PRESS RELEASE

National University Corporation Tsukuba University of Technology

KEK High Energy Accelerator Research Organization

April 23, 2026

High Energy Accelerator Research Organization (KEK)
Tsukuba University of Technology

Production of the English Edition Tactile Graphics Collection

"Origins of the Universe and Matter"

— Making Physics Accessible —

Executive Summary

● Question

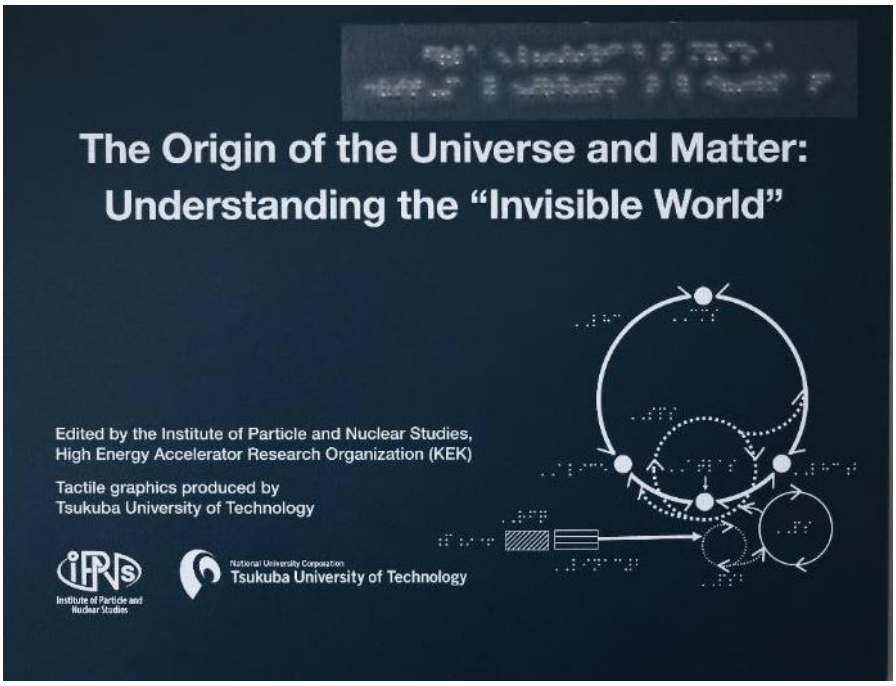
There are numerous challenges for visually impaired individuals when studying science-related fields. In particular, there is an extremely limited availability of Braille books covering cutting-edge scientific topics for the visually impaired. This issue is common around the world.

● Findings

This project presents an English translation of the Braille book and tactile graphics collection *"Origins of the Universe and Matter,"* originally created to deliver the latest research findings in particle physics and cosmology to visually impaired readers. The tactile graphics collection has been donated to support organizations for the visually impaired and to academic research institutions around the world.

● Meaning

By listening to the English-translated PDF of *"Origins of the Universe and Matter"* and using this tactile graphics collection to read diagrams through touch, visually impaired individuals worldwide can access the latest knowledge in particle physics and cosmology.



Cover of the English Edition Tactile Graphics Collection Produced in This Project

Summary

KEK and Tsukuba University of Technology produced an English edition tactile graphics collection on topics such as particle physics and donated it to organizations supporting visually impaired individuals, as well as universities and research institutions around the world. Through this initiative, we aim to expand opportunities for visually impaired people globally to engage with and understand cutting-edge science.

Overview

The Institute of Particle and Nuclear Studies (IPNS) at the High Energy Accelerator Research Organization (KEK), in collaboration with Tsukuba University of Technology, has produced an English edition tactile graphics collection titled *"The Origin of the Universe and Matter: Understanding the 'Invisible World'."* This collection has been donated to organizations supporting visually impaired individuals, as well as to universities and research institutions around the world.
This English edition tactile graphics collection is a translation of the tactile graphics of the Japanese Braille book *"The Origin of the Universe and Matter: Understanding the 'Invisible World',"* which was jointly produced by the two institutions in 2024.

Note: Tactile graphics are raised illustrations designed to be read by touch by visually impaired individuals. In this project, they were created using a swell-form (thermal expansion) copying machine, enabling the production of more complex and detailed graphics compared to traditional embossed diagrams produced by Braille printers.

The Braille Book Project

Specialized books in the natural sciences are not widely available in Braille, primarily because there are few transcribers with sufficient subject-matter expertise, and because creating accurate Braille transcriptions and tactile graphics is technically challenging. As a result, opportunities for visually impaired individuals to engage in fields such as physics remain limited. To respond to the desire among visually impaired people to "learn more about the universe and matter," ten researchers from IPNS, KEK each contributed to writing the original Japanese manuscript by topic. Based on this manuscript, a team from the Research and Support Center on Higher Education for People with Disabilities at Tsukuba University of Technology carried out the Braille transcription and produced the tactile graphics collection. The Japanese Braille book and tactile graphics collection were released in April 2024.

A print (standard text) version of the same content was also published by Kodansha as a Blue Backs title, *"The Origin of the Universe and Matter: Understanding the 'Invisible World'."*

Given that the situation is similar internationally, an English-language edition was also prepared. The translation was carried out by ten contributing researchers, and the production of the English tactile graphics collection was undertaken by the same team at Tsukuba University of Technology.

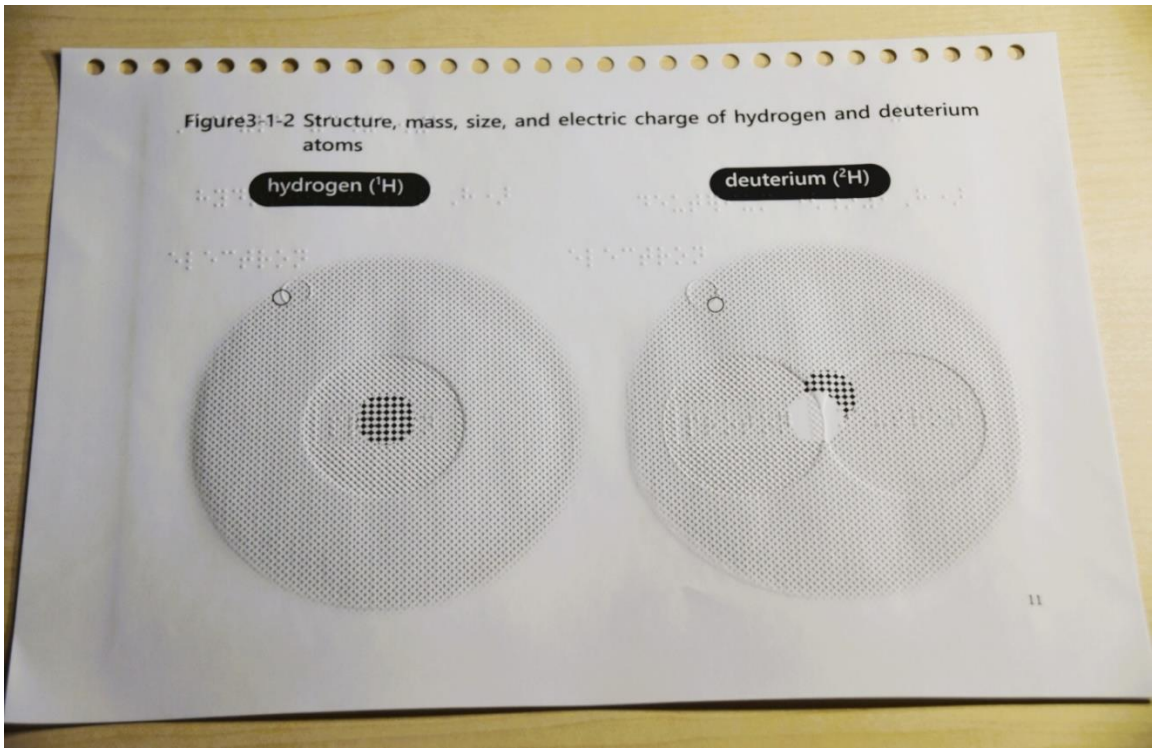
Key Considerations

In Europe and the United States, Braille and Braille publications are generally produced in larger formats than in Japan. This raised concerns about whether the same specifications used for the Japanese edition would be acceptable. To address this, the Japanese tactile graphics collection was sent to researchers and educators in France and the United States for evaluation. After they tested it through tactile reading, feedback indicated that "the size feels natural," leading to the decision to adopt the same specifications as the Japanese edition.
In addition, translating from Japanese into English tends to increase the volume of text in both print and Braille. To manage this, Unified English Braille (UEB) Grade 2— which uses contractions—was adopted for the Braille notation. This helped reduce both the overall volume and production costs.
The production costs for this project were covered by royalty donations from the Kodansha Blue Backs publication *"The Origin of the Universe and Matter: Understanding the 'Invisible World'."*

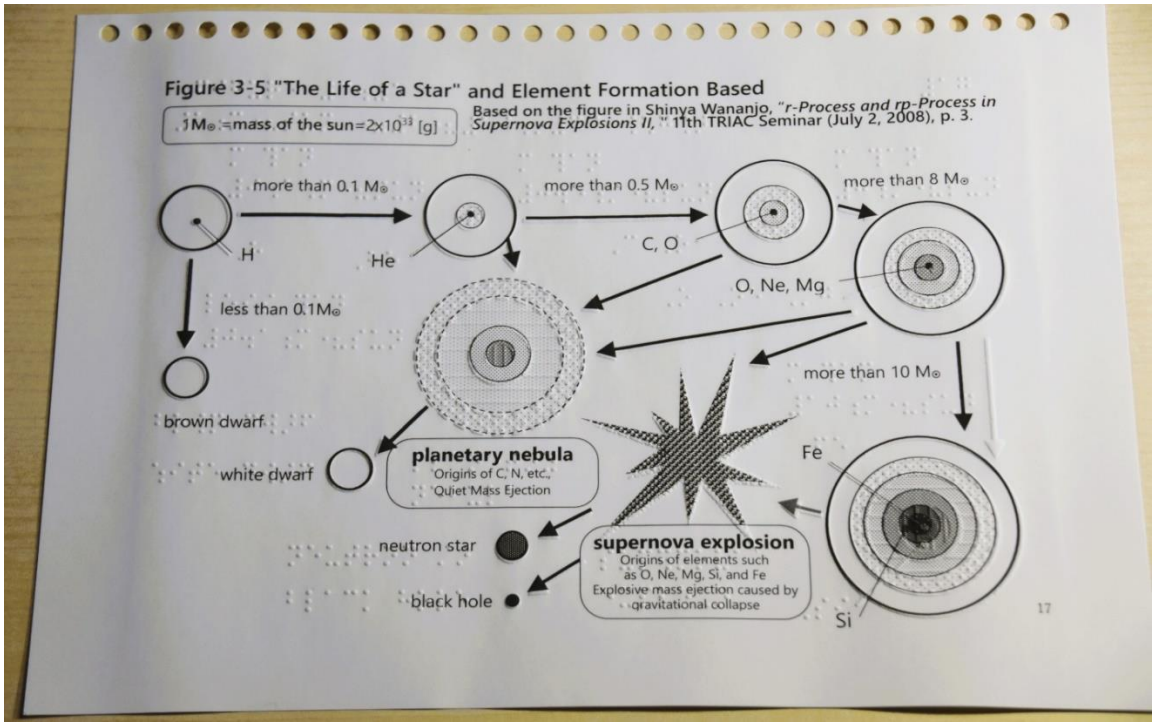
Feedback from Pilot Readers of the English Edition

Pilot readers provided highly positive feedback regarding the tactile quality and clarity of the Braille and tactile materials overall.
For example, Figure 3-1-2 (Figure 1), which explains the atomic structures of hydrogen

and deuterium, received the comment:
“The boundaries are very easy to locate, and the outlines are clear and well-defined. Overall, it is easy to read by touch.”
Similarly, Figure 3-5 (Figure 2), which illustrates the life cycle of stars and the formation of elements, was also highly rated, with feedback noting that “despite the large amount of information, it remains easy to read through touch.”



（Figure 1）Figure 3-1-2



（Figure 2）Figure 3-5

Institutions Receiving the English Edition Tactile Graphics Collection

The tactile graphics collection has been donated to universities and research institutions in Europe and the United States.
In Europe, recipients include the CERN, DESY, INFN (including its Frascati National Laboratories), Johannes Kepler University Linz (planned), University of Birmingham, Cockcroft Institute, University of Portsmouth, Rutherford Appleton Laboratory, John Adams Institute for Accelerator Science, and the Paul Scherrer Institute.
In the United States, the collection has been donated to GLAS Education and The Ohio State University.
These donations are intended to enable lending and active use of the materials by interested individuals at each institution.

Message from the Project Team

From associate professor Manabi Miyagi, Research and Support Center on Higher Education for People with Disabilities at Tsukuba University of Technology:
The themes of this book— “the universe” and “elementary particles”—deal with both vast cosmic scales and extremely small, microscopic worlds. For visually impaired individuals who cannot rely on photographs or visual diagrams, these subjects can be particularly difficult to imagine. This tactile graphics collection was created with the aim of alleviating that difficulty, enabling readers to understand these worlds through touch. One of the key features of this collection is that it ensures scientific accuracy through close collaboration with researchers at IPNS, KEK. At the same time, it draws on the extensive expertise developed at Tsukuba University of Technology to pursue representations that are easy to understand through touch. Through these combined efforts, we believe the result is a set of tactile graphics that are both informative and aesthetically engaging, enjoyable to explore not only visually but also through touch.
We hope that this tactile graphics collection, created in Tsukuba and now available in English, will reach a global audience and open new doors of understanding for many more people.

From Director Naoto Saito, IPNS, KEK:
Since its initial release, the Japanese edition of the tactile graphics collection has received generous support from many people and has been highly praised by researchers and institutional leaders from overseas. By combining tactile graphics that can be understood through touch with printed materials that incorporate thoughtful use of colors and patterns, the collection also serves as a tool for communication between visually impaired and sighted individuals. Until now, as the explanations were available only in Japanese, it was difficult to fully convey its value to those who do not speak the language. However, with the completion of the English edition, we hope that it can now be more widely utilized by English-speaking audiences.
We sincerely hope that the essence of science will reach the hands of many people.

For more details about the IPNS Braille Book Project, please visit the project website:
IPNS Braille Book Project website (English)
IPNS Braille Book Project website (Japanese)

Contact

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