own right, through the writings of Okamoto Taro and others. These Flame pots were first discovered in 1936, just prior to Leroi-Gourhan's arrival in Japan, during which time he visited Niigata prefecture (most notably the island of Sado), where the Flame pots were found.

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Kobayashi, T. (Adapted by Kaner, S. and Nakamura, O. 2004). *Jomon Reflections*. Oxbow. Available as a free download from: https://www.oxbowbooks.com/9781789257632/jomon-reflections/

*Session 2:*
*Clay Technology*

## Cultural Variations of Clay Boards with Handprints and Footprints in the Jomon Period

Hisashi Nakao
Nanzan University

Clay boards bearing the handprints and footprints of prehistoric people were found in limited regions of the Japanese archipelago during the Jomon period, especially in the Hokkaido region during the initial phase, and in the Tohoku and Hokuriku regions during the late and final phases. It is often claimed that they are from relatively young children or infants because those especially from the Hokkaido region in the initial phase were excavated from burials. The present study examines the morphological variations of the handprints and footprints via geometric morphological approach to their three-dimensional (3D) data. Furthermore, we compare the 3D data of the handprints and footprints from the Jomon period with that of modern children and infants (collected at the 2026 craft event of the Ukitamu Folk History and Archaeological Museum in Yamagata Prefecture) to explore the method used to create the handprints and footprints in the Jomon period.

*Session 3:*
*Lithic and Iron Technology*

## Technique, Design, and Experiment in Lithic Technology: From Experimental Flaking to Archaeological Interpretation

Kenji Nagai
Aichi Gakuin University

This presentation explores how experimental archaeology can contribute to the study of lithic technology by linking bodily action, technological design, and archaeological interpretation. Drawing on recent experimental studies of flaking techniques, I examine how specific features of lithic artifacts can be used to infer differences in technical procedures and motor practices. Particular attention is given to the relationship between experimentally produced traces and archaeological blade and microblade assemblages. Rather than treating stone tools only as finished forms, this approach considers them as material outcomes of gestures, constraints, and learned techniques. By combining carefully designed experiments, quantitative analysis, and archaeological comparison, the presentation discusses how technological design can be understood as a dynamic process involving body, material, and intention. In this sense, the study also engages with Leroi-Gourhan's concern with the relationship between gesture, technique, and material form.

*Session 3:*
*Lithic and Iron Technology*

## Materiality and Technology: Palaeolithic Views on Exteriorised Memory

Jun Takakura
Sapporo International University

The concept of *chaîne opératoire* introduced by Leroi-Gourhan has had a profound impact on the study of lithic technology over recent decades. However, greater attention must be paid to 'Le Geste et la Parole', where Leroi-Gourhan raises highly suggestive arguments regarding technological evolution, focusing on issues such as memory, rhythm, exteriorisation, and the distinction between manual and mechanical operations. These concepts can serve as a fundamental basis for examining the evolution of materiality and cognition. While Leroi-Gourhan highlights the importance of the dialogue with materials and the rhythm of gestures in 'Le Geste et la Parole', how can we reevaluate these insights from our perspective on the relationship between materiality and technology? Furthermore, how can his formulation of exteriorised memory be integrated with the findings obtained from recent experimental archaeological approaches? Guided by the suggestions brought forth by Leroi-Gourhan, this paper aims to redefine the framework for examining the relationship between materiality and technology, drawing upon case studies from the Palaeolithic period.

*Session 3:*
*Lithic and Iron Technology*

## Art Effects: Palaeolithic Sculpturing from a Crafter´s View

Wulf Hein
Independent Researcher

In the past, the author replicated several Stone Age art objects, preferentially those made from mammoth tusk, using authentic tools and techniques. This contribution describes the results of his research work and the experiences he collected during the experiments, not only in relation to the material and its properties but also concerning the use of flint tools and their technical aspects. In addition, the author gives a brief overview about his subsequent considerations regarding early artisans, their skills and their social position.

*Session 3:*
*Lithic and Iron Technology*

## The Technological Lineage of the Single-Dragon Ring-Pommelled Sword and the Survival Strategies of Groups of Craft Specialists

Woodae Kim
University of Shiga Prefecture

During the second half of the Late Kofun period (late sixth to early seventh century), various types of decorated swords were produced and distributed throughout the Japanese archipelago by the central polity for political purposes. Among the earlier examples, the single-dragon ring-pommelled sword has traditionally been considered to derive from Baekje prototypes on the Korean Peninsula, based on typological analyses of the dragon motif on its pommel.

Examination of the pommel-casting techniques, however, shows that these swords were produced using techniques characteristic of swords circulating in Daegaya and not attested in Baekje. At the same time, the dragon-and-phoenix ring-pommelled swords of Daegaya differ markedly in decorative design from those of Baekje and the Japanese archipelago.

Daegaya fell to Silla in 562. Chronologically, it is therefore plausible that a group of craft specialists from Daegaya subsequently migrated to the Japanese archipelago and was incorporated into sword-manufacturing workshops under the direct control of the central polity. This mode of sword production provides insight into the survival strategies of groups of craft specialists.

*Session 4:*
*Interdisciplinary Approaches to Art and Technology*

## Phylogeny and Ontogeny of Drawing Behavior

Aya Saito
Kyoto University of the Arts

Why did humans begin to draw? This presentation examines the underlying mechanisms behind the origin of art through the dual lenses of phylogeny and ontogeny. Chimpanzees can handle a paintbrush and draw without any special training or external rewards. However, their artistic output remains within the realm of scribbling, and there is no evidence of them creating representational drawings. In contrast, human children begin with scribbling but spontaneously start creating representational art around the age of three. To investigate this cognitive divergence, we conducted a shared drawing experiment with both species. The results suggest that a crucial prerequisite for representation is pareidolia—the ability to perceive meaningful forms in random lines—which is further driven by language development. Ultimately, this presentation will discuss how this cognitive shift connects to prehistoric cave art, where early humans utilized natural rock contours to project and paint animal figures through pareidolia.

*Session 4:*
*Interdisciplinary Approaches to Art and Technology*

## Changes and Continuities of Andean Pastoral Technologies under Globalization

Asami Tsukuda
Okayama University

In the highlands of the Andes, the camelids alpaca and llama have been domesticated and continue to be raised to this day. While the value of the llama—used as a pack animal—has declined due to the development of road networks and infrastructure, the alpaca has grown in importance in recent years as its wool has come to be highly valued in the international market. To enhance its commercial value, efforts to improve its quality are being promoted. Reproductive management is crucial for quality improvement. Traditionally, castration was a key element of reproductive management in pastoralism; however, in recent years, new reproductive management techniques based on scientific knowledge are being introduced under the banner of "genetic improvement." These techniques are designed to control the fineness and color of the fiber, and as a result, the tools required for these practices are also changing. However, these technologies and knowledge are not uniformly accepted; in practical settings, choices are made on a family-by-family basis, accompanied by corresponding value judgments. Additionally, traditional folk knowledge that has persisted from the past can still be observed. This presentation examines the choices people make when adopting new knowledge and technologies, and what elements continue.

*Session 4:*
*Interdisciplinary Approaches to Art and Technology*

## From In-Situ Excavation to the Minds of Prehistoric People: Revisiting Leroi-Gourhan's Palaeoethnographical Approach

Makoto Tomii
Taisho University

Leroi-Gourhan's achievements and influence have been far-reaching. While his focus on prehistoric technology, which he must have regarded as a key to understanding human evolution, is particularly intriguing from a viewpoint of anthropology, his commitment to reconstructing past scenes through archaeological in-situ excavation is also noteworthy in prehistoric study, especially given his contemporaneous French prehistorians' strong interest in establishing chronological frameworks. This presentation examines an example of applying in situ excavation—the methodological basis of his palaeoethnolographical approach—not merely to the reconstruction of prehistoric actions at site, but also to the inference of the mental states of the actors there involved. An archaeological site essentially preserves the final stages of people's interactions with objects, if both depositional and post-depositional conditions that followed those interactions until the time of excavation are found to have been undisturbed. It therefore provides an especially promising context for extending our interest in the behavior of actors in the study of material objects beyond the stages of their manufacture to the final stages of their use. I argue that such contexts may also offer a means of approaching, more directly, the minds of the actors who engaged with these objects.

*Session 5:*
*Revisiting Leroi-Gourhan*

## André Leroi-Gourhan and Japan

Tomo Ishimura
Tokyo National Research Institute for Cultural Properties

André Leroi-Gourhan (1911–1986) came to the attention of the academic world through his groundbreaking research into the Palaeolithic period in Europe, and in 1969 he was appointed Professor of Prehistory at the Collège de France. However, it is less well known that he was invited to Japan as a government-sponsored scholar between 1937 and 1939, where he conducted ethnographic research. He spent a long time in Kyoto, where he collected materials such as ema, Otsu-e paintings, ofuda amulets, Buddhist woodblock prints and folk toys, and conducted research into folk beliefs. He also travelled throughout Japan, from Hokkaido to Kyushu, taking over 1,600 photographs. This presentation will introduce some aspects of Leroi-Gourhan's activities during his stay in Japan.

*Session 5:*
*Revisiting Leroi-Gourhan*

## André Leroi-Gourhan Back from Japan:

## Tangible Collections and Intangible Recollections

Marion di Santi
Sorbonne Université

Following a two-year stay in Japan (1937–1939), André Leroi-Gourhan returned to Paris with an extensive collection of artefacts and photographs, in addition to numerous plans for publications on archaeology, ethnography, and folk art. The objective of this presentation is twofold: firstly, to showcase the collections of Japanese materials assembled by Leroi-Gourhan; and secondly, to highlight the more theoretical contributions that this trip to Japan made to his research, particularly regarding the study of techniques.

*Session 5:*
*Revisiting Leroi-Gourhan*

## *Chaîne Opératoire* as an Ethnographic Theory in the Era of Globalisation: Reinterpreting André Leroi-Gourhan's Anthropology of Technology

Hideyuki Ōnishi
Doshisha Women's College of Liberal Arts

The technological studies of André Leroi-Gourhan have significantly impacted on diverse research fields, including archaeology, prehistory, ethnography, sociology, and anthropology. However, his renowned concept, the *chaîne opératoire*, has remained insufficiently examined or applied beyond Paleolithic archaeology. Based on my research, this presentation explores the potential of this theory for understanding the practices and cognition underlying technological activities in ethnographic fields, spanning premodern to contemporary societies. Through this investigation, I demonstrate how Leroi-Gourhan's perspective can be employed to comprehend human behaviour and mentality across various technical activities. Ultimately, this approach sheds light on technical practices not only within pre-industrial societies but also in today's globalised world.

***Session 5:***
***Revisiting Leroi-Gourhan***

## *Archéologie du Pacifique-Sud*?: A Re-evaluation Leroi-Gourhan's Concepts of Technology View from Austronesian World

Akira Goto
KIKAI Institute for Coral Reef Sciences

Ever since using Leroi-Gourhan's Archéologie du Pacifique-Nord as a primary source for my graduation thesis on harpoon heads in the North Pacific, I have been interested in his work for over 50 years. Since then, I have examined concepts such as technicité, *chaîne opératoire*, and tendency and fact as presented in his works (e.g., Milieu et technique, Gesture et parole, etc.). Building on this foundation, I will discuss outrigger canoes, which are widely found in Austronesian societies south of the Philippines. In particular, I examine why the structure of outriggers—despite the high functional demands placed on them—exhibits such extreme diversity from island to island. Just as with pottery patterns, there is a wide range of choices regarding outrigger structures, and some components have been replaced with materials such as iron or PVC pipes. Nevertheless, I will reexamine—from the perspective of "tendency and fact" and the "*chaîne opératoire*"—why the structural characteristics themselves have been firmly maintained on each island to this day, more than 100 years after the ethnographic era.