OKAYAMA UNIVERSITY e-Bulletin

Vol. 17, December 2016

1-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530 Japan

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News

Professor Jian Feng Ma receives the *2016 Corresponding Membership Award* from the American Society of Plant Biologists (ASPB)

Professor Jian Feng Ma of the Institute of Plant Science and Resources at Okayama University was awarded the 2016 Corresponding Membership Award from ASPB. The award ceremony took place during the ASPB annual meeting, Plant Biology 2016, held in Austin, Texas, U.S.A., from July 9–13th. No more than three distinguished ASPB members from outside the United States are given the award each year, with winners receiving lifetime membership.

Professor Jian Feng Ma (right) receiving the Corresponding Membership Award from the president of the ASPB.

The award recognizes Professor Ma's pioneering work with transporters that play a central role in the uptake and translocation of mineral elements in plants, as well as for being a world leader on research on resistance mechanisms in plants for aluminum toxicity found in acid soil, which inhibits plant growth. Professor Ma said, "I am honored to have the work we have done recognized internationally this way. This award encourages me to continue to work diligently to conduct world-class research."

ASPB publishes two leading journals: *The Plant Cell* and *Plant Physiology*. In 2015, Professor Ma and his collaborator at the Institute of Plant Science and Resources, Associate Professor Naoki Yamaji, were selected as Top Authors by ASPB, based on the high citations of their papers in journals. Notably, they were two of the top nine authors located in Asia. Professor Ma was also selected as one of the World's Most Influential Scientists in 2015 by Thompson Reuters.

Further information

ASPB Awards Corresponding Membership
http://www.aspb.org/awards-funding/aspb-awards/corresponding-membership/

Institute of Plant Science and Resources at Okayama University
http://www.rib.okayama-u.ac.jp/

News

Surgeons at Okayama University Medical Hospital succeed in world's second hybrid lung transplant operation: Simultaneous lung transplants from both brain-dead and living donors

On July 17th 2016, surgeons at Okayama University Hospital successfully completed the world's second hybrid lung transplant, which is a simultaneous transplant from brain-dead and living donors. Okayama University Hospital was the first in the world to successfully using this method in April 2015. This time, a male patient suffering from idiopathic interstitial pneumonitis received a right lung from a brain-dead donor and left lung (inferior lobe) from a living donor.

World's second successful hybrid lung transplant (simultaneous transplant from brain-dead and living donor) conducted at Okayama University Hospital.

The operation was conducted by a team led by Dr. Takahiro Oto of the Okayama University Hospital Organ Transplant Center. During the operation, which took about nine hours, a lung provided by a brain-dead donor and part of a lung provided by a living donor (patient's son) were transplanted. The male patient was diagnosed with idiopathic interstitial pneumonitis in 2012 and was registered on an organ transplant waiting list at another medical institution in 2015, but changed his registration to the Okayama University Hospital waiting list in order to eventually receive the hybrid transplant.

Professor Oto stated, "This is the second successful hybrid transplant operation to be conducted in the world. My hope is that this method will reduce the number of patients who pass away while waiting for a transplant and more patients will have the opportunity to receive a transplant."

News

Misasa International Student Internship Program 2016 at Okayama University's Institute for Planetary Materials:Students from all over the world gather to try their hands at research

Okayama University's Institute for Planetary Materials (located in Misasa-cho, Tohaku-gun, Tottori Prefecture) held the Misasa International Intern Program 2016 from July 4 to August 10, 2016. With the aim of promoting international research and education, this program has been held each year since 2005, inviting third and fourth year undergraduates and master's course students from universities in Japan and overseas to participate. This year, 98 students from 26 countries applied to participate in the program, and 12 from six countries (USA, Canada, United Kingdom, France, India and China) were selected as student interns.

A student intern presenting research findings.

The student interns were divided into four groups with different research topics, and participated in their respective sub-programs for the six week program under the guidance of members of faculty and research groups at the Institute for Planetary Materials. A seminar was held at the program's conclusion, where each of the student intern presented their research findings to all of the other participants and teaching staff. At the farewell party, Professor Eizo Nakamura, Director of the Institute for Planetary Materials, awarded each student intern a certificate of completion.


Interns with students and staff at the Okayama University Institute for Planetary Materials.

Through this program, not only do the participants get a chance to use state of the art experimental and analytical technology, the organizers also hope that the experience of conducting experiments in such an environment, will infuse the participants with passion to conduct cutting edge research in the future.

Feature

Challenging conventional wisdom on the origins of human warfare

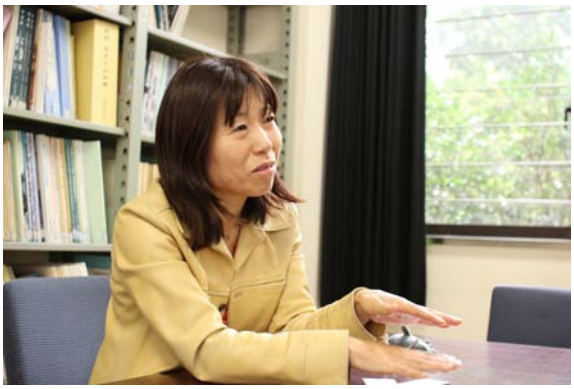
New research indicates that violence and warfare were not common in prehistoric Japan during the Jomon period 16,500 years ago (14,000 – 800 BC). These findings contradict archeological based research on society in prehistoric Africa and Europe.

Scientists have been intrigued about origins of human warfare for centuries. Notably, clarification of the origins of human lethal conflict and warfare is important for clarifying human evolution, and possibility for a more peaceful world of the future.

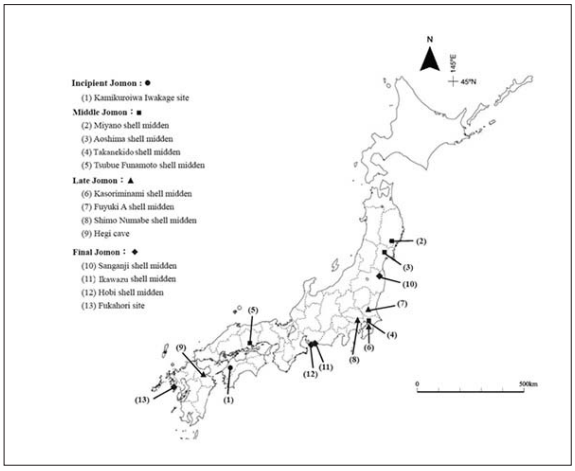
Analysis of skeletal remains in Africa and Europe for lethal injuries likely to have been inflicted in wars suggests that human warfare was widespread in hunter-farmer societies in prehistory. Hence, prominent scientific reports suggest warfare is being an intrinsic part of human nature.

But recently, these findings based on altruism and intergroup conflict have been challenged by new research conducted by Naoko Matsumoto at Okayama University and colleagues in Japan and UK [1]. “Our findings for prehistoric Japan during the Jomon period 16,500 years ago (14,000 – 800 BC) indicate that violence and warfare were not common during this era in Japan,” says Matsumoto. “Our results contradict research based on human remains in Africa and other parts of the world, which suggest widespread warfare amongst prehistoric groups of humans.”

Matsumoto and colleagues analyzed Japanese language catalogs of information on human skeletal remains classified as having died from violence. “Our analysis included datasets on age, sex, discovery



Naoko Matsumoto
Professor, Department of Archaeology, Okayama University, Japan.



Map showing spatio-temporal distribution of sites where injured bones from the Jomon period were discovered (Ref. 1).

site, and the time frame in the Jomon period," says Matsumoto. "We also plotted spatio-temporal "hot spots" of violence on a map of Japan."

The analysis revealed that 1.81% out of 2576 skeletal remains had died of violence over the entire Jomon period. "Our finding of only 1.81% mortality due to violence is much less than previous reports of 12-14 %, and no evidence of hot spots," explains Matsumoto. "Our findings challenge the view that warfare is inherent in human nature."

Matsumoto and her colleagues are continuing their research, and will be focusing on the Yayoi period in prehistorical Japan dated 800 BC to AD 250.


Conducting excavation survey of Jomon ruins in Tottori prefecture with students.


Discussion with students about reports on remains of injured human bones

Reference

1. H. Nakao, K. Tamura, Y. Arimatsu, T. Nakagawa, N. Matsumoto, T. Matsugi, Violence in the prehistoric period of Japan: the spatio-temporal pattern of skeletal evidence for violence in the Jomon period, *Biology Letters* 12: 20160028 (2016).

http://dx.doi.org/10.1098/rsbl.2016.0028

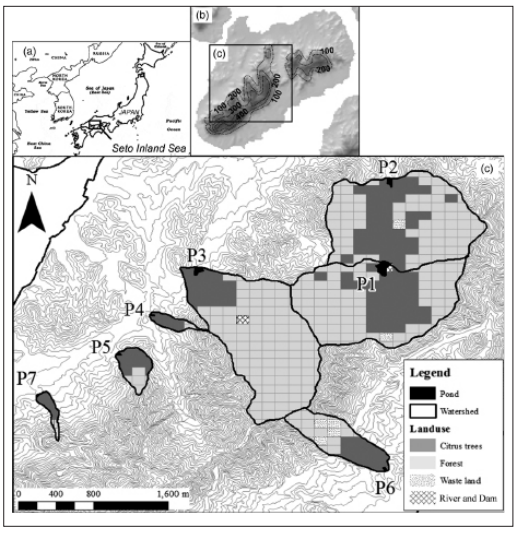
Further information

Naoko Matsumoto website (In Japanese)
http://www.okayama-u.ac.jp/user/arch/about/matsumoto.html

Research Highlights

Longer water retention in ponds increases nitrogen-removal processes

Nutrient removal processes in ponds and the influence of size, shape and other physical characteristics are reported by researchers at Okayama University, Hiroshima University and the National Agriculture and Food Research Organization in Hiroshima in Japan.



Study area: (a) location of the study area, (b) Ikuchijima Island, and (c) study ponds and their watersheds.

Small ponds provide a crucial water supply for farming and agriculture in dry regions, but these activities can give rise to high levels of nitrogen and phosphorus in the water system that cause algal blooms, clogging and putrid conditions. "For sustainable water use in agricultural areas with little rain, greater understanding of the potential of nutrient removal in small ponds and reservoirs is required for effective management and enhancement of removal processes to improve water quality," explain Mitsuyo Saito and her colleagues in their report.

The researchers studied seven ponds on Ikuchijima, a small island with steep terrain and granite bedrock in the Seto inland sea of Western Japan. Ponds here are important water resources for agriculture. The water volumes of each pond ranged from more than 20,000 m^3 to less than 1,300 m^3. The researchers monitored water depth – from which they estimated the water volumes – vertical profiles of water temperature, electric conductivity, and chlorophyll-a, as well as in- and outflow channel volumes to estimate the retention time, and nitrogen, phosphorous and silica concentrations.

Retention times were longer in the summer than the winter, which the researchers suggest indicates the use of pond water for irrigation and crop protection. Longer retention times were accompanied by higher rates of nitrogen removal. The researchers also noticed "thermal stratification" in the summer with temperatures lower at deeper levels. An accompanying reduction in chlorophyll-a at deeper levels suggests that the primary production and uptake of nutrients is by phytoplankton, and their levels are affected by thermal stratification.

Trends in phosphorus concentrations differed from those of nitrogen, possibly because phosphorous is easily desorbed from sediments under extreme low oxygen conditions. As a result phosphorous levels could increase for longer residence times.

Publication and Affiliation

M. Saito[1*], S. Onodera[2], K. Okubo[1], S. Takagi[3], Y. Maruyama[2], G. Jin[2] and Y. Shimizu[4] Effects of physical and morphometric factors on nutrient removal properties in agricultural ponds. 2015 *Water Science and Technology* 2187-2193

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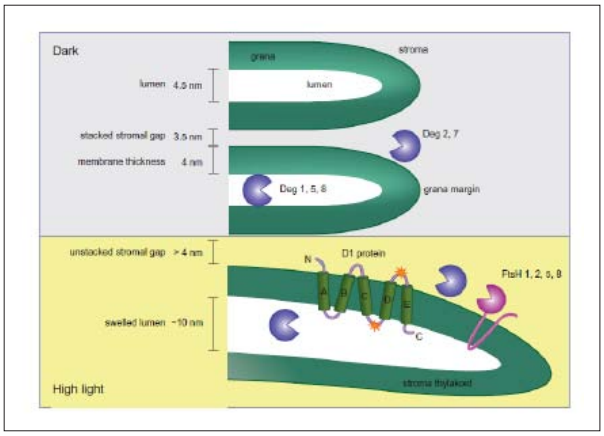
Research Highlights

Molecular and structural light adjustments protect plants

Miho Yoshioka-Nishimura at Okayama University summarises the latest progress in understanding at the molecular level how plants respond to changes in light conditions.



Structural changes of the thylakoid membranes under high light. Stacked thylakoid membranes (upper) are unstacked and bent, which is accompanied by thylakoid swelling (lower). The distance between two adjacent thylakoid membranes and the width of the lumen (Daum et al. 2010, Kirchhoff et al. 2011) are shown on the left side of the figure. Deg1, 5 and 8 are located on the lumenal side, whereas Deg2 and 7 are peripherally attached to the stromal side of thylakoid membranes. FtsH proteases bind to thylakoid membranes with two transmembrane helices. Thylakoid swelling allows Deg1, 5 and 8 to move freely within the thylakoid lumen. Under high light, Deg2, 7 and FtsH access the D1 protein in the grana region because membrane stacking constraints dissipate.

"Light is necessary for photochemical reactions of photosynthesis; however, light is one of the most fluctuating environmental factors in nature," explains Yoshioka-Nishimura in her mini review. She describes how plants adapt to harvest light more efficiently in shady conditions, as well as the two main strategies adopted – molecular and structural – that protect plants from harsh high light intensities.

A major cause of damage under over-exposure to light is the production of reactive oxygen species (ROS) in the chloroplasts due to the over-reduction of photosystem II (PSII) the main protein complex involved in light-dependent oxygenic photosynthesis reactions. Specific enzymes, antioxidants and pigments present in the chloroplasts can contribute to absorbing some of these ROS before they damage key photosynthesis protein complexes.

However the structure of the cell components within the chloroplasts itself is key to its ability to harvest light efficiently and conversely its susceptibility to light damage. Light-dependent photosynthesis reactions occur within compartments bound by thylakoid membranes, which have subdomains of flat grana thylakoids and linking stromal thylakoids. In plants that thrive in shaded areas, the thylakoid grana are stacked, which facilitates energy transfer processes. In high light conditions these grana can become unstacked and bent, which diminishes energy and electron carrier transfer processes. The aqueous phase bound by the thylakoid (the lumen) also swells in response to light and this can improve the mobility of enzymes that degrade and replace damaged proteins.

High light conditions can also lead to protein complex aggregation, diminishing their mobility. In low light conditions this is reversed but if the over-exposure of light is too great and the aggregates accumulate, and aggregation becomes irreversible. As Yoshioka-Nishimura points out in the article,

"Membrane fluidity and mobility of proteins are crucial points for understanding the effects of light stress on PSII at the molecular level."

Publication and Affiliation

Miho Yoshioka-Nishimura* Close relationships between the PSII repair cycle and thylakoid membrane dynamics. 2016 *Plant and Cell Physiology* 1115-1122

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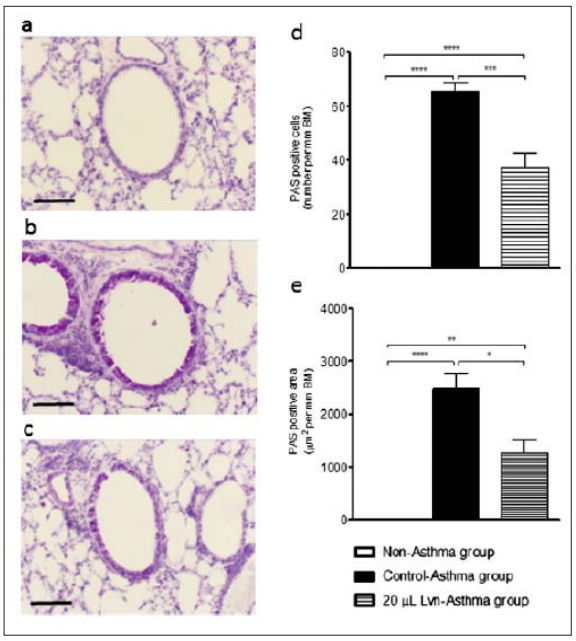
Research Highlights

Lavender oil may offer a new treatment for murine models of allergic asthma

In studies using mice researchers at Okayama University demonstrate the therapeutic effects of lavender essential for treating asthma.

Asthma affects over 200 million people worldwide and can be fatal. The condition is characterised by shortness of breath, often in response to allergens. Once triggered, the production of inflammatory cytokines and mucins - gel-forming mucos glycoproteins - leads to obstruction, hyperresponsiveness and inflammation of the airways. Evidence of beneficial effects from lavender essential oil (Lvn) on other immune responses prompted Tomoe Ueno-Iio, Misako Shibakura and colleagues at Okayama University and Okayama University Graduate School of medicine to examine the effect of Lvn on a mouse model of acute asthma.



Detection of mucus-producing cells by periodic acid-Schiff (PAS) staining. The lung sections were stained by PAS staining and analysed. (a) Non-Asthma group (n = 7), (b) Control-Asthma group (n = 7), and (c) 20 μL Lvn-Asthma group (n = 7). The number of mucus-positive cells per mm of basement membrane (d) and PAS-stained area per mm of basement membrane (e) were measured in PAS-stained sections.BM; basement membrane. Scale bar indicates 100 μm. *p ← 0.05, **p ← 0.01, ***p ← 0.001, and ****p ← 0.0001. Data are represented as mean ± SEM.

The researchers used ovalbumin to artificially induce asthma in mice, with some were exposed to to Lvn, others weren't, and a non-asthma control was not treated with ovalbumin. They characterised the resulting symptoms by monitoring lung resistance and examining both the cells found in fluid washed from the lungs (Bronchoalveolar lavage, BAL) and lung tissue. Ueno-lio, Shibakura and colleagues observed a reduction in cytokine levels in BAL fluids and their mRNA expression, as well as a decrease in one of the mucins secreted most in the respiratory tract, Muc5b.

The researchers highlight that one of the main components of Lvn is linalyl acetate, which previous research by other groups has been shown to inhibit NF-κB in human cancer cells. NF-κB is also known to be activated to produce the gene for the Muc5b. Significantly Muc5b was inhibited in the mice exposed to Lvn but not another highly secreted mucin, Muc5ac, which is not regulated by NF-κB. The T-helper-2 cells that produce the key cytokines (IL)-4, IL-5 and IL-13 involved in airway inflammation are also regulated by NF-κB, and were found to be inhibited by exposure to Lvn.

They conclude in their report, "Our results present a new role for this essential oil in allergic airway inflammation and mucous cell hyperplasia. But we need further studies if we want to apply these findings to humans because they may only be applicable to mice at this moment."

Note

The effects of NF-κB were verified in research by other groups and not Tomoe Ueno-Iio.

Publication and Affiliation

Tomoe Ueno-Iio[1], Misako Shibakura[1,*], Kanayo Yokota[1],Michinori Aoe[1], Tomoko Hyoda[1], Ryoko Shinohata[1], Arihiko Kanehiro[2], Mitsune Tanimoto[2], Mikio Kataoka[1] Lavender essential oil inhalation suppresses allergic airway inflammation and mucous cell hyperplasia in a murine model of asthma. 2014 *Life Sciences* 108 109-115.

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2. Department of Haematology, Oncology, Allergy, and Respiratory Medicine, Okayama University Graduate School of Medicine, Dentistry, Pharmaceutical Sciences, Okayama, Japan

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Research Highlights

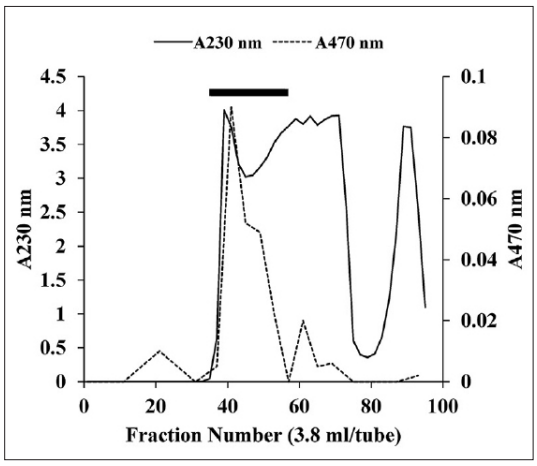
Links discovered between plant complex type *N*-glycans and hay fever

Okayama University researchers identify plants expressing substantial amounts of a nitrogen-linked polysaccharide – plant complex type *N*-glycans – which is linked to allergic responses in mammals, and may provide useful study models for understanding hay fever.

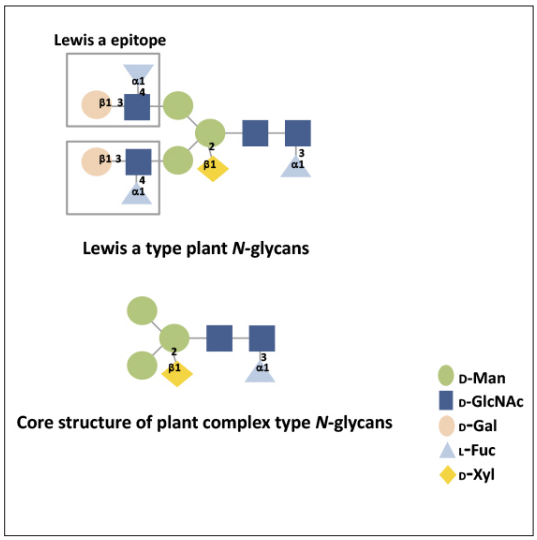
Researchers have noted the occurrence of plant complex type *N*-glycans on cedar pollen allergens, which carry a component called the "Lewis a epitope". However previous studies found that rather than triggering allergic responses the core structure of plant complex type *N*-glycans may inhibit them. One of the main stumbling blocks in studies to understand the immunological significance of Lewis a type plant *N*-glycans studies has been the lack of means for preparing Lewis a type plant *N*-glycans in substantial amounts. The demonstration of high levels of plant complex type *N*-glycans expressed in three sea water plants provides a significant step forward for these studies.

The "epitope" is the part of toxic and foreign substances and other antigens that is recognised to trigger the immune system into action. In certain types of antigen – allergens – the epitope overstimulates the immune system.

In previous work the Okayama researchers reported that many types of seaweed and marine algae express high-mannose type *N*-glycans, but not plant complex type *N*-glycans. In this work they identify three water plants that instead have *N*-glycans bearing β1-2 xylosyl and/or α1-3 fucosyl residues but not high-mannose type.



Preparation of PA-Sugar Chains from Peptic Digest of Water Plant Glycoproteins. A gel-filtration of the peptic digest of glycoproteins using a Sephadex® G-25 fine column (4.0 x 35 cm) was equilibrated with 0.1 N NH_4OH. The solid line indicates the elution of peptides (A230) and the dotted line indicates the elution of glycopeptides (A470). The glycopeptide-fraction was pooled, as indicated by horizontal bars, and was used for structural analysis of *N*-glycans.



Megumi Maeda, Yoshinobu Kimura and their colleagues at Okayama University studied the plants

Elodea nuttallii, *Egeria densa, and Ceratophyllum demersum*. Structural investigations identified eight types of *N*-glycans. "Moreover, the Lewis a type plant *N*-glycans were commonly expressed in a substantial amount on the glycoproteins produced in these three water plants," they add in their conclusions.

Land plants are well known to ubiquitously carry plant complex type *N*-glycans. Seaplants such as seaweed are thought to have evolved from land plants in the cretaceous period. Further genetic studies are underway to understand the why *N*-glycans expression differs in these plants and to identify any possible physicochemical or biological functions for these glycoproteins.

Publication and Affiliation

Megumi Maeda[1,2,*], Misato Tani[1], Takeo Yoshiie[2], Christopher J. Vavricka[1], Yoshinobu Kimura[1,2,**] Structural features of *N*-glycans linked to glycoproteins expressed in three kinds of water plants: Predominant occurrence of the plant complex type *N*-glycans bearing Lewis a epitope. 2016 *Carbohydrate Research* **435** 50-57

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Topics : Okayama Travelogue

Okayama University Archaeological Museum

The Museum houses rare historically significant specimens such as pottery and metal ornaments from prehistoric Japan in the Palaeolithic, Jomon, Yayoi, and Kofun periods.

The Okayama University Archaeological Collections

The University Collections are broadly speaking the fruits of the research of two members of faculty at Okayama University. In 1965 the Faculty of Letters' Department of Archaeology was founded with the vision of excavating sites within and around Okayama prefecture, and to further knowledge of prehistory and protohistory within the Japanese Archipelago. The University's Archaeological Research Center is excavating sites unveiled within the campus, unearthed in the process of constructing and expanding facilities at Okayama University, such as the Tsushima-Okadai and the Shikata sites.

Photographs of wide range of exhibits on display in the museum

The exhibits are shown in chronological order with relics of the Stone Age excavated from the remains of the Onbara sites to those of the Heian period excavated from the vicinity of Shikata sites (Shikata campus.)

Specific exhibits at the museum

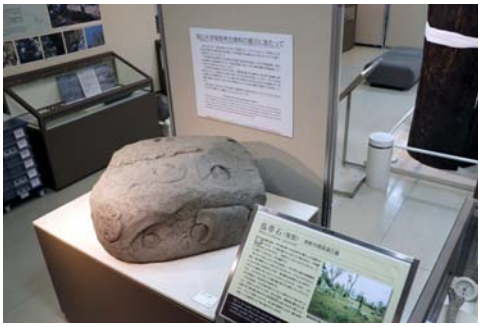
Replica of *Kotaiseki* (carved stone). This is a replica of the carved stone called Kotaiseki which was preserved on Tatetsuki tumuli of chiefs (Kurashiki city, Okayama prefecture) since the late Yayoi period

Exhibits from the Jomon to Yayoi periods. The central exhibitions are special vessels found at the Tatetsuki site Kurashiki.

(the second century A.D.). It is covered with winding parallel lines and circlar nodes. This pattern is also found in the ceremonial pottery related to the chieftainship in the Kibi region and inherited as a magical figure into the Kofun period with some transformation.


Exhibition of the Kofun Period ceramic coffins made by baking clay.

Clay Coffin.
This is a clay coffin from Yoshihara three tumulus (Sanyo town, Okayama Prefecture) from the beginning of the seventh century A.D. Such a clay coffin is a mortuary item that characterizes some parts of the Kinai and Kibi regions.


Replica of *Kotaiseki* (carved stone).


Clay Coffin.

