

Touch the Invisible Sky: Exploring the Cosmos in Braille

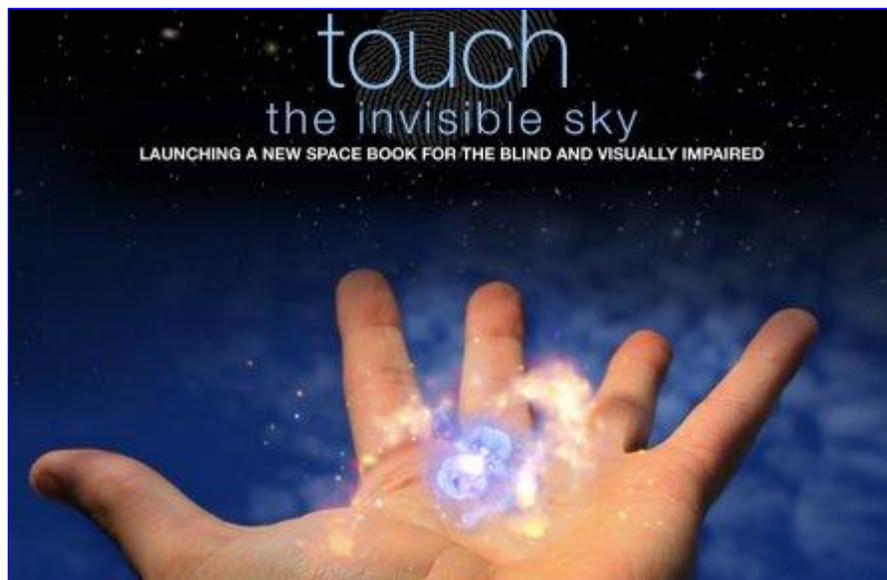
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Jan. 15 , 2008: Images from NASA telescopes are jewels of the space program, marvelous to behold. But how do you behold them when you can't see?

The answer lies between the covers of a new NASA-funded book written in Braille, *Touch the Invisible Sky*.

In an inspiring forward to the volume, blind mountain climber Erik Weihenmayer writes, "Sight ... is only one of the many tools with which to experience the marvels of the world." *Touch the Invisible Sky* uses Braille, large type print, and tactile diagrams of celestial images observed by space telescopes Hubble, Chandra, and Spitzer to reveal the cosmos to the blind and seeing-impaired.



Many of the pictures in the book show the cosmos at wavelengths that no human eye can see--e.g., infra-red, ultraviolet and x-rays. "By showing these images, we remind readers that most of the universe and its beauty is hidden for all of our eyes unless we use special telescopes," says Doris Daou, a NASA astronomer who co-authored the book along with Noreen Grice and Simon Steele.

According to Kathleen Lestition, who coordinates Education and Outreach for the Chandra X-ray Center, "The *Touch the Invisible Sky* project began as a small mission grant, but NASA is making this book a national resource, distributing copies of the book at no cost to schools of the blind around the US, the Library of Congress, several blind technology and training centers, and state libraries that have astronomy collections."

Science@NASA asked two blind readers to review the book. Until age 15, Tim Hendel could see light and dark, colors, shadows, and large objects such as the sun and moon. He could not read print but learned to read Braille. Deborah Saylor was born totally blind and also reads Braille. Hendel and Saylor live in Huntsville, Alabama, and have been space enthusiasts since childhood. Both experienced *Touch the Invisible Sky* and shared their comments.

Tim Hendel:

"Even though I've lived in Huntsville, which is nicknamed the 'Rocket City,' for twelve years, I had no idea what a space telescope looked like or how a star might be depicted on a map. There's not much information on this kind of thing in Braille, so I was thrilled to read *Touch the Invisible Sky*.

Right: Tim Hendel explores the X-ray Sun with his fingertips. Click to view more images of Tim and Deborah reading *Touch the Invisible Sky*: [#1](#), [#2](#), [#3](#), [#4](#), [#5](#).

On page 4 is a depiction of all the wavelengths of the electro-magnetic spectrum, from radio to gamma-rays. It shows, in a way, that all humans are partially blind. No one can see gamma-rays! Yet the cosmos is bright and lively in these 'invisible' wavelengths.



I'm a ham radio operator, so I already had a good understanding of the radio part of the spectrum, but it's useful to see the entire spectrum shown on one diagram. I can show this diagram to some of my other blind friends to explain how the whole spectrum comes together and how astronomers use different kinds of telescopes to 'see' everything from radio waves to gamma-rays.

I knew that our sun emits light and heat, and I had a vague notion that there were other kinds of radiation that our sun and other stars emit. But looking at the diagrams in the book brought home to me just how little of the actual energy sent out by stars can be seen with the eyes or felt on the skin."

Deborah Saylor:

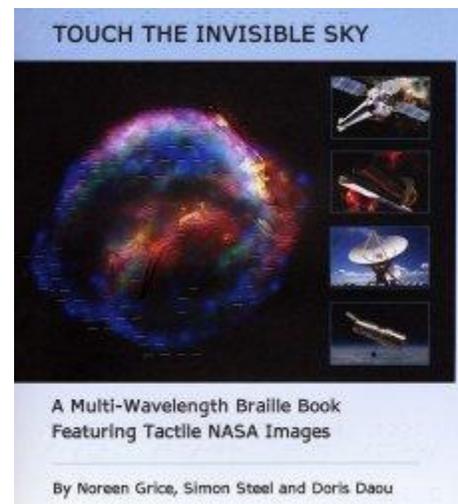
"I moved to Huntsville a few years ago. After all these years of living here in the Rocket City and hearing about the space industry, I'm finally able to appreciate space exploration in the same way everyone else does! So I am, to say the least, very excited about being able to see this book!

The thing that impressed me so much about *Touch the Invisible Sky* was the way the authors put things together so I could experience what people with sight are seeing. The diagrams helped me to see, but, through touch. The explanations of the diagrams were very helpful for getting the ideas across.

Right: *Touch the Invisible Sky*--book cover. [[Larger image](#)]

I like this book a lot, and I recommend it to others. It's really something!"

Touch the Invisible Sky ends with the following analogy: "Imagine that you could only hear sound from the middle three keys on a piano and were asked to name a song.... Being able to



study a star, nebula, or galaxy across the entire electromagnetic spectrum gives us the big picture, providing clues to unravel the greatest mysteries"

Saylor, a Van Cliburn finalist who plays entire piano concertos from memory, agrees: "The way to seek and learn the most is to develop as many ways of 'seeing' things as possible. And keep your sense of curiosity and wonder alive, always!"

That's exactly what scientists do as they journey through the cosmos, and now the blind can ride along.

SEND THIS STORY TO A FRIEND

Author: Dauna Coulter | Production Editor: [Dr. Tony Phillips](#) | Credit: [Science@NASA](#)

more information

Touch the Invisible Sky was authored by astronomy educator and accessibility specialist Noreen Grice of You Can Do Astronomy LLC and Museum of Science, Boston, astronomer Simon Steel of the Harvard-Smithsonian Center for Astrophysics in Cambridge, MA, and astronomer Doris Daou of NASA. NASA funded the astronomy Braille book, which was publicly released Tuesday, January 15, 2008.

The tactile diagrams feature raised outlines and textures superimposed on the images themselves to indicate how the objects appear differently according to wavelength viewed in – for example, radio, infrared, visible, ultra-violet, or x-ray. The text clearly and concisely explains what each image shows, and even describes how the different types of telescopes capture the images.

The Braille and the tactile diagrams are done in clear acrylic overlay, so the large print type and high-resolution color images can be viewed as well as felt. *Touch the Invisible Sky* is therefore a useful teaching tool for mainstream classrooms and parents with blind children, making the same information accessible simultaneously by sighted, non-sighted, and reduced-vision readers.

NASA has funded two other astronomy-related Braille books: [Touch the Universe](#) and [Touch the Sun](#).

NASA's Future: [The Vision for Space Exploration](#)



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