

Impact Objectives

- Understand landscape history through archaeological astronomical methods
- Introduce archaeological astronomy to Japan through an interdisciplinary research framework

Astronomy brings fresh insights to archaeological sites

Professor Hojo Yoshitaka (research representative) and Professor Akira Goto (research collaborator) are seeking to introduce astronomical methods into archaeology through collaboration between astronomers and experts from various fields of humanities and social science



Professor Hojo Yoshitaka



Professor Akira Goto

Firstly, can you each talk a little about your research background?

HY: I have been studying Kofun (burial mounds) burial sites in the Japanese archipelago between the 3rd and 6th centuries. However, I feel that the research method of archaeological astronomy has not yet been established in Japanese archaeology, because of a shared impression that it is a pseudoscience. This is why I have decided to conduct this study and I am proud to lead this current project.

AG: I majored in Polynesian archaeology at the University of Hawai'i and studied the maritime adaptation of Austronesian peoples living from Oceania to Southeast Asia. In the course of this research, I have been interested in not only artifacts from fisheries and canoes, but also myths, legends and taboo ideas about the sea and marine life. In particular, I consider the art of navigation to be a synthesis of scientific knowledge and tradition, and my interest lies in the observation of celestial bodies, which is the basis of the art of navigation. In recent years, I have been studying the folk astronomy of the Ryukyu and Hokkaido

Ainu peoples of the Japanese archipelago. At the same time, I have been publishing information on Japanese archaeoastronomy and cultural astronomy in English (including the newly published book, *Cultural Astronomy of the Japanese Archipelago*, by Routledge, 2020).

This is a highly interdisciplinary project, crossing over archaeology, literature history and astronomy. Can you talk about the different disciplines involved and the value each of these brings to the work?

HY: Although we agree on the importance of introducing archaeological astronomy to Japan, there are differences in the way archaeologists perceive it and how astronomers perceive it. The importance of mutual awareness and discussion of these cognitive differences is immeasurable. The accumulation of cross-disciplinary discussions on such common themes will evoke fresh interests and lead to a constructive interdisciplinary research framework.

There are a number of collaborators on this project. How important is this collaborative approach to the research outcomes?

YH: This project involves researchers from a variety of fields. However, researchers in the humanities and social sciences participate as individuals, not as an institution. The unique aspect of this project is that astronomers from NAOJ (National Astronomical Observatory of

Japan) collaborate with the researchers in humanities and social sciences. Although each researcher has his or her own research background, until recently, each research field was closed to the public and sometimes became a stereotype in its own research field. However, in recent years, these fields have been opened out to each other and the stereotypical view of each research field has gone. This study aims to achieve a high level of effectiveness through such discussions. In particular, this is the first time in Japan that a full-scale interdisciplinary research project between astronomy and various fields of humanities and social sciences has been undertaken.

What are the next steps for your research?

AG: In 2009, it was the World Year of Astronomy - it was 400 years since Galileo's first observation by telescope. At that time, I collaborated with astronomers from East Asian countries, as well as Japan on a project called 'Stars of East Asia'. One book in Japanese has already been published as a result of this collaboration and we are preparing for an English version. It is a collection of myths, legends and folktales of stars from Asia and the Pacific. In addition, we would very much like to share the results of our current research with neighbouring countries and areas, such as South Korea, China, Taiwan, Southeast Asia and Oceania, and to establish a common understanding across the entire East Asian and Pacific region through cooperation. ●

Archaeological astronomical methods unlock the past

A highly collaborative team is conducting fascinating research that seeks to understand landscape history through archaeological astronomical methods

When we look into the skies, depending on whether it is day or night of course, we immediately recognise the sun and the moon without really giving it a second thought. Equally, we understand what stars are and there are even apps for phones that can digitally render the night sky and tell us specific constellations and the locations of planets within our Solar System and beyond.

It is something that can easily escape the attention of us as we go about our daily lives. Imagine seeing the sun, moon, stars and planets and having absolutely no understanding of what they were. Yet humanity demands explanation and just because something is later scientifically proven to be something other than was previously believed, this does not mean that people hundreds of years ago had any less conviction than we do now.

INTRODUCING ASTRONOMICAL METHODS INTO HISTORY

It is with this in mind that a highly collaborative group of experts have come together to conduct interdisciplinary research. Led by Professor Hojo Yoshitaka, the team is aiming to construct archaeology and ancient history research methods that are based on astronomical methods and understanding. 'While astronomical phenomena have shaped spatio-temporal (space-time) recognition and cosmology throughout the history of anatomically modern humans, the introduction of astronomical methods into

Japanese history and archaeology has been slow, and researchers have been indifferent to such research,' explains Goto. 'There has been a somewhat 'strange history' of archaeoastronomy and historical studies in Japan. This partially came from the fact that many pseudoscientific hypotheses have been proposed in the context of archaeology and ancient history.'

Although archaeological astronomical methods have been introduced in the study of calendar history in the field of literature history, the lack of basic knowledge of astronomy makes it difficult to apply them effectively in a wide range of research settings in Japan. So, with the establishment of this project, the team hopes to overcome the situation by combining philology, archaeology, astronomy and folklore. The team includes researchers from the National Astronomical Observatory, Chiba Institute of Technology, Kwassui Women 's University, Sapporo University, Nanzan University, Kyushu University, Senshu University and the National Institute of Cultural Properties.

PAST ASTRONOMICAL PHENOMENA RECONSTRUCTED

Goto is an expert of archaeological astronomical thought, where astronomical methods are introduced into archaeology. Japanese archaeology is famous for its sophisticated recording techniques of archaeological sites, and highly developed system of artifact typology but, although

landscape perspective has gained traction over the past couple of decades, interest in landscape almost totally lacks considerations for the skyscape. To overcome this shortcoming, the team is reconsidering astronomical perspectives that were once popular in the early age of modern Japan. ►



Sannai Maruyama ruins and its reconstructed main structure

By simulating past astronomical movements, it is believed that a deeper understanding of archaeological sites can be achieved

By analysing the relationship between the linear structure of the archaeological site and the azimuths of rising and setting points of the sun and the moon when the site was constructed, the team has built up evidence that summer solstice and winter solstice were important in ancient Japan. 'We can understand the origin and background of the rituals by examining the relationship between the results of the analysis and various rituals recorded in the past literal records and the dates of rituals practiced in Shinto today,' highlights Yoshitaka. 'In Japan, there is historical literature including myths such as 'Kojiki' and 'Nihonshoki', and it is possible that some of the Shinto deities that appear in myths are derived from celestial bodies, such as the sun, moon, fixed stars and planets.'

By reconstructing past astronomical phenomena through simulation and comparison with literary records, the team wants to clarify the background and reasons for the deification of astronomical phenomena and objects.

PREJUDICE AND PRECONCEPTIONS OVERCOME

Prior to the establishment of this project, the

results of research derived from archaeology and history have never been checked and evaluated in detail by experts of astronomy. This is the first time that the results of a project can be objectively verified using such methods. 'There is a tendency among historians and archaeologists to dismiss these methods as pseudoscience, so the team hopes to overcome such preconceptions and prejudice,' observes Goto. 'By simulating past astronomical movements, it is believed that a deeper understanding of archaeological sites can be achieved.'

To gather and analyse the data required, Yoshitaka and his team are using high-precision GPS and astronomical software which simulates the operation of a celestial body. 'Stellanavigator is a software that most Japanese researchers have used for archaeological study, but it is available only in Japan,' explains Goto. He says they are now developing an astronomical simulator for archaeological research based on the world standard software, Stellarium and incorporating the astronomical data of NAOJ.

HISTORY EXPLAINED USING HISTORICAL VIEWPOINTS

This research team believes that the social contributions of the project will reaffirm that we remain governed by the values and sense of time derived by the stars, moon and sun in much the same way as we have always been - whether we recognise this or not. With this in mind, Goto has been conducting astronomical shows for the public for the past ten years, using an air dome mobile planetarium, about the astronomical culture of the world's peoples or prehistoric archaeological sites and the direction of the sun's appearance. The results of this particular project will be made available to the public in the cities, towns and villages where the specific sites are located.

Ultimately, the team has a challenge to overcome the prejudices that many researchers have about using astronomy to provide fresh insight into archaeological sites. To understand history it is sometimes necessary to use historical viewpoints, for the present is a prism through which we view the past, a prism that can just as easily refract our understanding as it can frame it. ●

Project Insights

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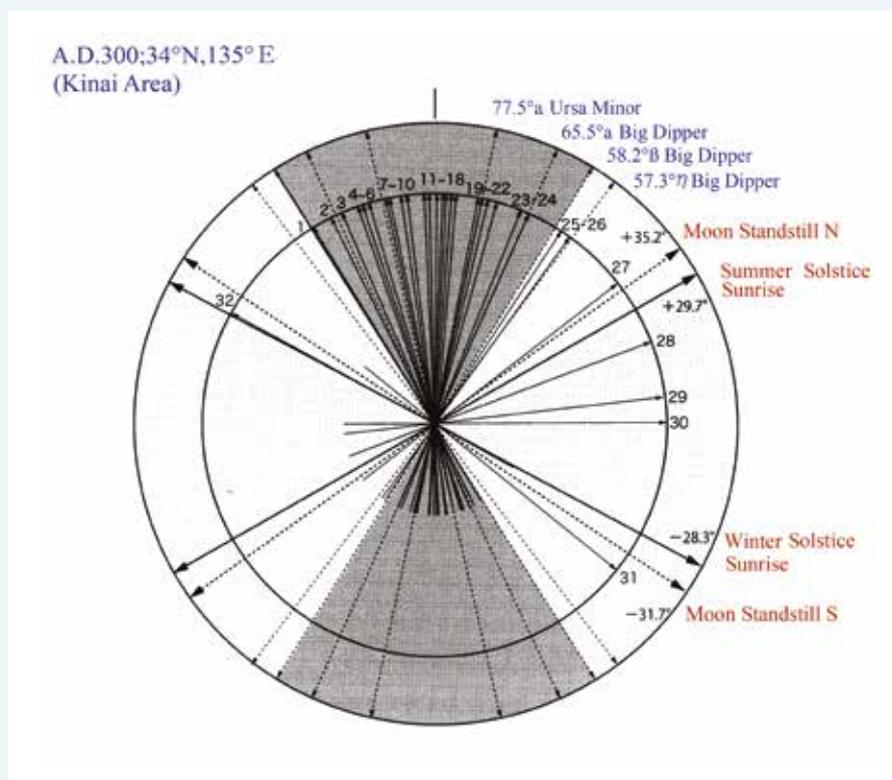
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The orientation of Kofun burials and stars