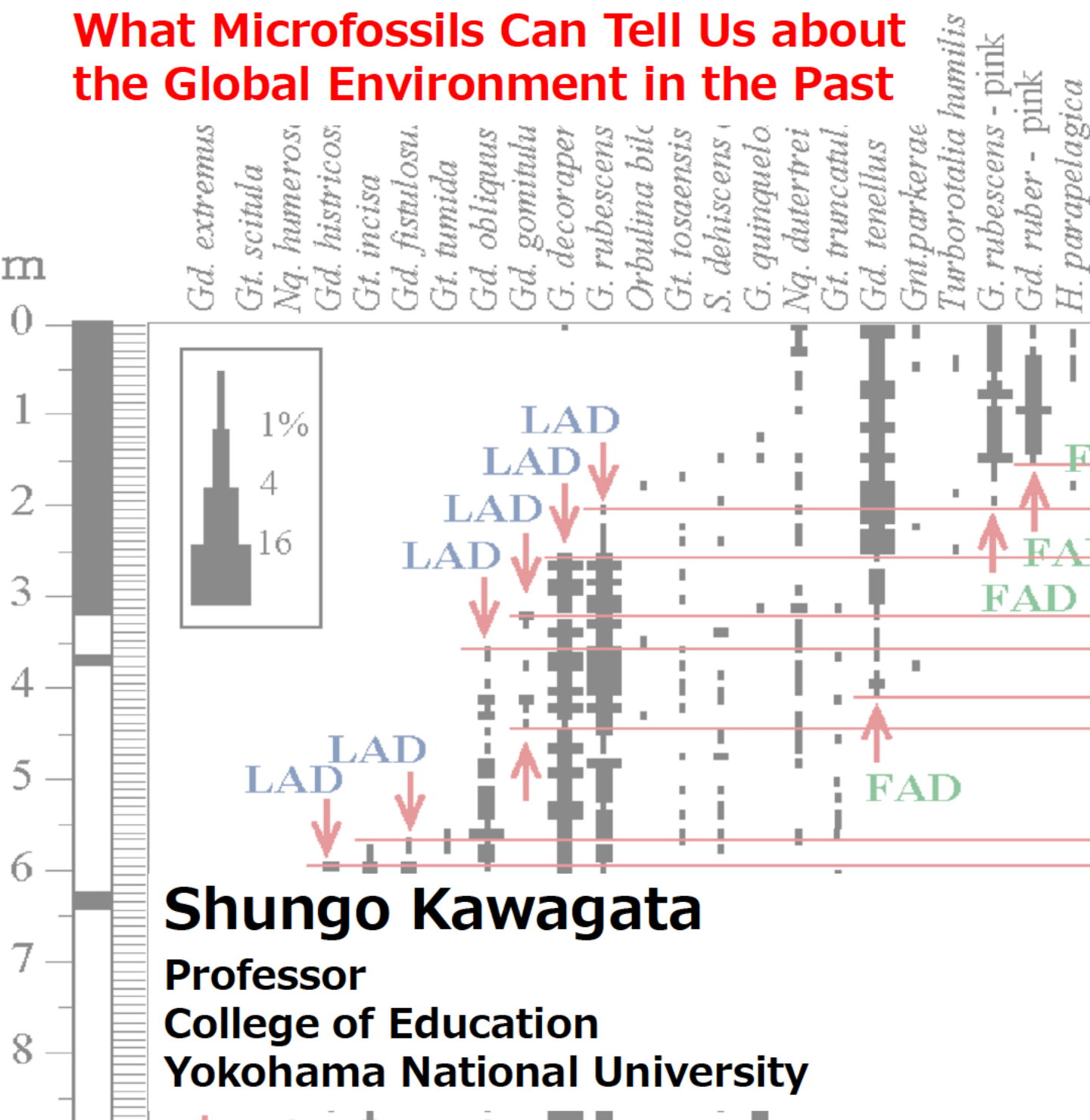


# Exploring Changes in the Global Environment

## What Microfossils Can Tell Us about the Global Environment in the Past



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# Learn about the global environment in the past from strata!

When I say, "I do research on geology," people misunderstand and say, "Wow, you study archaeology!" While archaeology mainly studies humans and cultures, geology is different in that it studies strata and rocks, regardless of the period in history. Studying strata and rocks reveals the mechanisms and laws of natural phenomena occurring in the geosphere and hydrosphere. Geology also attempts to unravel the past changes in the global environment. Because the seafloor is the largest area where strata have been created on earth, it can be said that the past changes in the global environment are recorded under the seafloor (in marine sediments).



Photo (top): JOIDES Resolution (deep-sea drilling vessel), Photo (bottom): Strata drilled from the seabed (deep-sea sediment core)

## Witnesses of the global environment in the past

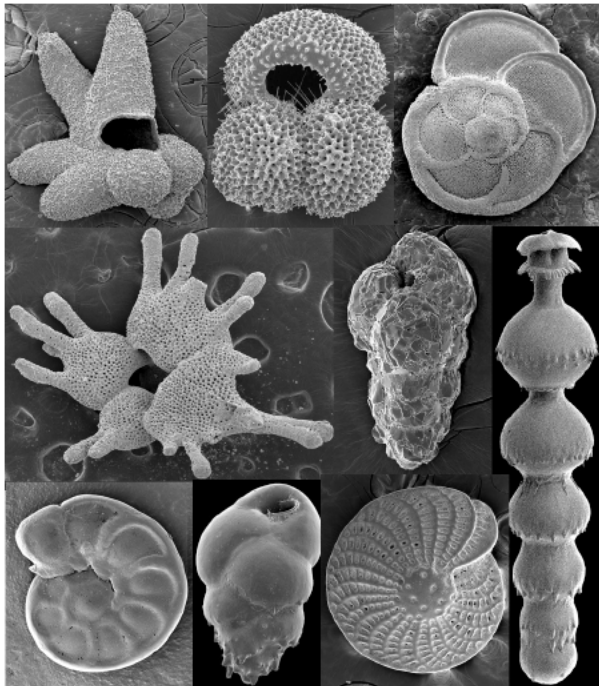


Photo: Scanning electron microphotographs of fossil foraminifera

Fossils of planktic foraminifera living in the surface water of the ocean and benthic foraminifera living on the seafloor can be extracted from marine sediments. They are fossils of protists that are smaller than 1 mm; and their type, composition, and the stable isotope ratio composition of their shells are different depending on the time and environments in which they lived. We have been studying these fossils using methods from taxonomy, sedimentology, chronology, stratigraphy, paleoclimatology, and so on. Regarding the global environment in the past, there are many issues that we want to resolve, such as elucidating changes in the past global ocean circulation, sea level changes and their effects, biological evolution/extinction and their relationship with the marine environment, and the difference in the past and present marine environment.

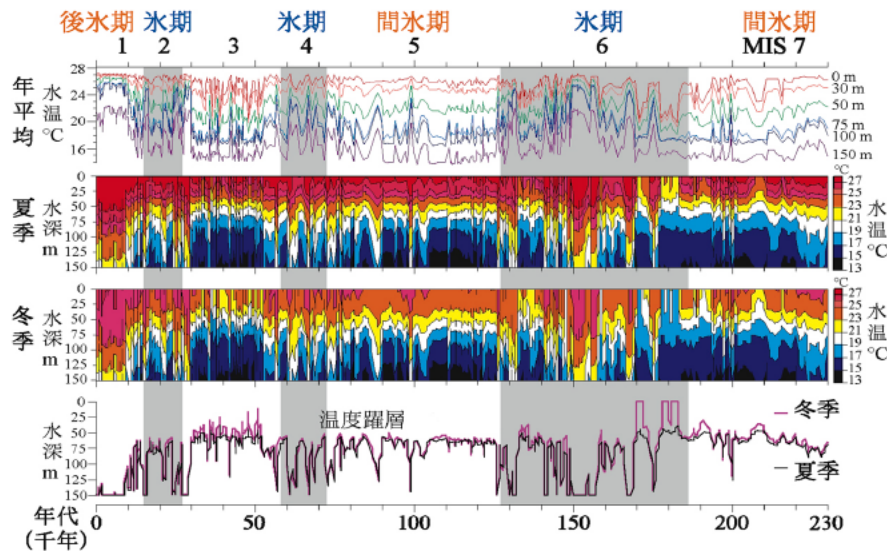


Figure: Example of the thermal structure in tropical surface waters in late Quaternary as restored from fossil planktic foraminifera assemblages

## Reconstructing the thermal structure of the surface water in the past from fossil planktic foraminifera assemblages

Fossil foraminifera assemblages from late Pliocene to Quaternary have many things in common with modern assemblages. Therefore, we attempt to reconstruct the thermal structure of the surface water of the ocean during late Quaternary based on the relationship between the composition of modern planktic foraminifera assemblages and the surface water temperature. It is predicted that the surface water temperature was constantly lower during the cold glacial periods than during the warm interglacial periods. However, depending on the ocean area, the restored past thermal structure was found out to be different from the prediction. By conducting such research in different ocean areas in the same period, the image of the ocean surface environment of that period becomes clearer. Was the change in the surface water temperature a local or global phenomenon? What was the cause? If my fellow researchers and I can unveil the past changes in the global environment that no one has ever seen, that will be very exciting.

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Completed the Doctoral Course from the Graduate School, Institute of Geoscience, the University of Tsukuba. Ph.D (Science). Started his current post after working at the University of Tsukuba, the Center for Advanced Marine Core Research of Kochi University, and in New Zealand. Microfossil research, which he stumbled upon in his university graduation research, became his profession.

