



# A Universal Design of Learning approach to astronomical activities with the public

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*Are we ready for a diverse public?*

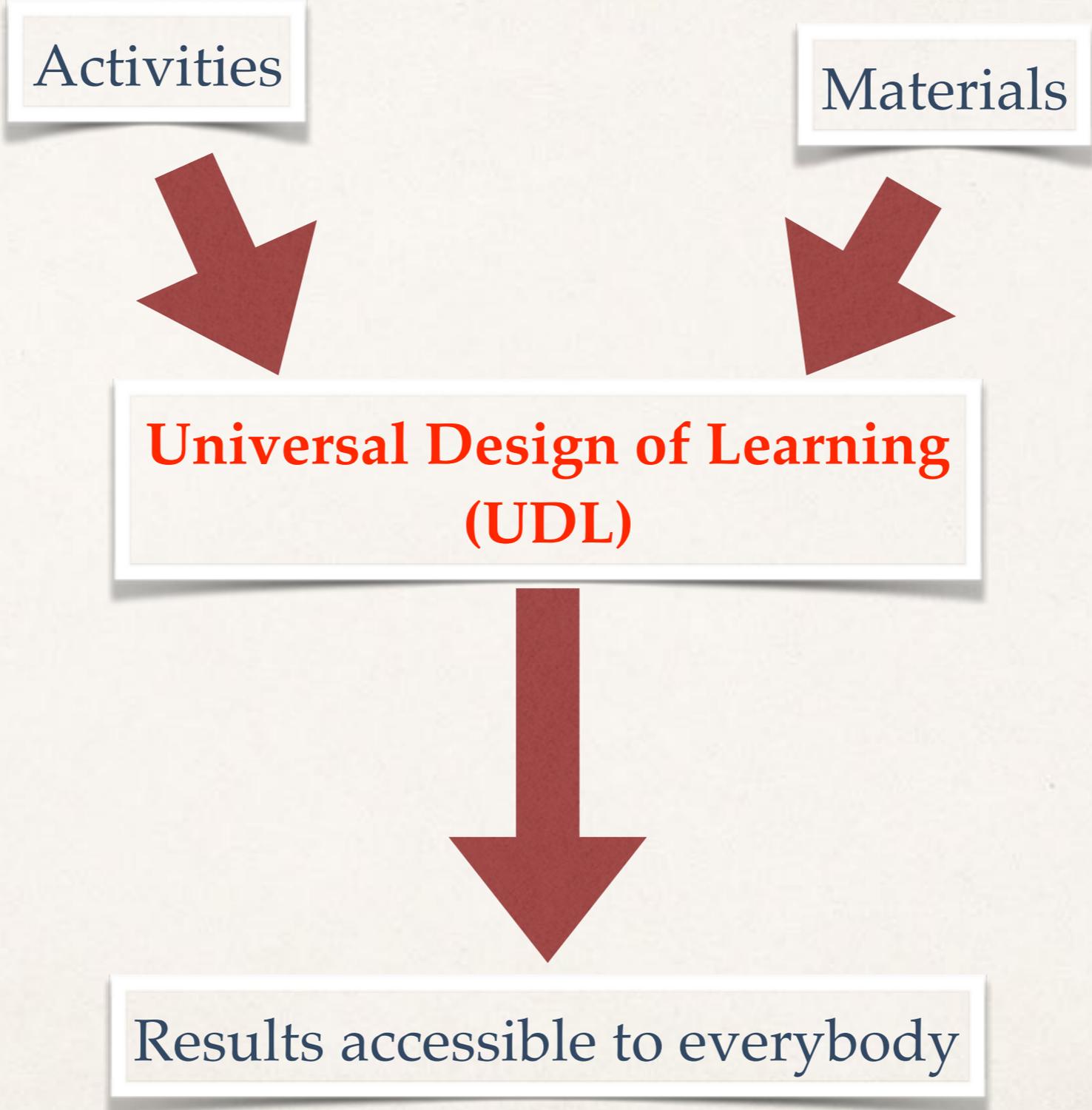
# Universal Design of Learning



*UDL is a framework based on strategies/technologies that support multiple learning modalities, including visual, auditory, kinesthetic and tactile.*

Activities

Materials



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graph TD; A[Activities] --> C[Universal Design of Learning (UDL)]; B[Materials] --> C; C --> D[Results accessible to everybody];
```

**Universal Design of Learning  
(UDL)**

Results accessible to everybody

## What is UDL?

it is a **framework** that helps **to remove barriers** (physical, sensorial, affective and cognitive) to gain access, learning and participation for students or the public



disabled person



disabling environment



## Main principles of UDL

Key: multiplicity

provide multiple means  
of **representationn**

provide multiple means for  
**taking action** and **communicating**

provide multiple means  
for **engagement**

## Main principles of UDL

provide multiple means  
of **representationn**



people differ in the way in  
which they **perceive** and  
understand information



provide contents through  
**different perception channels**

## Main principles of UDL

provide multiple means for  
**taking action** and **communicating**



people differ in the ways in which they  
«**navigate**» through the learning environment  
and communicating what they know



opportunities for taking action  
(through **materials** everyone can  
interact with)



opportunities for **communication**  
(software and various other resources)

## Main principles of UDL

provide multiple means  
for **engagement**



people differ in the ways in which they can feel  
**engaged and motivated** to learn



wide choices that reflect the  
**interests** of the participants



provide them with **strategies**  
to deal with new activities



reflect about their  
**expectations**

**A general protocol**

**Teach/communicate to the four learning styles**

**Teach/communicate to strengths**

**Provide multiple forms of assessment/feedback**

# A general protocol

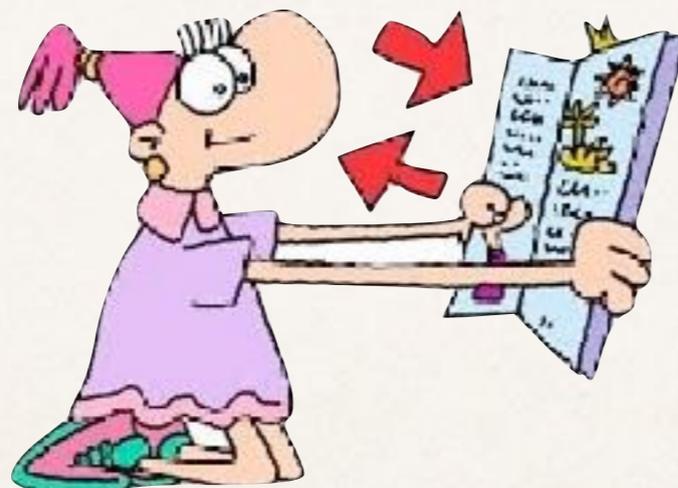
## Teach/communicate to the four learning styles



tactile



kinesthetic



visual



auditory

communication is more effective when provided according to the preferred learning style of the receiver

## A general protocol

### Teach/communicate to strengths



use the natural abilities and talents as a  
foundation for learning

## A general protocol

### Provide multiple forms of assessment/feedback



to gather a **complete picture of the abilities** of those in your audience with learning disabilities  
check whether the **contents are being received** correctly

# Learning disabilities

be direct and specific when  
communicating

**ask** questions to make sure that the  
audience understand  
and  
allow **enough time** for them to answer

## Sensory disabilities: vision

address the person by using their **name**  
and giving yours

be **explicit** in your directions and avoid  
using place referent pronouns

**let them know** when you are leaving so  
they're not left speaking to no one

use a **variety of**  
**methods** to access texts

## Sensory disabilities sensoriales: deafness

ask which is their **preferred** means of communication

**attract** the person's attention before speaking

**shouting or exaggerating** when speaking does not improve the communication

**rephrasing** rather than repeating is a more effective way to ensure the message is understood

# Space Science is for Everyone (NASA)

National Aeronautics and Space Administration



Space Science Is for Everyone:  
Creating and Using Accessible Resources in Educational Settings

## LESSONS FROM THE FIELD



# UDL activity: Inclusive Campus at the University of Valencia

high school students with a variety of special needs



we need to use the UDL principles to  
prepare the activities

# UDL activity: Inclusive Campus at the University of Valencia

Accommodation of the planetary show “The  
sky in your Hands”



slides for the deaf to watch and read  
soundtrack and tactile half-spheres for the blind

# UDL activity: Inclusive Campus at the University of Valencia

## “From Earth to the Universe” tactile prints (NASA)

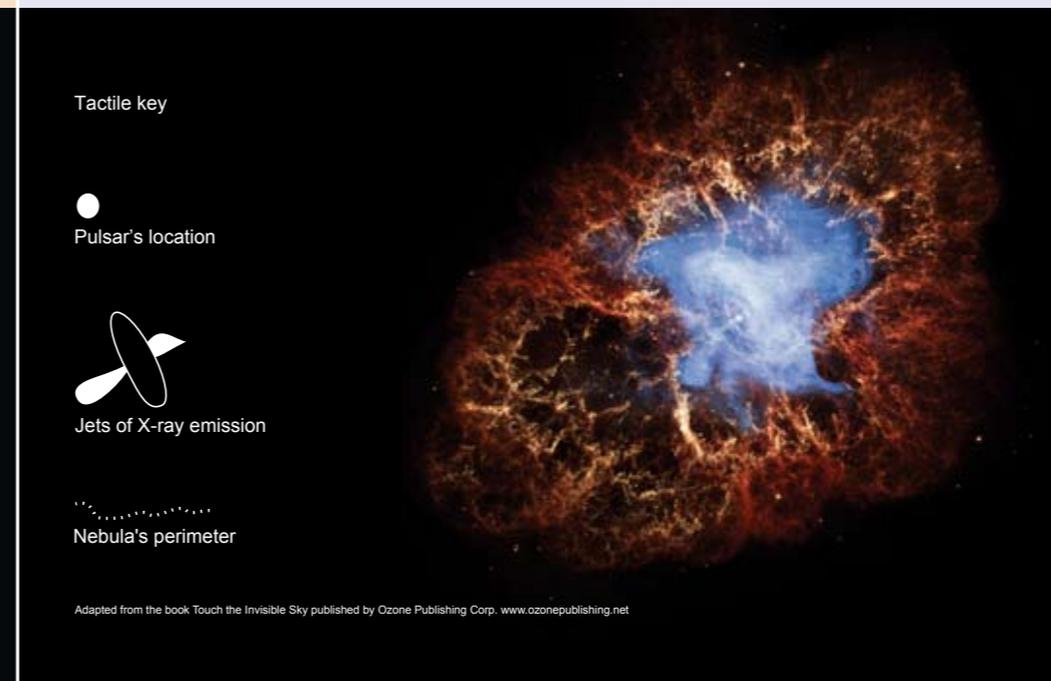


THE CRAB – an image in visible light taken by the Hubble Space Telescope.

The Crab Nebula is the remnant of a supernova explosion which was visible from Earth in the year 1054. Originally called a nova because it seemed to be a new star, a supernova is actually the death of an old star. As you touch the image, you can feel the jagged outer edge of the nebula revealing the chaotic and violent nature of the explosion that ripped off the outer layers of a once majestic star. The nebula is still expanding outwards at 1500 kilometers per second, almost a thousand years after the explosion occurred!

THE CRAB – an image in combined X-Ray and visible light, taken by the Hubble Space Telescope and the Chandra X-Ray Observatory.

As you touch this image, you can feel the outline of the visible Crab from the previous image. Now move your finger towards the center of the image to feel the X-ray emission, a tilted ring of high-energy particles surrounding a tiny point source. Two jets of high energy particles are shooting outwards towards at two and eight o'clock. The source is called a pulsar, a rapidly spinning neutron star no larger than an average city, but spinning on its axis 30 times a second. As the neutron star spins it flashes its jets towards the Earth. This pulsar is the leftover core of the original supergiant star that exploded.



the deaf can read them, the blind can touch and read the text in Braille and /or listen to the dvd

## A Touch of the Universe



# A Touch of the Universe

Non-profit project to build and send 30 kits of tactile astronomy materials to be distributed among educators and teachers in underdeveloped countries in the Americas, Asia and Africa



## Team

**Amelia Ortiz-Gil** (coordinator) (Observatorio Astronomico - Universidad de Valencia)

**Kimberly Arcand** (NASA-CXO)

**Caterina Boccato** (Osservatorio Astronomico di Padova / INAF)

**Lina Canas** (Nuclio / AWB / Galileo Mobile)

**Rosa Doran** (Nuclio / Galileo Teachers Training Program)

**Héctor Espinós** (IPL - Universidad de Valencia)

**Thilina Heenatigala** (AWB/UNAWE)

**Mariana Lanzara** (Observatorio Astronomico - Universidad de Valencia)

**Maria Jesus Moya** (Observatorio Astronomico - Universidad de Valencia)

**Javier Navarro** (IPL - Universidad de Valencia)

**Pedro Russo** (UNAWE)

**Stefano Sandrelli** (Osservatorio Astronomico di Brera / INAF)

**Mike Simmons** (AWB)

# A Touch of the Universe

## IAU's Office of Astronomy for Development Project



# A Touch of the Universe

What is in the kit?





# A Touch of the Universe

## The Sky in Your Hands Planetarium show



Script and music recorded in a seven channel soundtrack.

Each constellation / object has a sound associated to it



# A Touch of the Universe

## The Sky in Your Hands Planetarium show



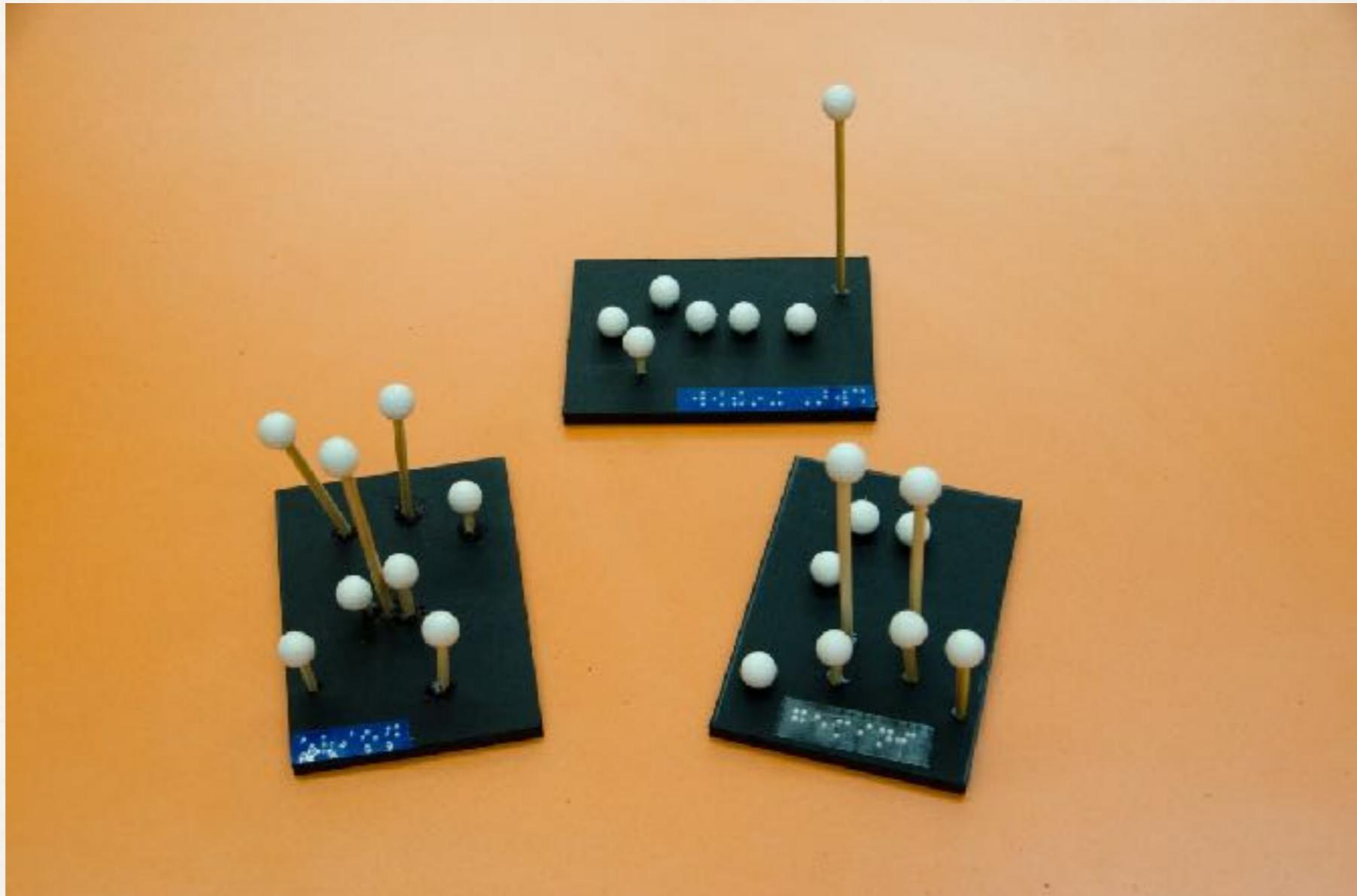
# A Touch of the Universe

## The Sky in Your Hands Planetarium show





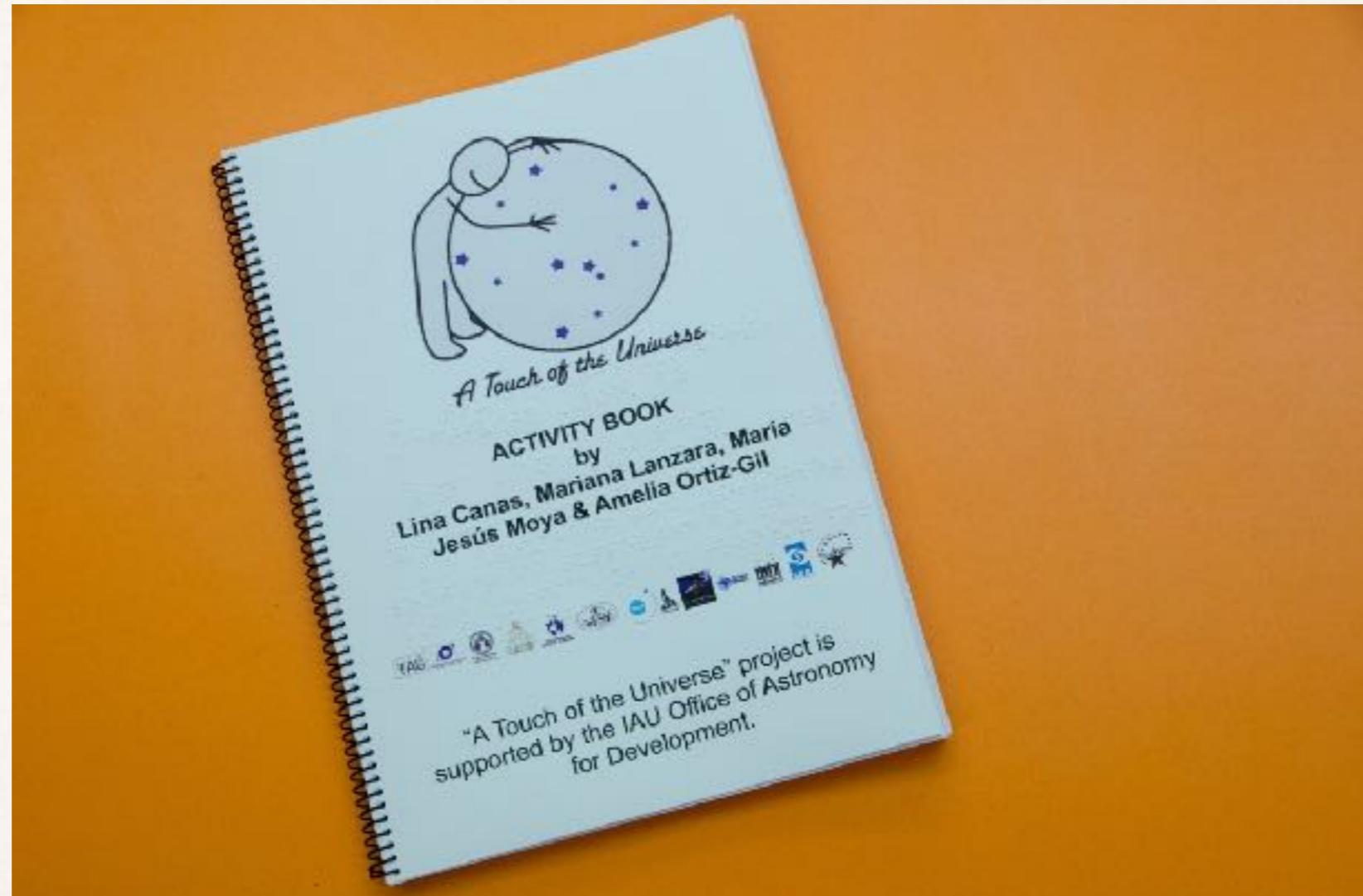
## Models of constellations in 3D



Tactile models of constellations showing the real (scaled) physical distance relation between the stars in the constellation

# A Touch of the Universe

## Activity book

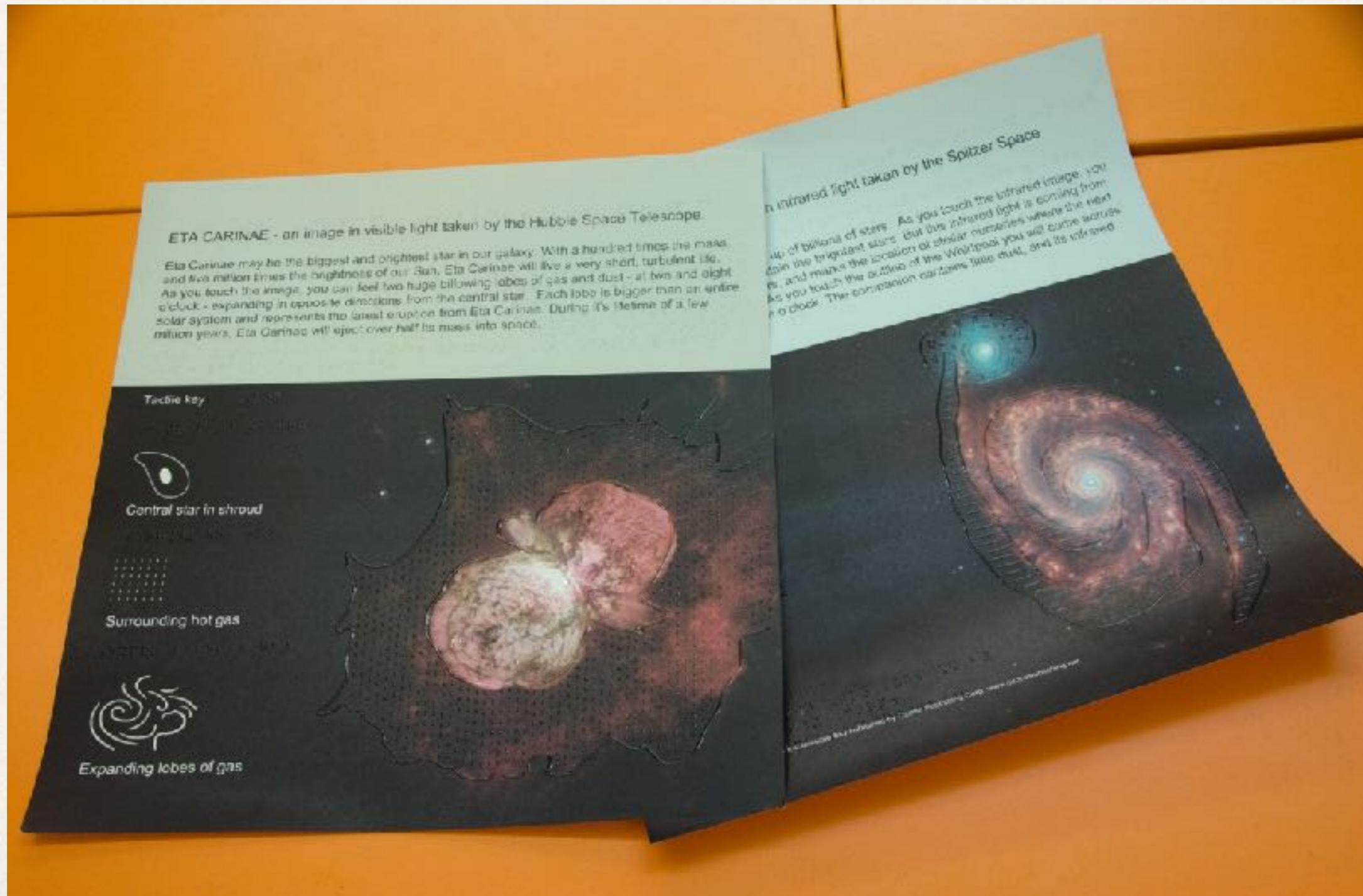


Activities that can be carried out with the half-sphere, the Moon and the constellations

Regular print and Braille

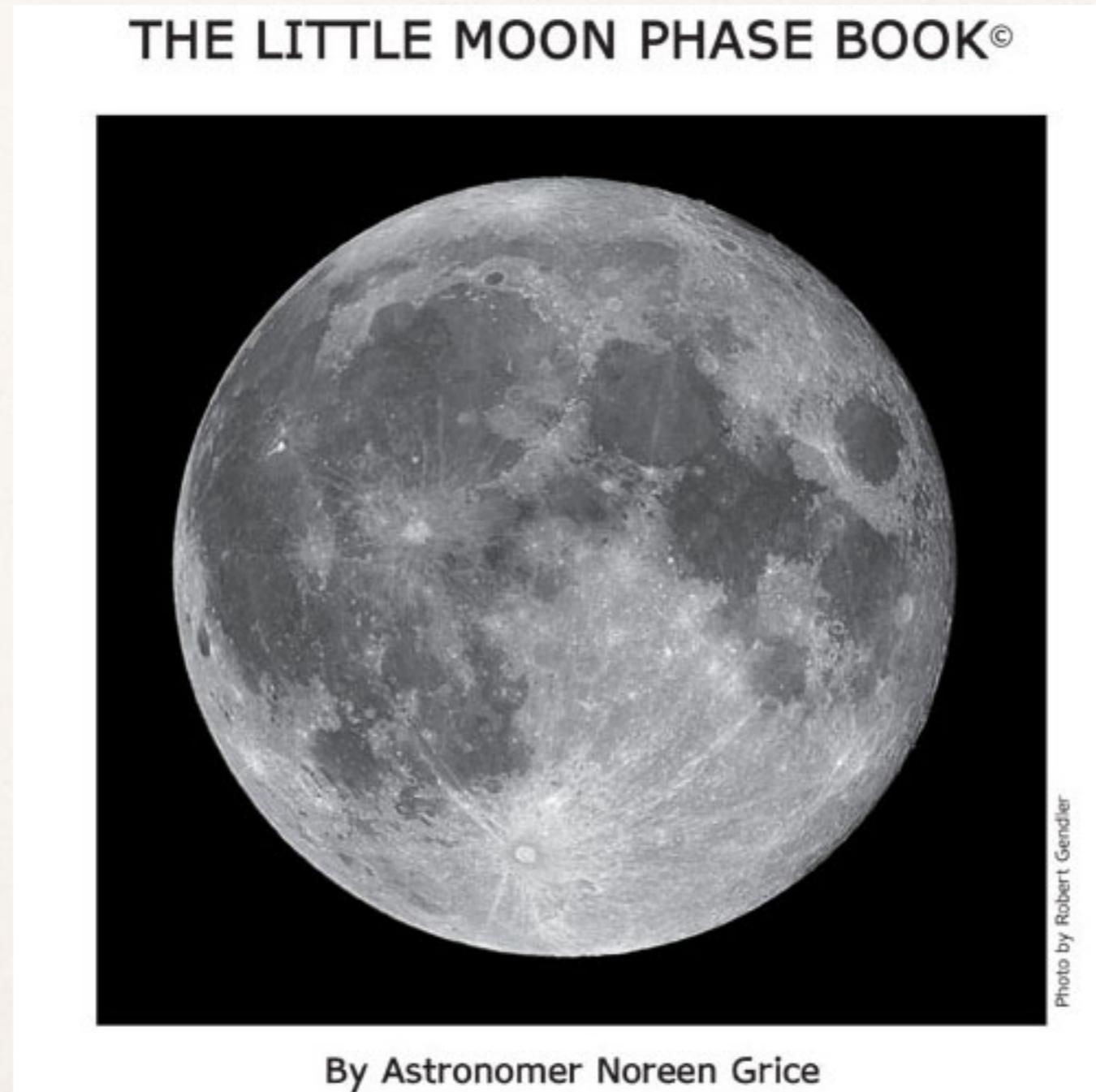
# A Touch of the Universe

## Chandra's "From Earth to the Universe" tactile prints



# A Touch of the Universe

## Noreen Grice's "The Little Moon Phase Book"



# A Touch of the Universe

DVD with planetarium soundtrack (English, Spanish, Portuguese)

## *A Touch of the Universe*

In this DVD you will find the soundtracks of the planetarium program "The Sky in Your Hands" in Spanish, Portuguese and English, the FETTU Audible file and various guides in pdf.

### Contents:

1. English Stereo Soundtrack
2. Spanish Stereo Soundtrack
3. Portuguese Stereo Soundtrack
4. English Soundtrack (7 separate tracks)
5. Spanish Soundtrack (7 separate tracks)
6. Portuguese Soundtrack (6 separate tracks)
7. FETTU Audible in English
8. FETTU activities in English (pdf)
9. Planetarium guide in English (pdf)
10. Planetarium guide in Spanish (pdf)
11. Tactile Moon guide in English (pdf)
12. Tactile Moon guide in Spanish (pdf)

If you need any assistance, the planetarium script or further information please send a request from the project's webpage:  
<http://astrokit.uv.es>



*A Touch of the Universe*

Soundtracks and  
pdf documents



# A Touch of the Universe

Moon guide, Planetarium guide and feedback form

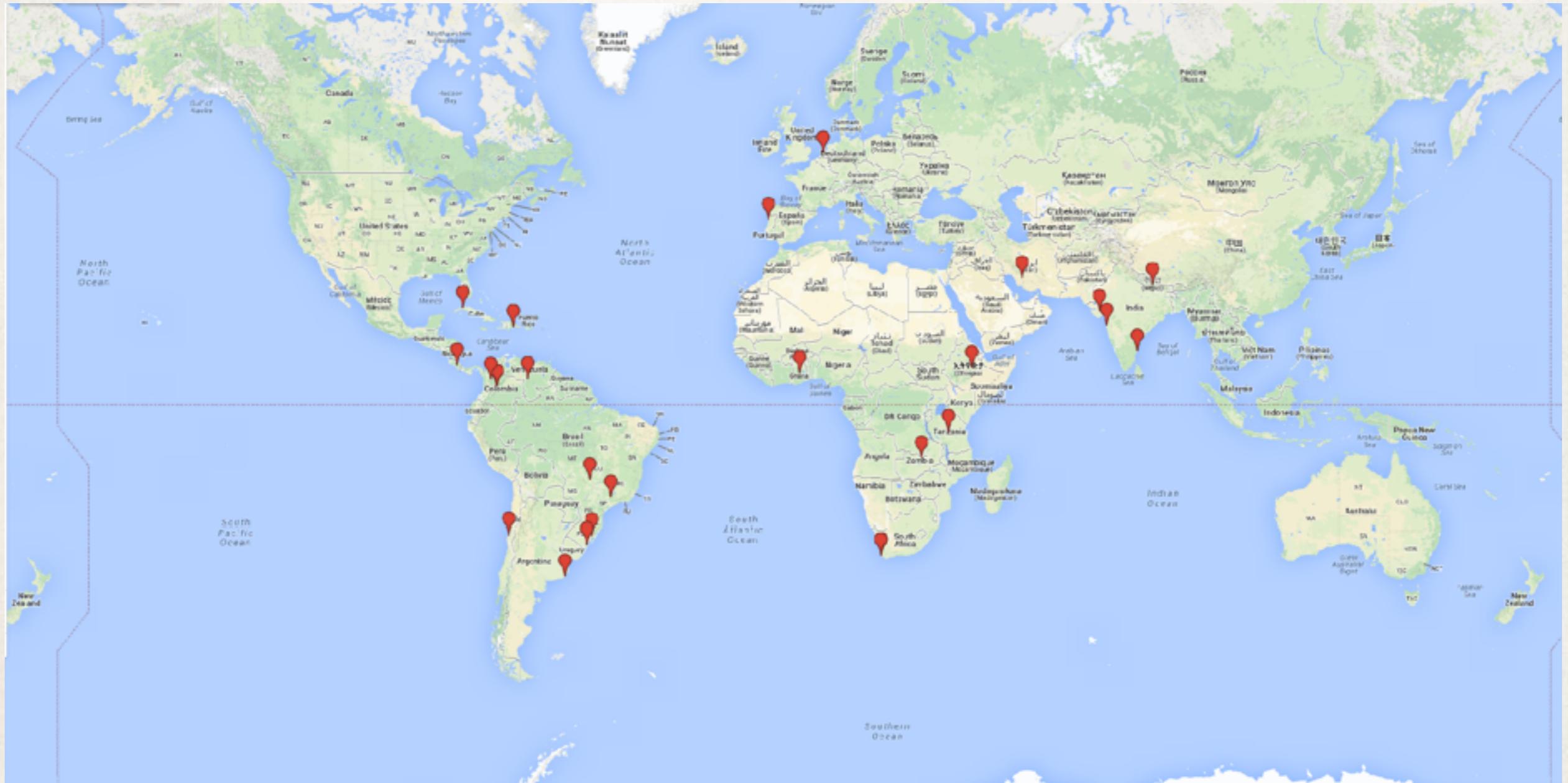
## The Sky in your Hands



*The planetarium show user's guide*

# A Touch of the Universe

Where has it been sent?



India, Chile, South Africa, Argentina, Brazil, Colombia, Venezuela, República Dominicana, Nepal, Tanzania, Colombia, Costa Rica, Zambia, Iran, Ethiopia, Cuba and Bolivia (Galileo Mobile)

# A Touch of the Universe

## Nepal

### ASTRONOMY CLASSES FOR THE BLIND AND VISUALLY IMPAIRED CHILDREN

A day program on  
*A TOUCH OF THE UNIVERSE*

**Venue: Shree Amar Singh Higher Secondary School  
AmarSingh, Pokhara, Nepal.**



#### Program Schedule:

1. INTRODUCTION OF A TOUCH OF UNIVERSE.
2. DEMONSTRATION OF MOON MODEL.
3. DEMONSTRATION OF HALF SPHERE MODEL.
4. DEMONSTRATION OF 3D CONSTELLATION MODEL.
5. DEMONSTRATION OF PLANETARIUM ACTIVITY.



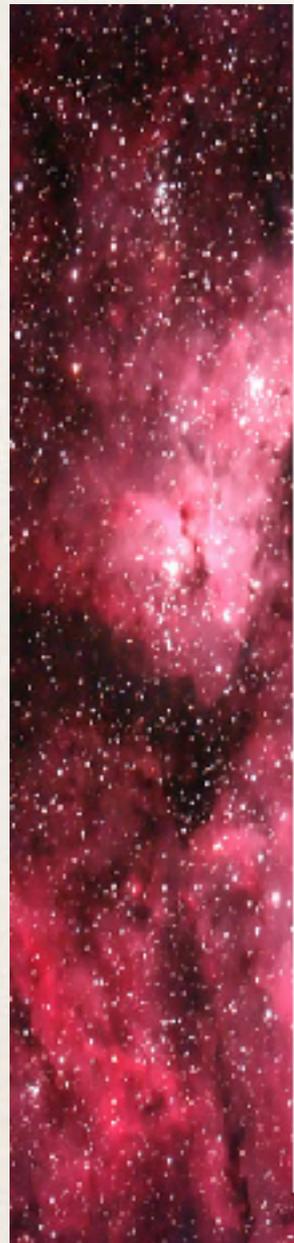
**Time: 1:00 to 4:00 PM**  
**Date: 7<sup>th</sup> August 2014**

Suman Gautam  
Program Coordinator  
Vice- Chairman: GHoU- Nepal  
Student Ambassador: EU-UNAWA Nepal  
[suman@ghou.com.np](mailto:suman@ghou.com.np)



# A Touch of the Universe

## Costa Rica



**Astronomía para Todos**



**15 de Marzo desde las 10:00 a.m.  
Sala 1  
Biblioteca Carlos Monge, Universidad de Costa Rica.**

**Actividad gratuita y destinada a público no vidente  
y con baja visión (cupos limitados).**

**¡Que la astronomía te maraville a través de tus sentidos!**



# A Touch of the Universe

## South Africa



# A Touch of the Universe

## Argentina



# A Touch of the Universe

## India



# A Touch of the Universe

## Bolivia - Galileo Mobile



# A Touch of the Universe

## Padova - Italia



# A Touch of Venus



OAD funding for a new  
planetary model + activity  
book + video tutorials

# A Touch of the Universe



Inizio Progetto Chi siamo Materiali Tutorial Galleria Contatto English Español

## A Touch of the Universe

"A Touch of The Universe" è un progetto no-profit che ha come obiettivo lo sviluppo di un kit di astronomia tattile dedicato a bambini con disabilità visive. I primi 30 stati distribuiti a educatori e insegnanti di Paesi sottosviluppati in America, Asia e Africa. Attualmente stiamo lavorando a un'estensione del progetto, "A Touch of Venus", che include un globo tattile 3D che rappresenta Venere, insieme a un libro di attività e delle video guide.



A Touch of the Universe

Dopo aver sviluppato e testato diversi materiali didattici di astronomia tattile, abbiamo deciso di assemblarli in un kit. Inizialmente abbiamo prodotto 30 kit per "A Touch of the Universe" nell'ambito del Universal Design for Learning (UDL). Sono stati distribuiti tra gli educatori nei paesi sottosviluppati delle Americhe, dell'Asia e dell'Africa. Ora il kit sta crescendo con altri materiali tattili sviluppati nel nostro nuovo progetto "A Touch of Venus". Il nostro obiettivo è aiutare i bambini e i giovani adulti in questi paesi a conoscere l'astronomia, anche se sono ipovedenti. La nostra missione è di sopprimere la mancanza di materiale educativo inclusivo che esiste in queste regioni.

[Scarica i nuovi pianeti tattili!](#)

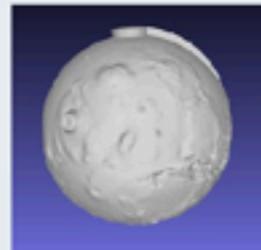
<https://astrokit.uv.es>

**Italian version!!!**  
(thanks to Federica Niola & Caterina Bocatto & Astrofile Veronesi)



**NUOVO!! Un tocco di Venere**

Stanno sviluppando un'estensione del kit "A Touch of the Universe" nell'ambito del progetto "A Touch of Venus" che è stato finanziato dall'International Astronomical Union's Office of Astronomy for Development, con un generoso sostegno finanziario da parte di Universe Awareness (UNAWE), Osservatorio Astronomico dell'Università



**NNUOVO! Più globi 3D tattili online !!**

Abbiamo sviluppato nuovi globi tattili 3D di altri pianeti rocciosi utilizzando il fantastico software [Mapelia](#) (di Jordi Burguet).

Dalla scheda [Materiali](#) a noi possibile



**Cosa c'è nella versione online del kit?**

La versione on-line del kit include:

- (1) Map-sphere e colonna sonora dello spettacolo di pianeta ["El Cielo en las manos"](#).
- (2) [Luna tattile](#).
- (3) LIBRO CON ATTIVITÀ DA SVOLGERE CON LA



**Finanziamenti**

Il progetto è stato finanziato principalmente dall' [International Astronomical Union's Office of Astronomy for Development](#), con un generoso sostegno finanziario da parte di Universe Awareness (UNAWE), Osservatorio Astronomico dell'Università

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# IAU Working Group on Astronomy for Equity and Inclusion

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- ❖ **DIVISION C Education, Outreach and Heritage**
  - ❖ **COMMISSION 1 Astronomy Education and Development**
    - ❖ **WORKING GROUPS**
      - ❖ WG1 Theory and Methods in Astronomy Education
      - ❖ WG2 Network for Astronomy School Education (NASE)
      - ❖ **WG3 Astronomy for Equity and Inclusion**
    - ❖ **INTERCOMMISSIONS**
      - ❖ C1-F2-F3-H2 Education and Training in Astrobiology
      - ❖ B7 Inter-Division B-C Commission Protection of Existing and Potential Observatory Sites

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# Goals

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Compile tools

Develop new methods

Develop new tools

**Universal Design of Learning (UDL)**

Identify problems  
and find solutions

Identify and gather a  
community of experts

Best practices

Formal declarations  
endorsed by the IAU

Database on the web

# WG website with resources

<http://sion.frm.utn.edu.ar/iau-inclusion/>

**Astronomy for Equity and Inclusion**  
IAU Division C Commission C1.WG3

Home About Collaborators Partner Organizations Good Practices Activities & Resources Around the World Contact Us

## Astronomy for Deaf and Hard-of-Hearing

- 1. Welcome: the incredible true with infomax**  

- 2. Dictionary of Astronomy - Sign Language**  

- 3. Your weight is other worlds**  

- 4. Surface of Mars**  

- 5. Reaching the sky with the hands**  


IAU Working Group

**Astronomy for Equity and Inclusion**  
IAU Division C Commission C1.WG3

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## Astronomy for people with Motor Impairments

- 1. Your weight is other worlds**  

- 2. Surface of Mars**  

- 3. Astrodejeet**  
Astrodejeet is a free open source software for people with motor impairments.
- 4. HATTS Program**  
Headwheeler Access To The Sky - is a program that gives free mounting systems to organizations that support people with disabilities who include Astronomy enthusiasts.

[\[GO TO ACTIVITIES & RESOURCES PAGE\]](#)

IAU Working Group

## **In a nutshell**

Developing resources, activities, etc. in the UDL framework allows

**To include persons with disabilities**

as well as

**Making the learning process easier for everyone**

A Touch of the Universe:  
<https://astrokit.uv.es>

Astronomy for Equity and Inclusion  
<http://sion.frm.utn.edu.ar/iau-inclusion/>

*Grazie!!*

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