

**EXPERIENCE
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HALLÅ STEAM!

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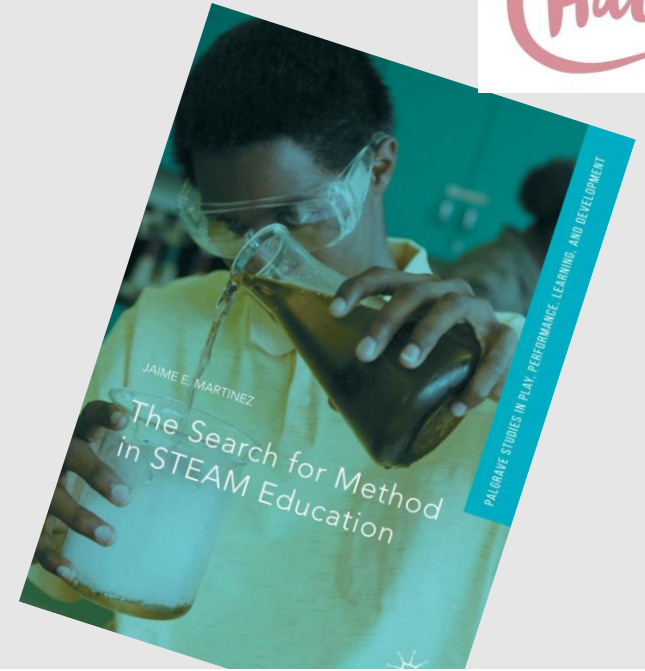
Experience Workshop's STEAM Learning Material

Build the Warka
Water Tower with
4D Frame





What is STEAM education?



- The **Finnish National Core Curriculum** makes recommendations to teachers and schools about the development of *student-centered, multidisciplinary / phenomenon-based learning* programs and collaborative teaching.
- **STEAM** provides a reasonable basis to complete this requirement, as it means the *multidisciplinary or transdisciplinary integration of Science-, Technology-, Engineering-, Arts- and Mathematics* learning about various topics.
- **STEAM** is based on the collaboration between the teachers.

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STEAM EDUCATION

What is **STEAM** Education?

STEAM stands for Science, Technology, Engineering, the Arts, and Mathematics, referring to an integrated approach to learning.

Through project-based, creative methods, STEAM Learning aims to foster problem-solving, collaboration, integrative thinking.

STEAM can boost students' engagement, motivation and their joy of learning.

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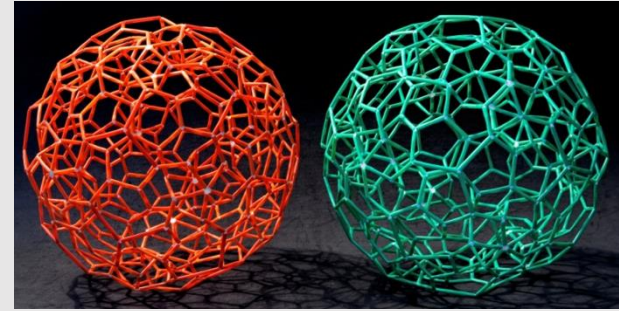
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Introduction to hands-on modeling with 4D Frame

free imagination and infinite creativity





Introduction to hands-on modeling with 4D Frame

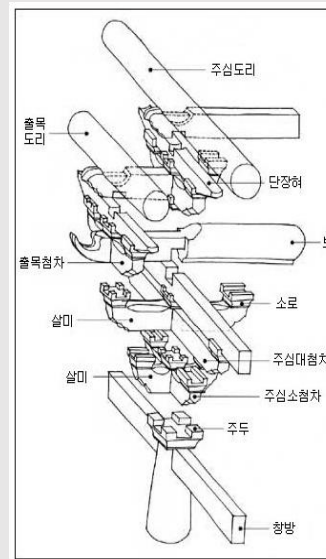
The **4D Frame educational modelling kit** is based on the analysis of Korea's traditional, wooden buildings' construction techniques, where no nails are used.

4D Frame has proved to be an **appropriate tool for developing various skills in the transdisciplinary framework of STEAM learning.**

4D Frame toolkits are available from the webshop www.experienceworkshop.org/shop



traditional Korean wooden palace



principles of construction

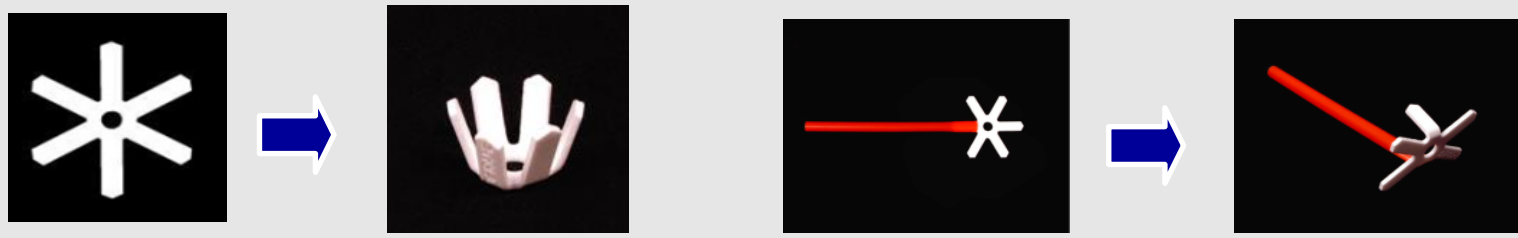


4D Frame tube

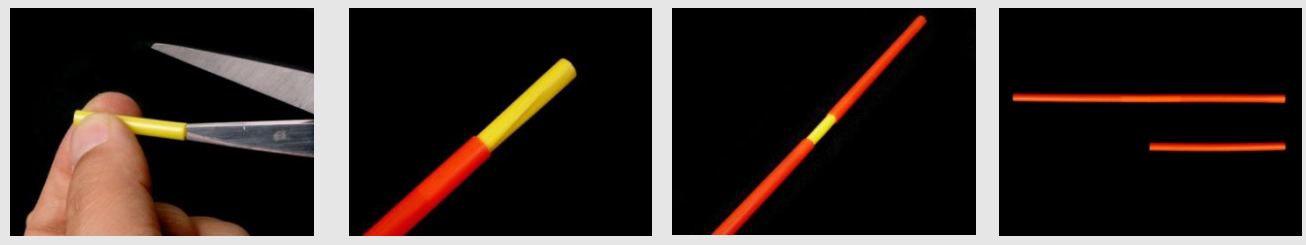


4D Frame connector

Introduction to hands-on modeling with 4D Frame

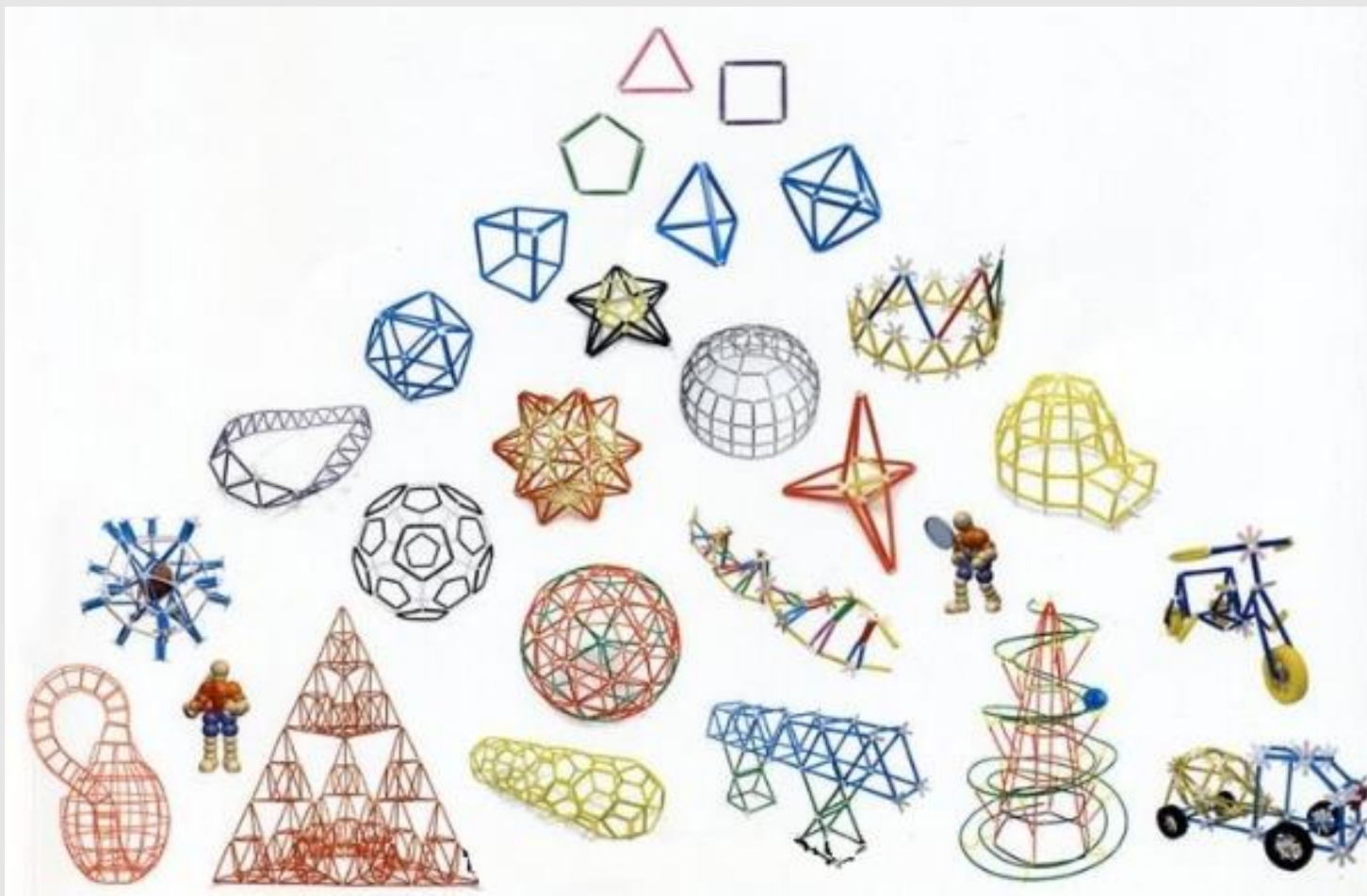


bend, cut & connect!





Introduction to hands-on modeling with 4D Frame



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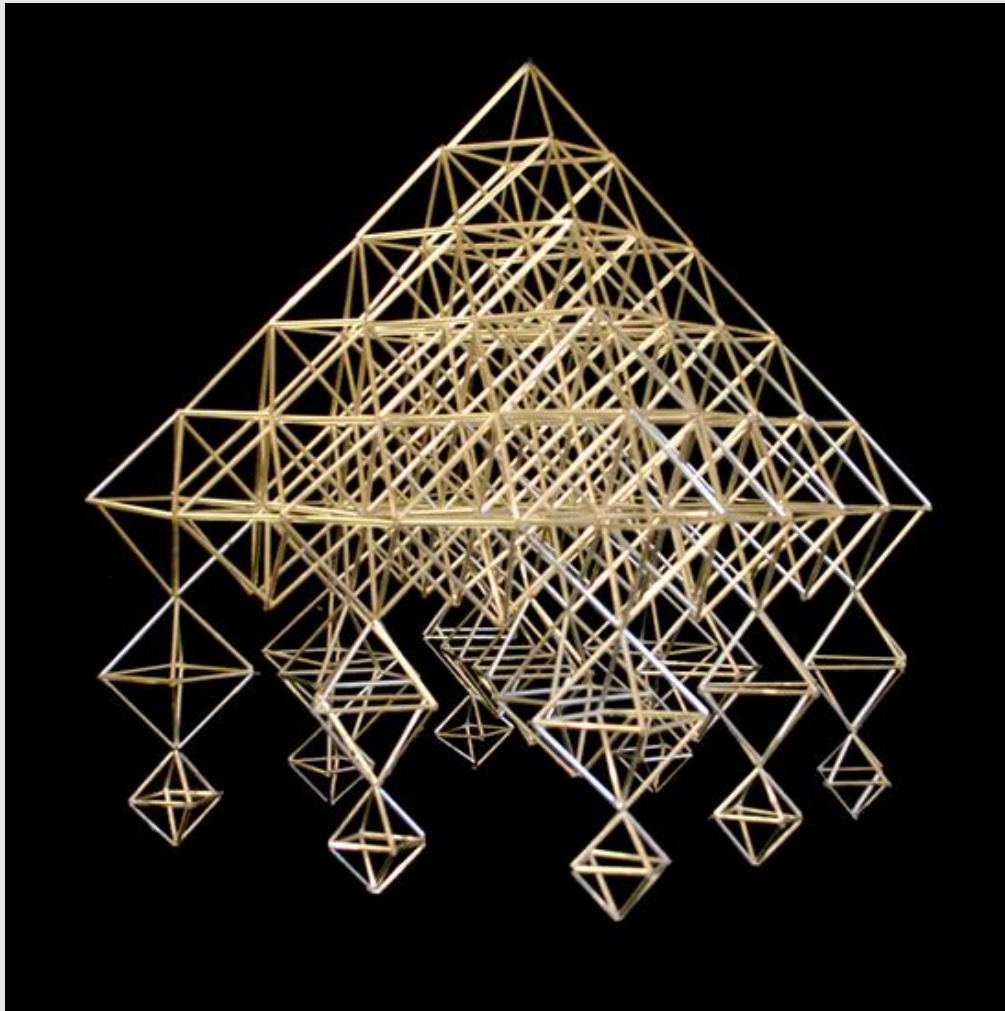
Introduction to hands-on modeling with 4D Frame



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The traditional
Nordic Christmas
decoration: the
himmeli





Introduction to hands-on modeling with 4D Frame





Introduction to hands-on modeling with 4D Frame



Tubes



Connectors



Modelling the Warka Water Tower with 4D Frame



4Dframe's rich capacities are well illustrated by the **STEAM workshop adaptation** of the **Warka Water social design project**, which was launched by the architect **Arturo Vittori** in 2012.



For a detailed description, go to <http://archive.bridgesmathart.org/2016/bridges2016-601.html>. Kristóf Fenyvesi, Ho-Gul Park, Taeyoung Choi, Kwangcheol Song and Seunguk Ahn: Modelling Environmental Problem-Solving through STEAM Activities: 4Dframe's Warka Water Workshop. Proceedings of Bridges 2016: Mathematics, Music, Art, Architecture, Education, Culture (2016), Pages 601–608.

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The Warka Water Social Design Project

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Arturo Vittori

Italian artist, architect and industrial designer

He is the co-founder and director of the design studio **Architecture and Vision**.

"Visiting small isolated communities up on the high plateau in the North East region of Ethiopia, I witnessed this dramatic reality: the **lack of potable water**."

The villagers live in a beautiful natural environment but often without running water, electricity, toilets. To help improve this drastic situation, **I made it our mission to find solutions and help these people**", said Arturo Vittori.

<http://www.warkawater.org/>

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Ethiopia, Africa



<http://www.warkawater.org/>

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The Warka Water Social Design Project

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The name of the project 'Warka' comes from the **Warka Tree**, which is a giant, wild fig tree native to Ethiopia. Like the tree, the Warka Tower serves as important cornerstone for the local community, becoming part of the local culture and ecosystem by providing its fruits, shade and offering a gathering place.

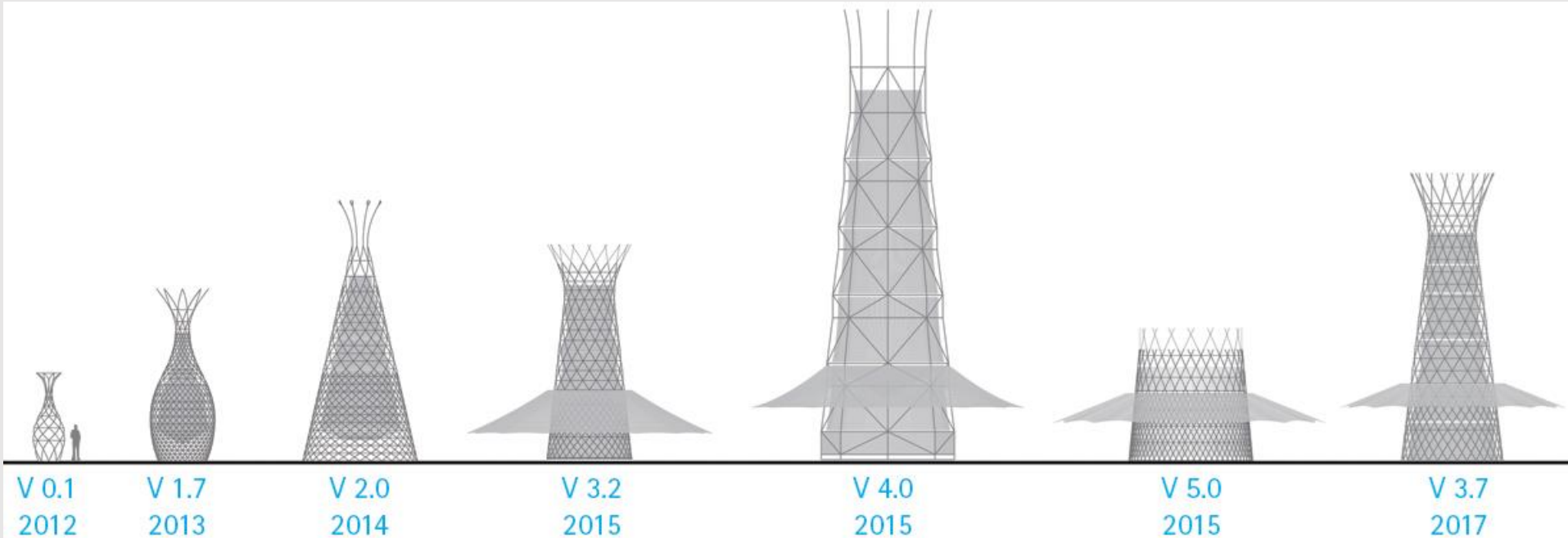
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The Warka Water Social Design Project

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Since 2012, several full-scale prototypes were constructed in order to test different materials within varying environmental conditions.

<http://www.warkawater.org/evolution>

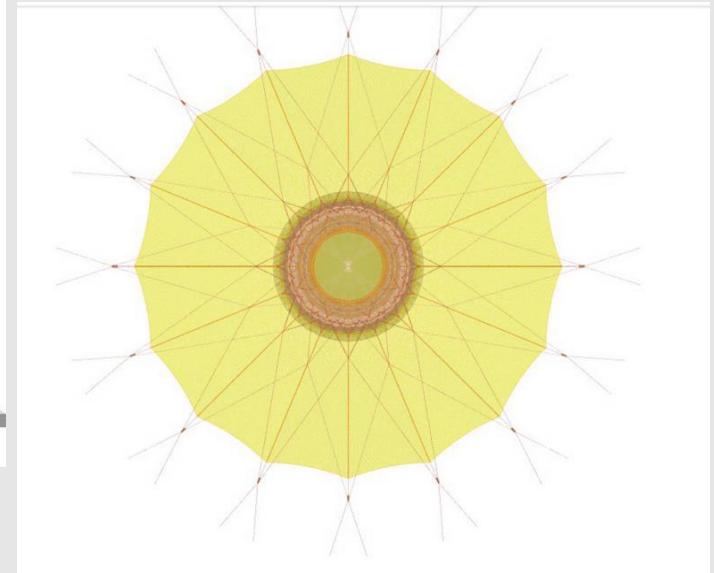
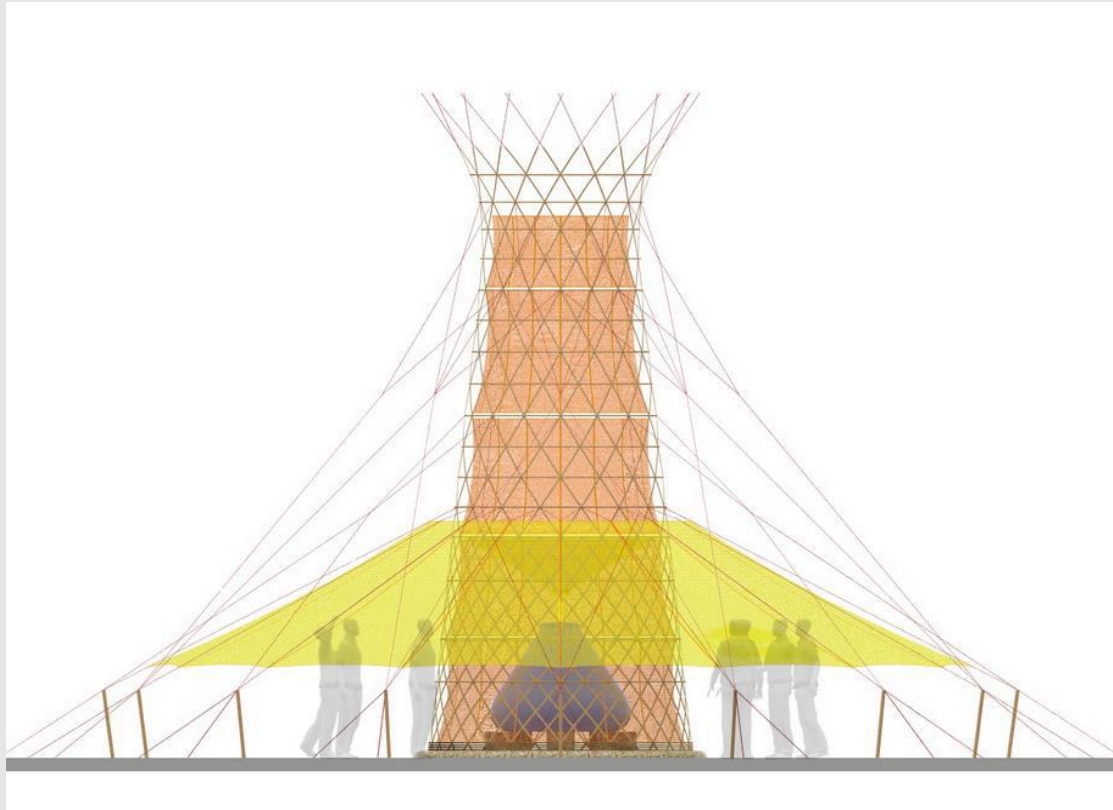
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The Warka Water Social Design Project

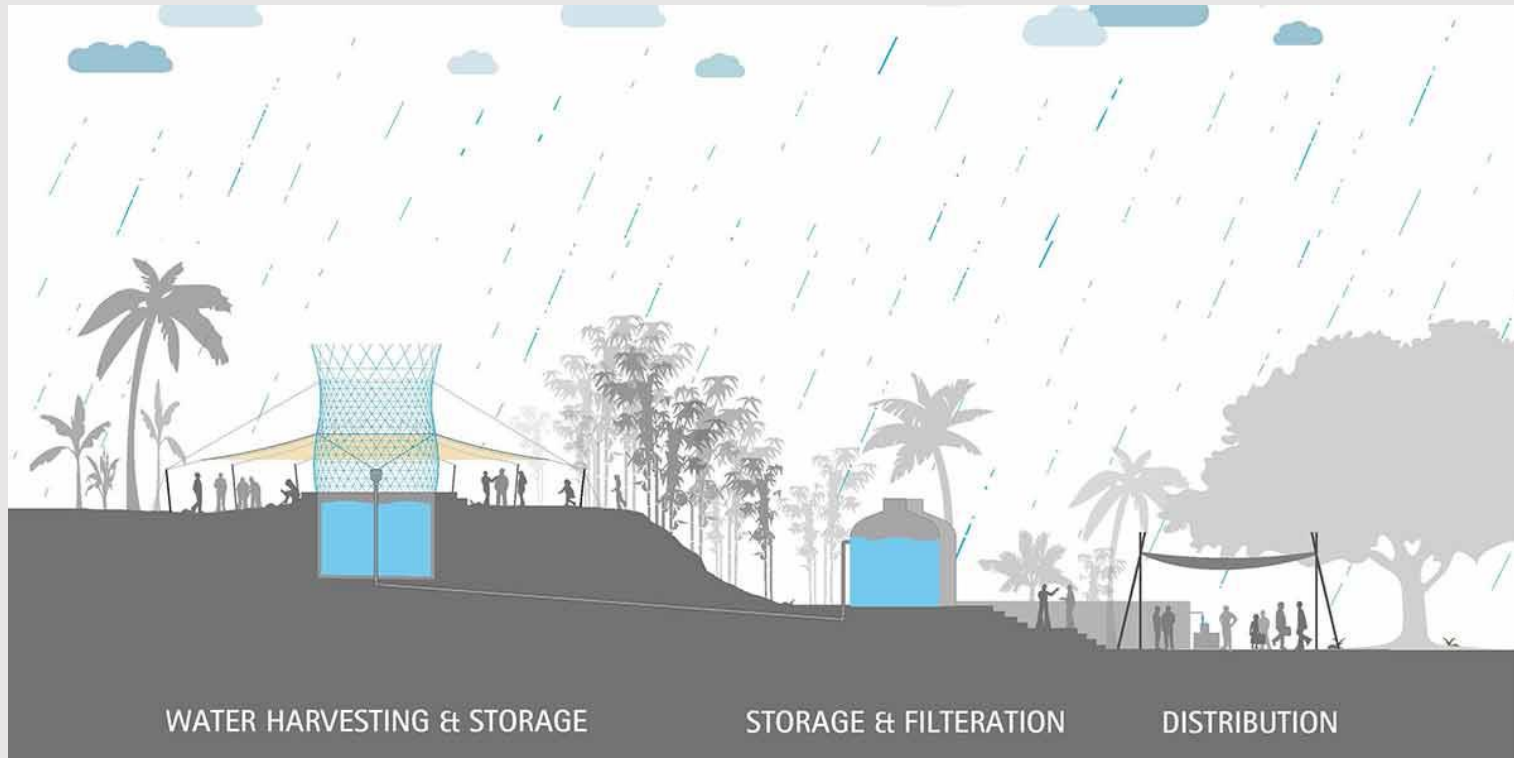
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<http://www.warkawater.org/>



The Warka Water Social Design Project



The Warka Tower is designed to harvest potable water from the atmosphere (**it collects rain, harvests fog and dew**). It functions only by natural phenomena such as gravity, condensation & evaporation and **doesn't require electrical power**.

The tower also creates a social place for the community, where people can gather under the shade of its canopy for **education and public meetings**. <http://www.warkawater.org/warka-tower-copy/>

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The Warka Water Social Design Project

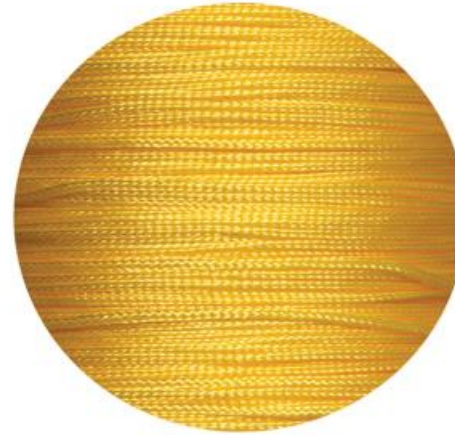
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BAMBOO



POLYESTER MESH



POLYESTER CABLE



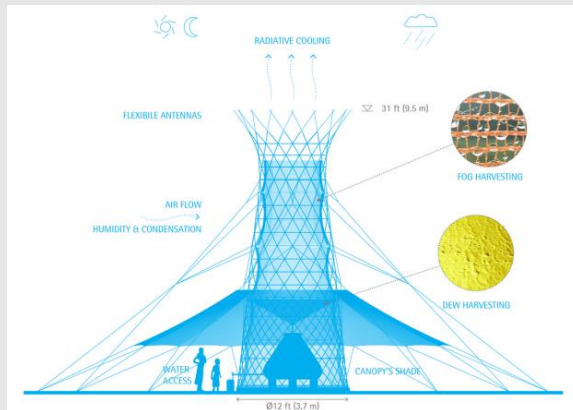
HEMP ROPE

Warka Tower is realized with biodegradable and 100% recyclable materials.
<http://www.warkawater.org/warka-tower-copy/>



Modelling the Warka Water Tower with 4D Frame

The iterative design concept underlying the development of the Warka bamboo tower can be introduced through 4Dframe workshop activities. When the main phases of the design process are reproduced in the form of **a problem-solving activity**, the structure provides first-hand experience in **developing engineering skills** containing practical, geometric and aesthetic aspects. Since the Warka tower is not only a structure, but also intends to serve **the better understanding our relationship with the environment** and move away from the “slash-and-burn” agriculture, which is responsible for deforestation, this project’s **social dimensions and ethical aspects** can also be explored and discussed.



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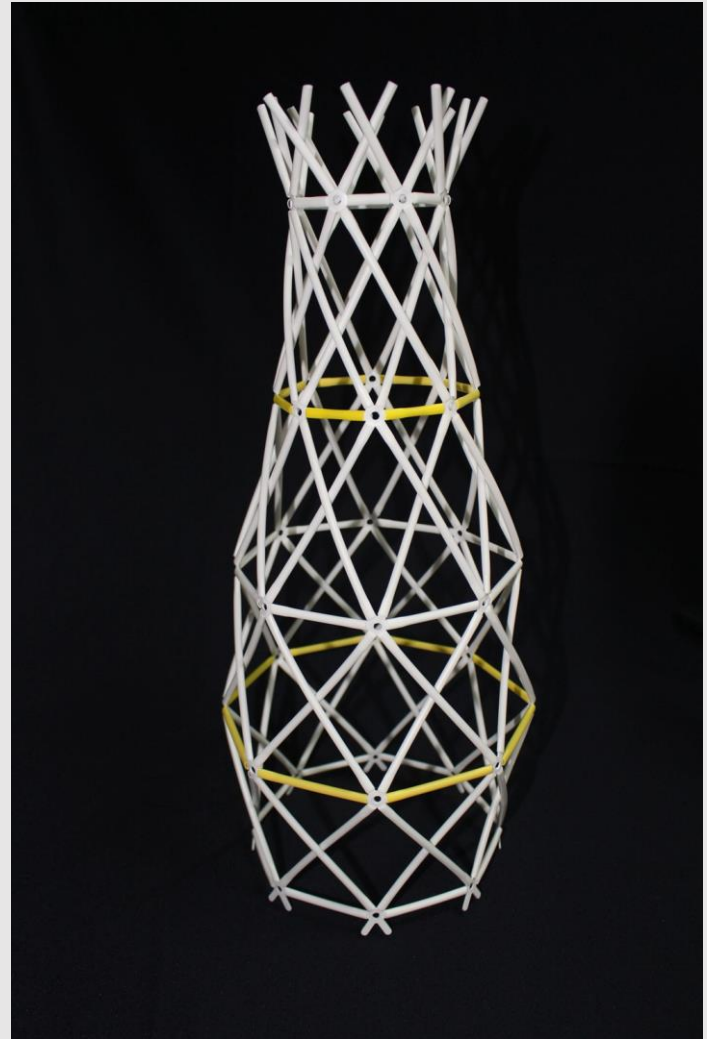
Tower of Hope

Small 4D Warka Water

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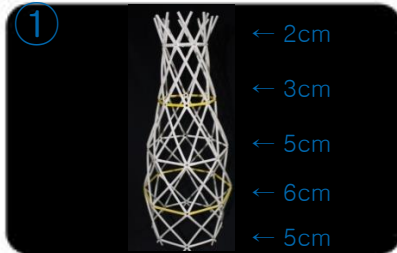
You need: 2 cm, 3 cm, 5 cm, 6 cm and 10 cm frames and 6 pods



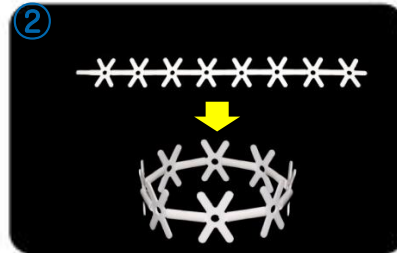


Tower of Hope

Small 4D Warka Water



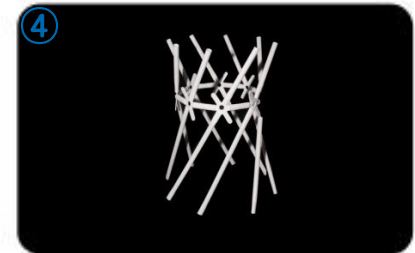
1 Check the length of each frame.



2 Insert 8 pieces of 2cm frames into 6 pods and connect the ends as shown.



3 Insert 10 cm frames into (2) diagonally (/).

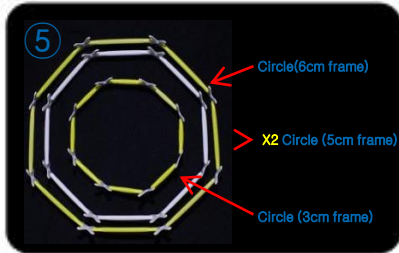


4 Join 5cm frames on the upper part of (3) like in (3).

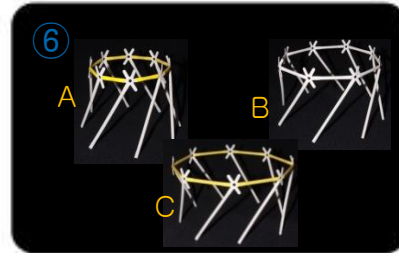


Tower of Hope

Small 4D Warka Water



Insert 6cm, 5cm, and 3cm frames into 6pods like in (2). Create one 6cm, two 5cm and one 3cm chain as shown.



Connect 10cm frames downwards in (/) into each chain created in (5).



Join (4) on A of (6).

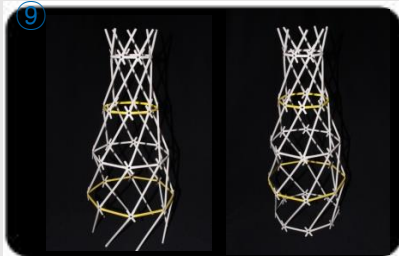


Join (7) on B of (6).

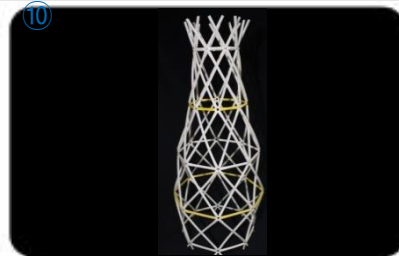


Tower of Hope

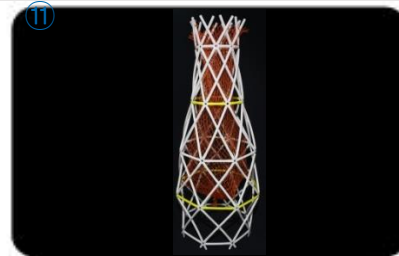
Small 4D Warka Water



Join (8) on C of (6) and insert the 5cm chain on the bottom.



Join 10cm frames downwards in (\) and also 5cm frames upwards in (\).



Attach a mesh inside (10).



Ready!



Tower of Hope

The Super 4D Frame Warka Water Tower



The Super 4D Frame Warka Water Tower set is ideal for **outdoor community building activities**. The structure can reach **a height of 5 meters**.

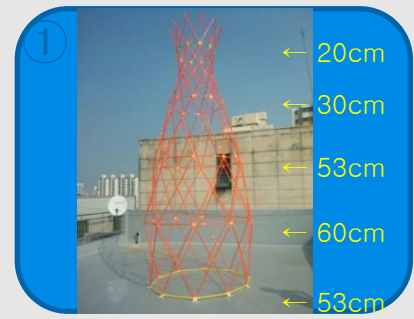
You need super size 53 cm and 60 cm frames, transparent flat pods, and 6 pods





Tower of Hope

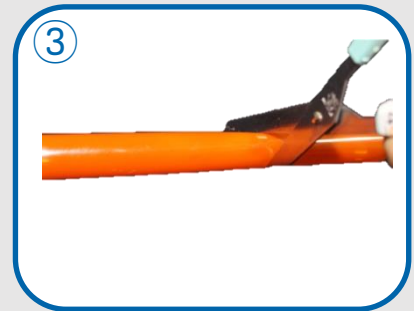
The Super 4D Frame Warka Water Tower



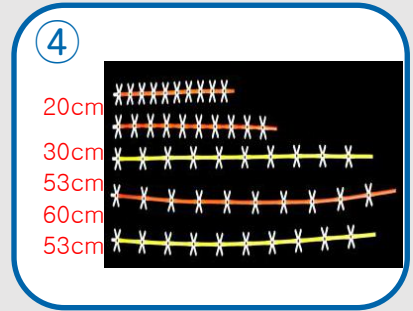
1 Check the length of each frame and pod.



2 Insert two 60cm frames into a transparent flat pod frame. Create 80 identical units.



3 Cut 60cm frames into 20 and 30cm frames. Create 10 units of each.

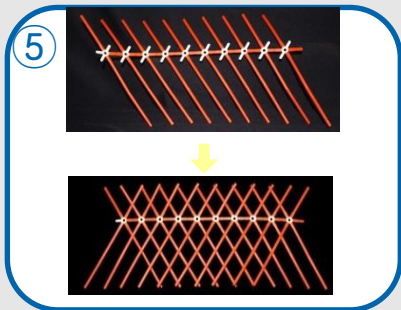


4 Join 10 units of 6pods into each frame according to the illustration.

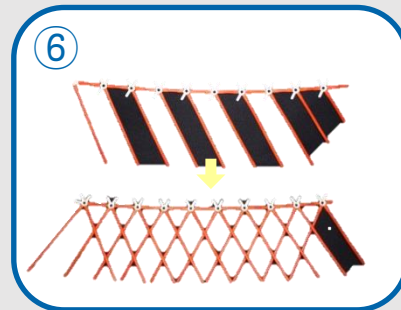


Tower of Hope

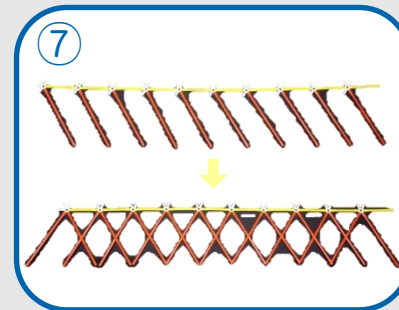
The Super 4D Frame Warka Water Tower



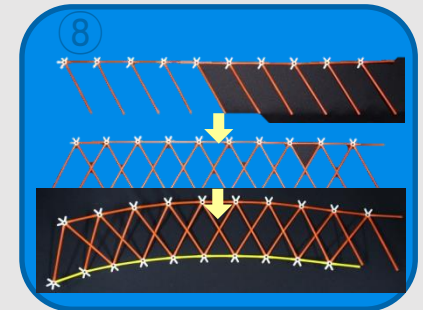
Join 60cm frames on the 20cm frame connected shape in (2) in (\) and then join 60cm frames in (/) as shown.



Join 60cm frames on the 30cm frame connected shape in (2) in (\) and then join 60cm frames in (/) as shown.



Join 60cm frames on the 53cm frame connected shape in (2) in (\) and then join 60cm frames in (/) as shown.

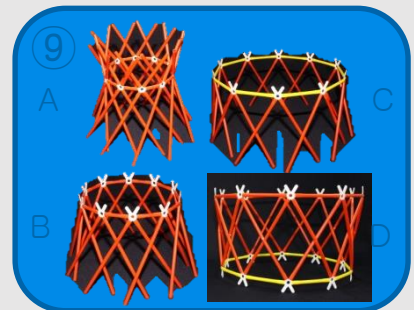


Join 60cm frames on the 53cm frame connected shape in (2) like 7 and connect it using 53cm frames and 6pods.

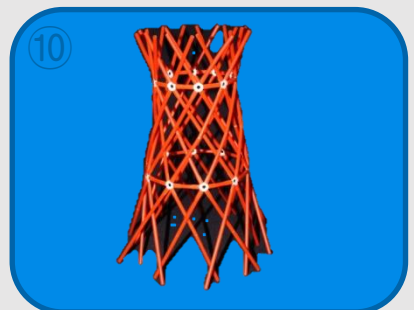


Tower of Hope

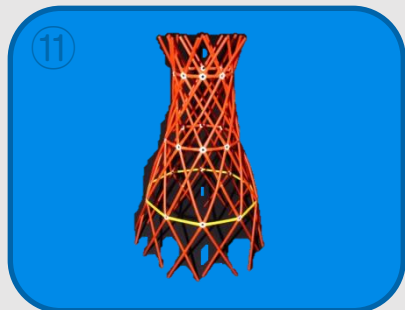
The Super 4D Frame Warka Water Tower



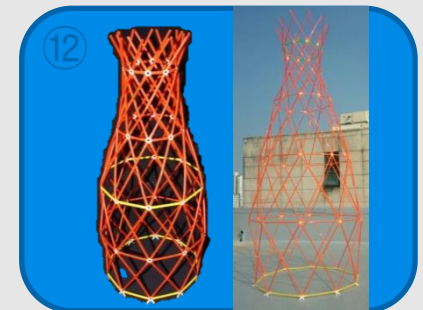
Join both ends of (5) and (6).



Join A into B of (9).



Join (10) into C of (9).



Join (11) into D.



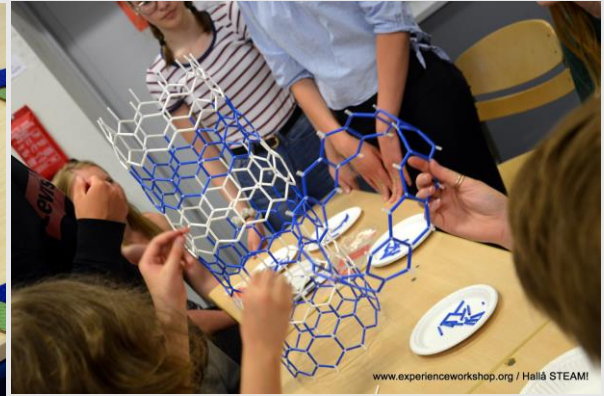
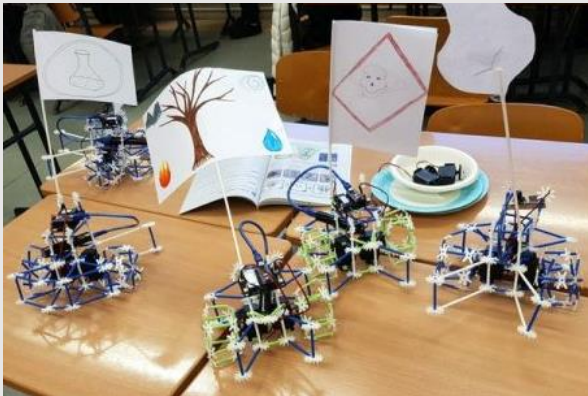
HALLÅ STEAM!



This educational material was created within the frameworks of the HALLÅ STEAM! program, realized with the support of the **Swedish Cultural Fund** in Finland.

The **Swedish-Finnish STEAM Learning Day “HALLÅ STEAM!”** offers STEAM activities, partially based on historical connections between art and sciences in the Swedish-Finnish context.

The content of the STEAM Learning Day **involves local teachers and students** of the hosting school and is designed in close cooperation with them.



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Who are we?

Osmo Pekonen (1960) docent of
mathematics, history of science and
history of civilization

Kristóf Fenyvesi (1979) PhD,
researcher of STEAM education

Johan Sten (1967) docent of technology,
mathematics researcher, science historian

Keskipohjanmaa-lehti/Jukka Lehojärvi

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SYNERGIES IN ACTION

Our goal is to offer opportunities for everyone to learn mathematics through the arts, and to create art through mathematics.

NETWORK & EVENTS

We organize creative school days / mathematics & art education programs / multidisciplinary festivals / family days / exhibitions / workshops / seminars and trainings

FULL STEAM AHEAD

We offer research, consultancy and project management in the field of multidisciplinary learning and STEAM (Science, Technology, Engineering, Arts and Mathematics) education.

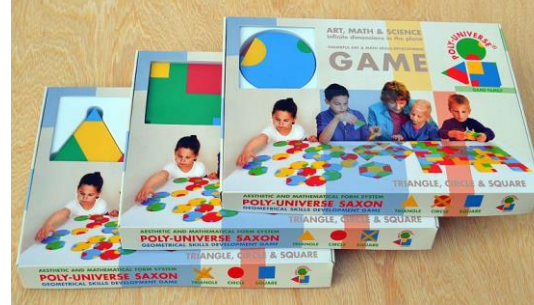
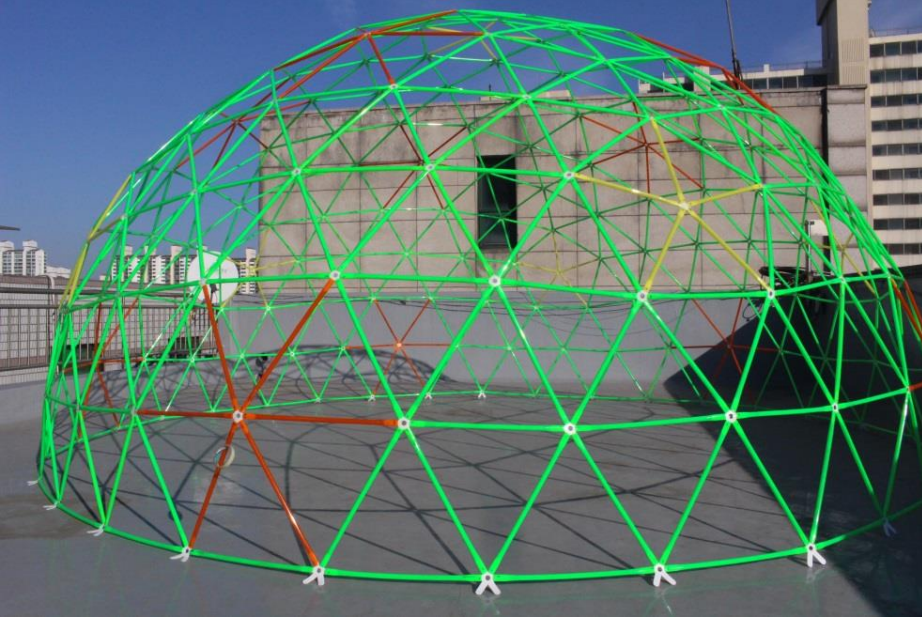
ARTS AND SCIENCE FOR CHILDREN

Our International Travelling Exhibition of Mathematical Art is ready to visit you. The collection includes artworks, scientific modelling tools, math-art puzzles, and other spectacular objects.

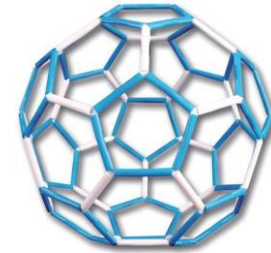


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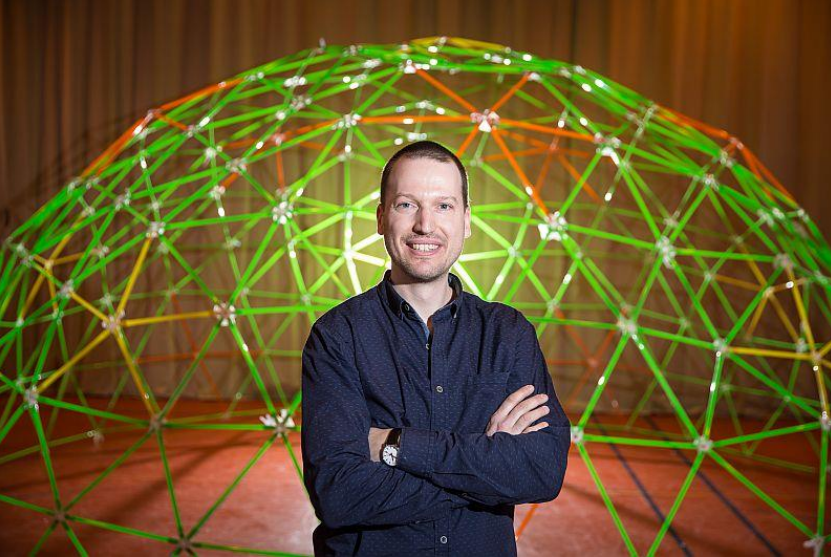


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tinyurl.com/mathart-channel

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