

# “Over The Top”

## Developping the Shapeways 17x17x17

M. Oskar van Deventer

New York Puzzle Party Symposium

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This talk and puzzle were sponsored by



# Outline

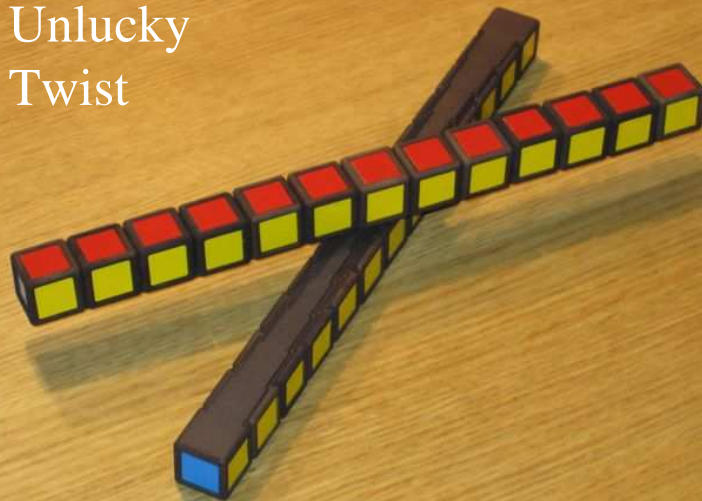
- Oskar, puzzle designer
- To ever higher  $N \times N \times N$  “Rubik’s Cubes”
  - Rubik, Sebestini, Krell, Verdes, Le, ...
- Designing these twisty puzzles
- The Shapeways  $17 \times 17 \times 17$

# Oskar, puzzle designer



- Started in 1978 at age 12
- Designed 100's of mechanical puzzles
- Hanayama, Smart Games, Recent Toys, Mefferts, ...
- Day-time: making internet TV standards
- World records: 1x2x13, 2x2x23, 3D-print Shapeways

Unlucky  
Twist

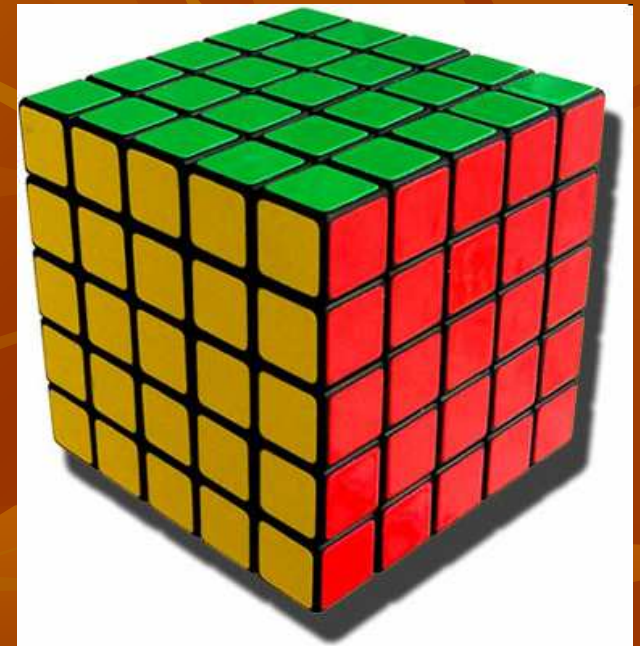
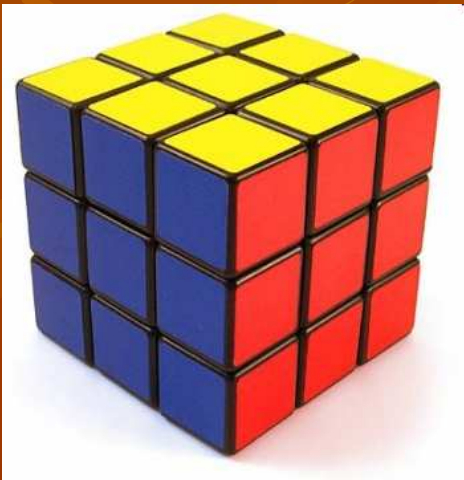


Overlap  
Cube



# To ever higher $N \times N \times N$ “Rubik’s Cubes”

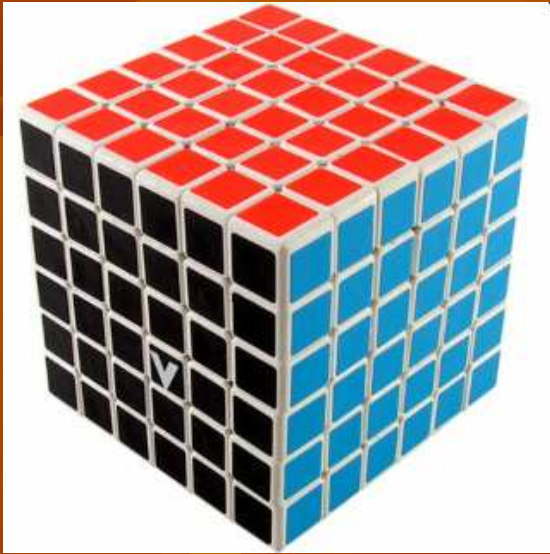
- $3 \times 3 \times 3$ : Erno Rubik, Budapest, 1974
- $4 \times 4 \times 4$ : Péter Sebestény, Hamburg, 1980
- $5 \times 5 \times 5$ : Udo Krell, Hamburg, 1986



Source: Jerry Slocum et al, “The Cube: The Ultimate Guide to the World's Best-selling Puzzle: Secrets, Stories, Solutions”, 2009, ISBN-13: 9781579128050

# To ever higher $N \times N \times N$ “Rubik’s Cubes”

- 6x6x6 – 11x11x11: Panagiotos Verdes, 2003



Verdes, P.K.: “Cubic logical game”, patent  
GR20030100227 20030521, 2003

# To ever higher $N \times N \times N$ “Rubik’s Cubes”

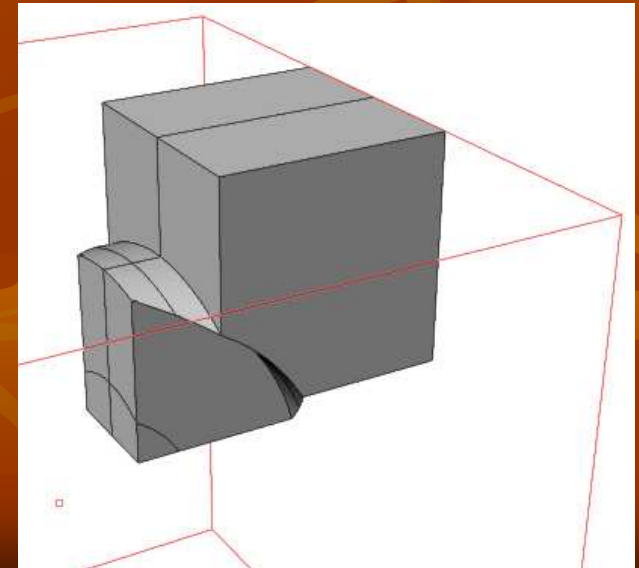
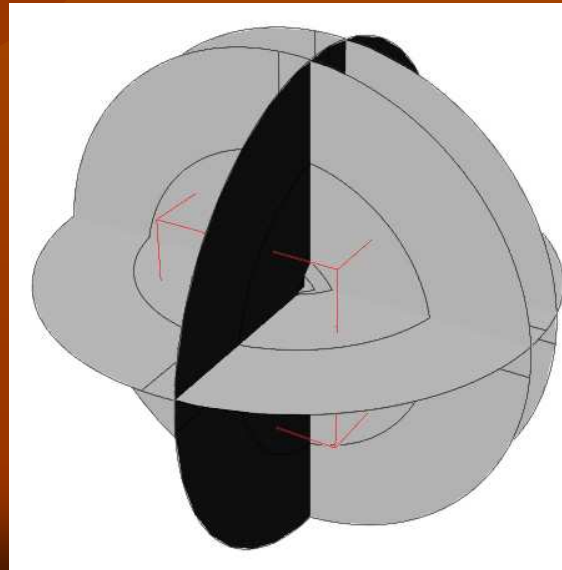
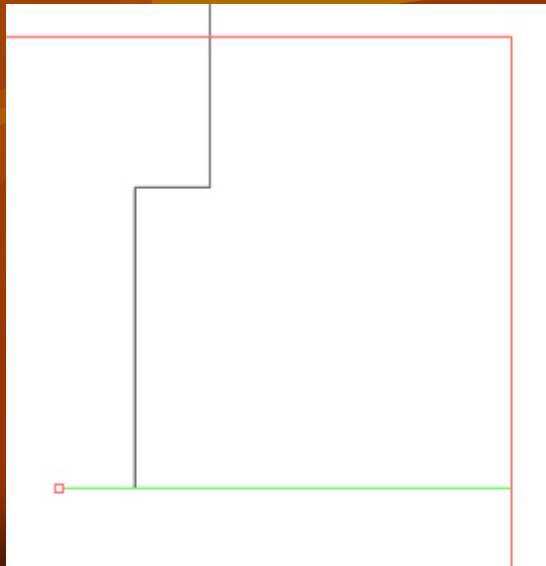
- $12 \times 12 \times 12$ : Leslie Le, 2009



Leslie Le, “The world's first  $12 \times 12 \times 12$  cube”, Nov 20, 2009,  
<http://twistypuzzles.com/forum/viewtopic.php?f=15&t=15424>,

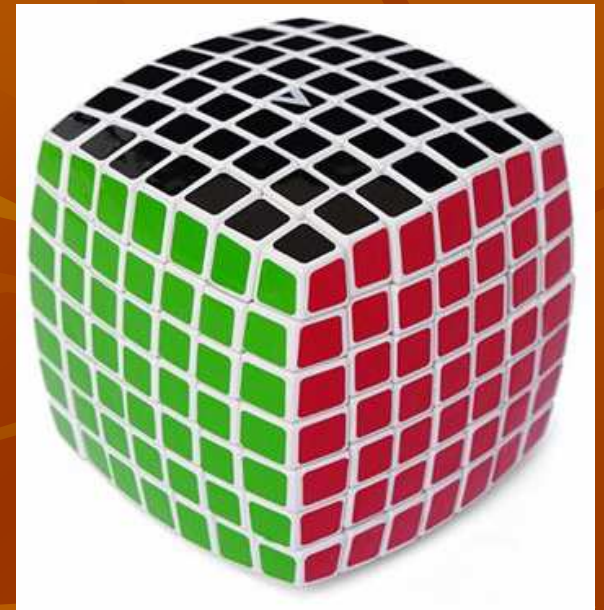
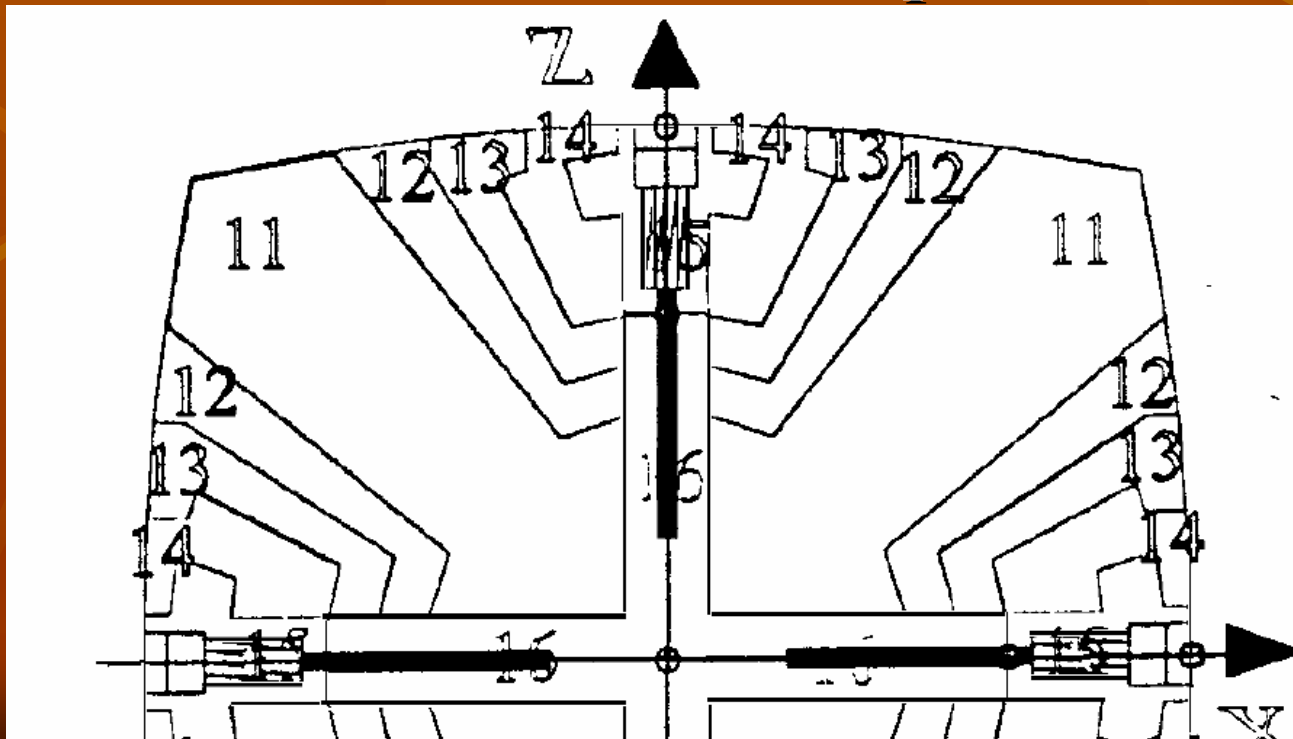
# Designing these twisty puzzles

- Recipe:
  - Design cut curves → the creative part!
  - Revolve, boolean intersections
  - Offsets, rounding, hollowing, meshing → work
- Example: Rubik's Cube



# Designing these twisty puzzles

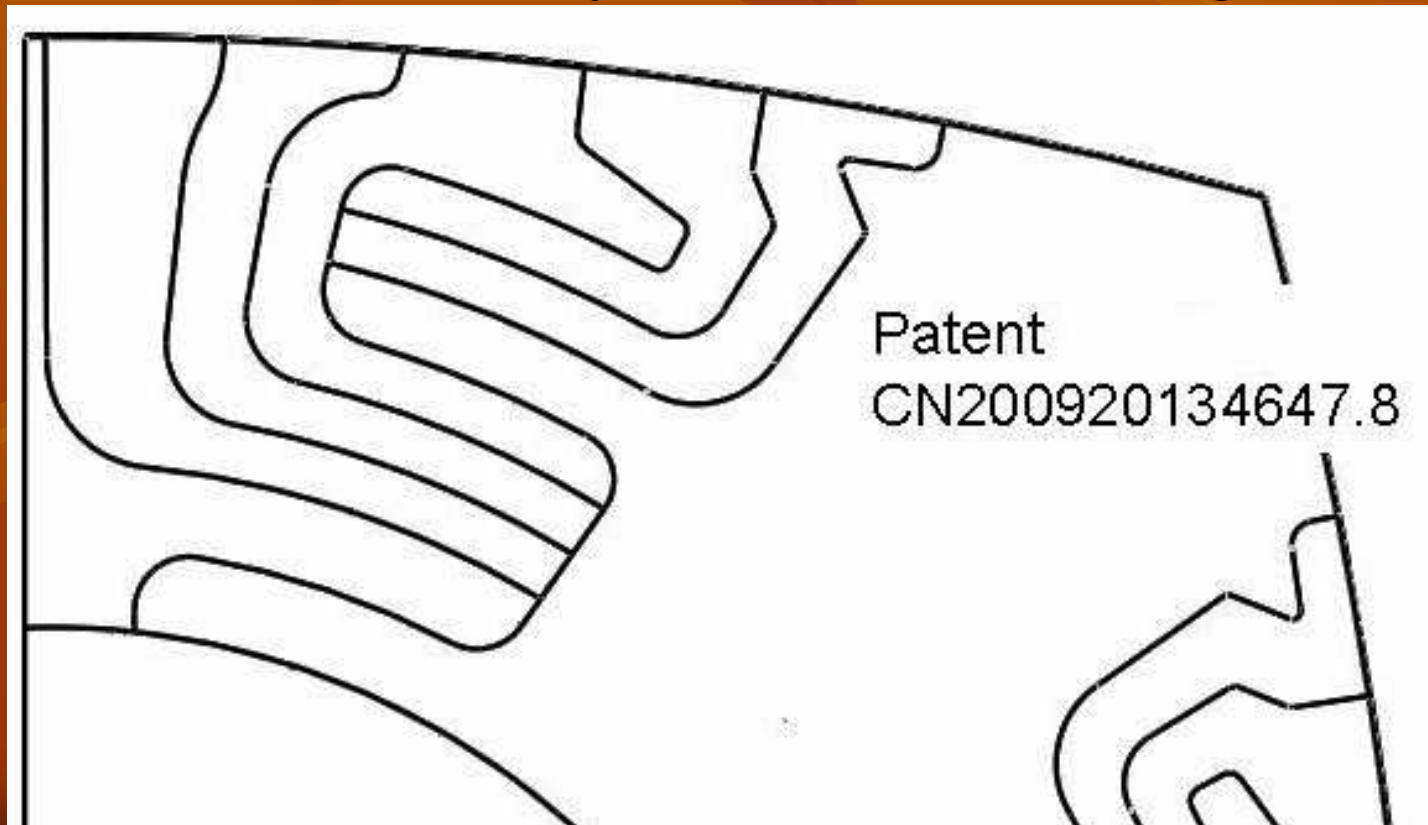
- Verdes brilliance:
  - Curved outside  $\rightarrow$  7x7x7 corner stays attached
  - Spherical shells  $\rightarrow$  stable turning
  - Conical cuts  $\rightarrow$  robust pieces





# Designing these twisty puzzles

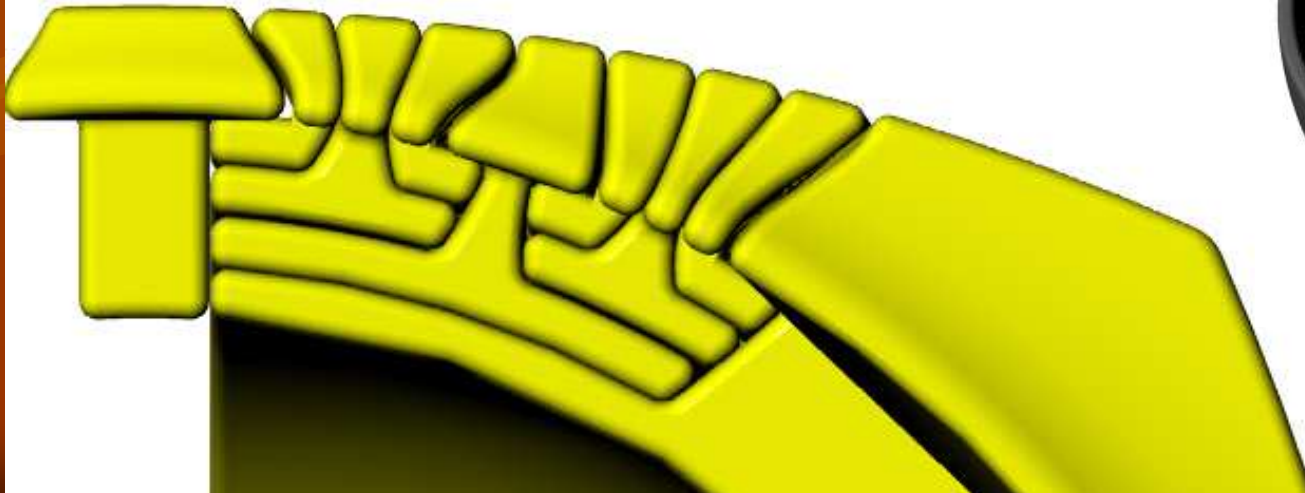
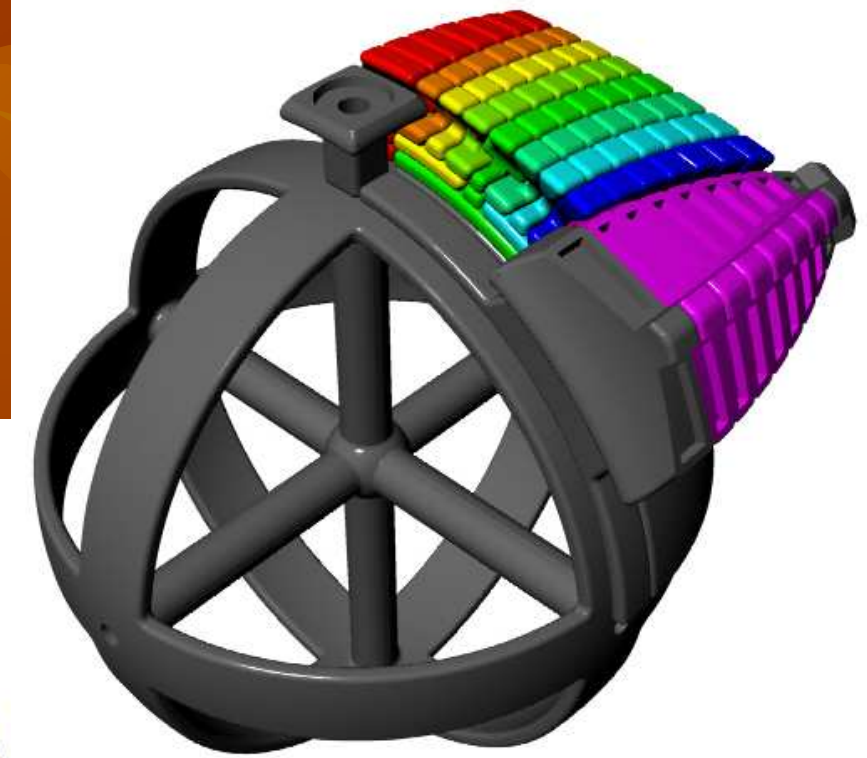
- Leslie Le brilliance:
  - Corner hanging → additional stability
  - Extremely clever curve design



Leslie Le, Chinese  
patent 2009.08.1  
CN200920134647.8

# The Shapeways 17x17x17

- Oskar attempt 1, January 2010
  - Pagoda style: center-corner-edge hanging
  - Binary recursion



# The Shapeways 17x17x17

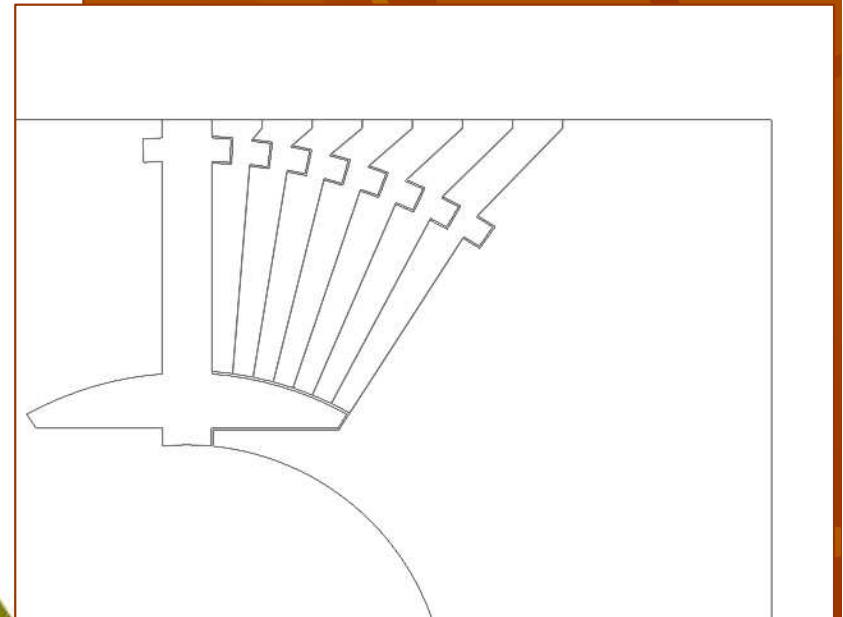
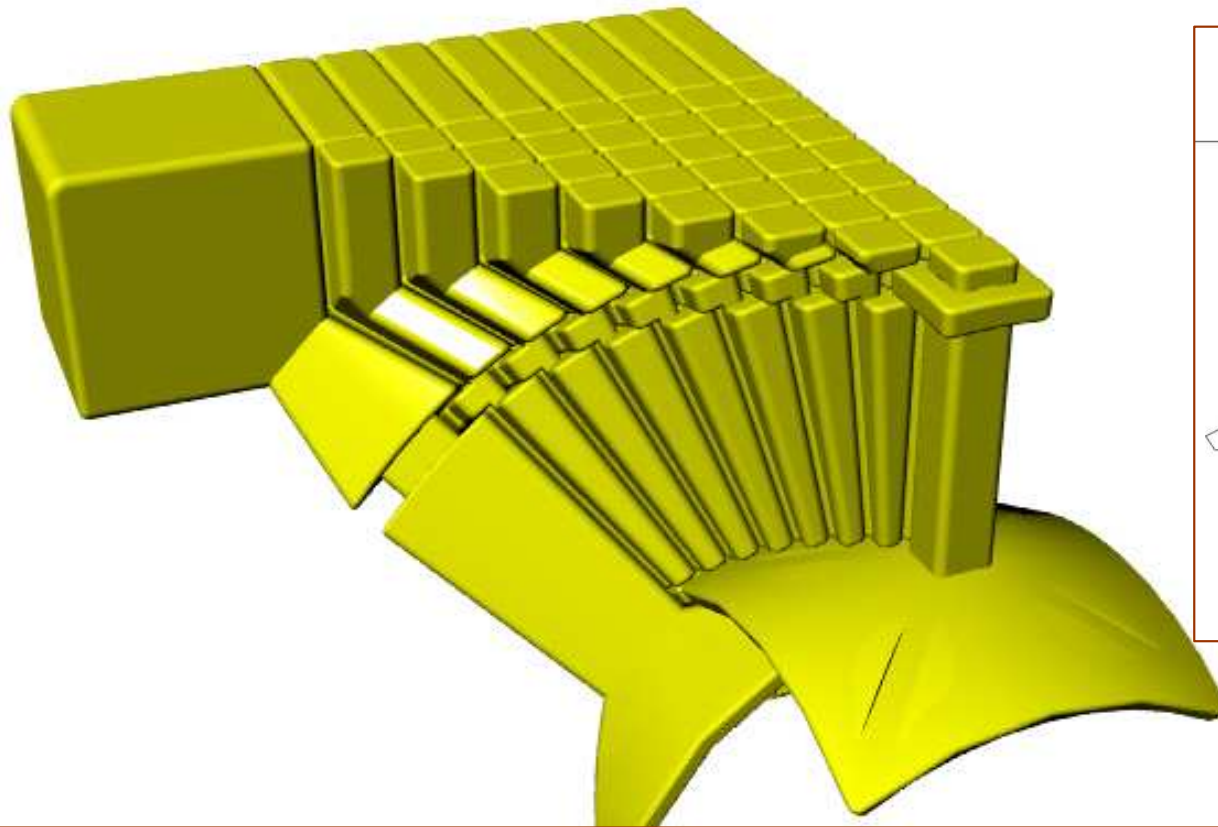
- Oskar attempt 1, January 2010
  - Failure: too much friction, pieces falling out



Sponsored and built  
by Claus Wenicker,  
3D-printed by  
Shapeways

# The Shapeways 17x17x17

- Oskar attempt 2, November 2010
  - Floating anchors: long pieces for stability
  - Hanging from centers-edges-corners



# The Shapeways 17x17x17

- Oskar attempt 2, November 2010
  - Success at last! Bit loose ...



Sponsored and built  
by Claus Wenicker

# The Shapeways 17x17x17

- Today, shown live for the first time!
- Perfect prototype no. 3, printed by Shapeways



# The Shapeways 17x17x17



# The Shapeways 17x17x17

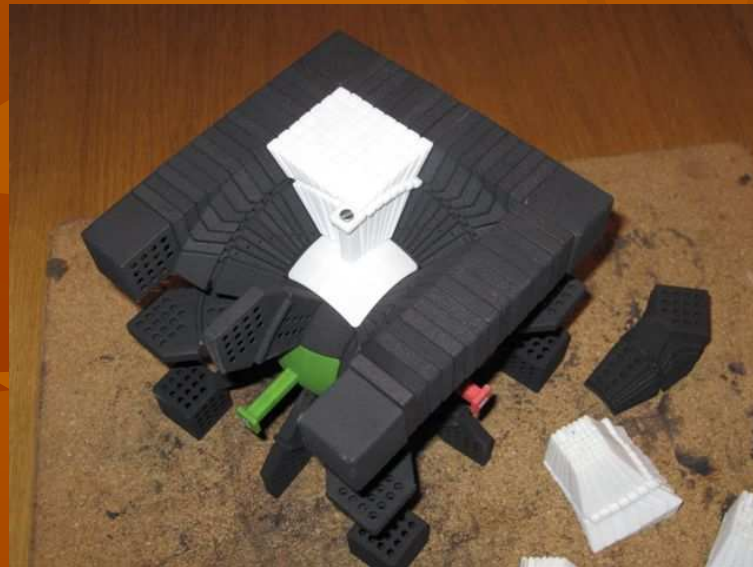
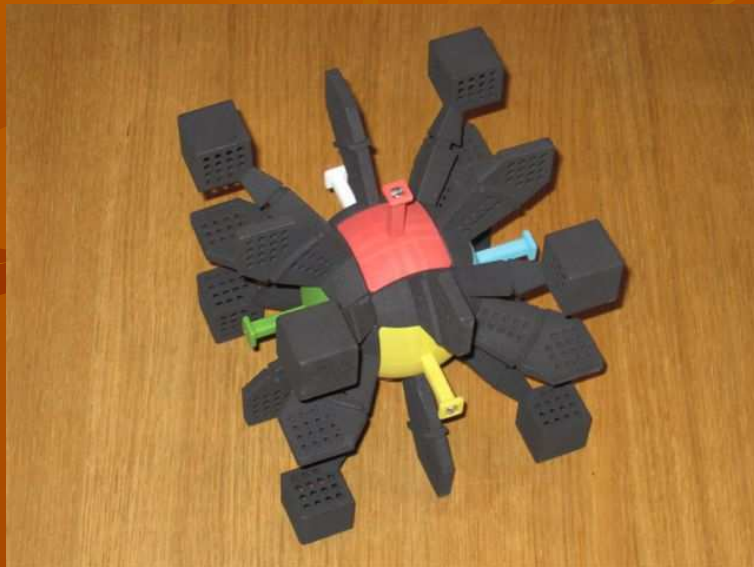




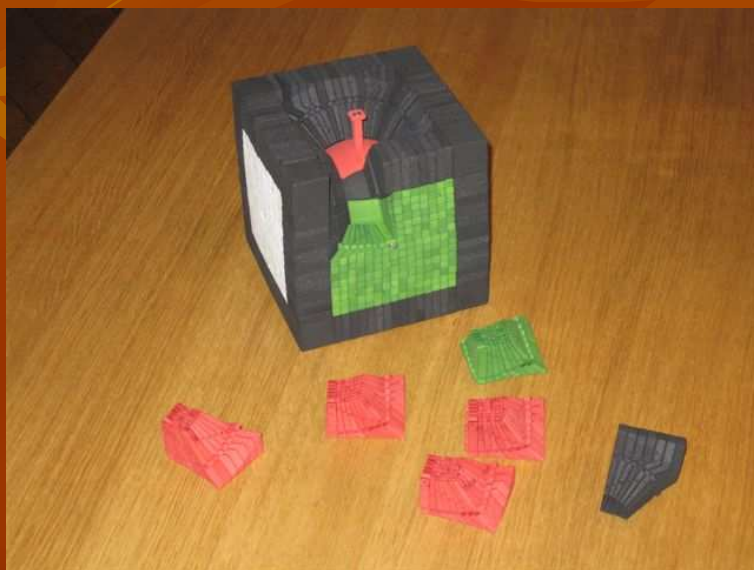
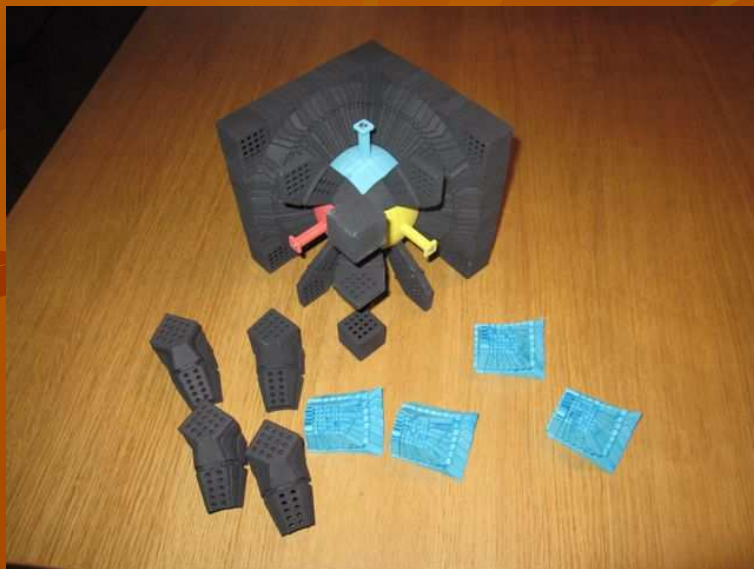
# The Shapeways 17x17x17



# The Shapeways 17x17x17



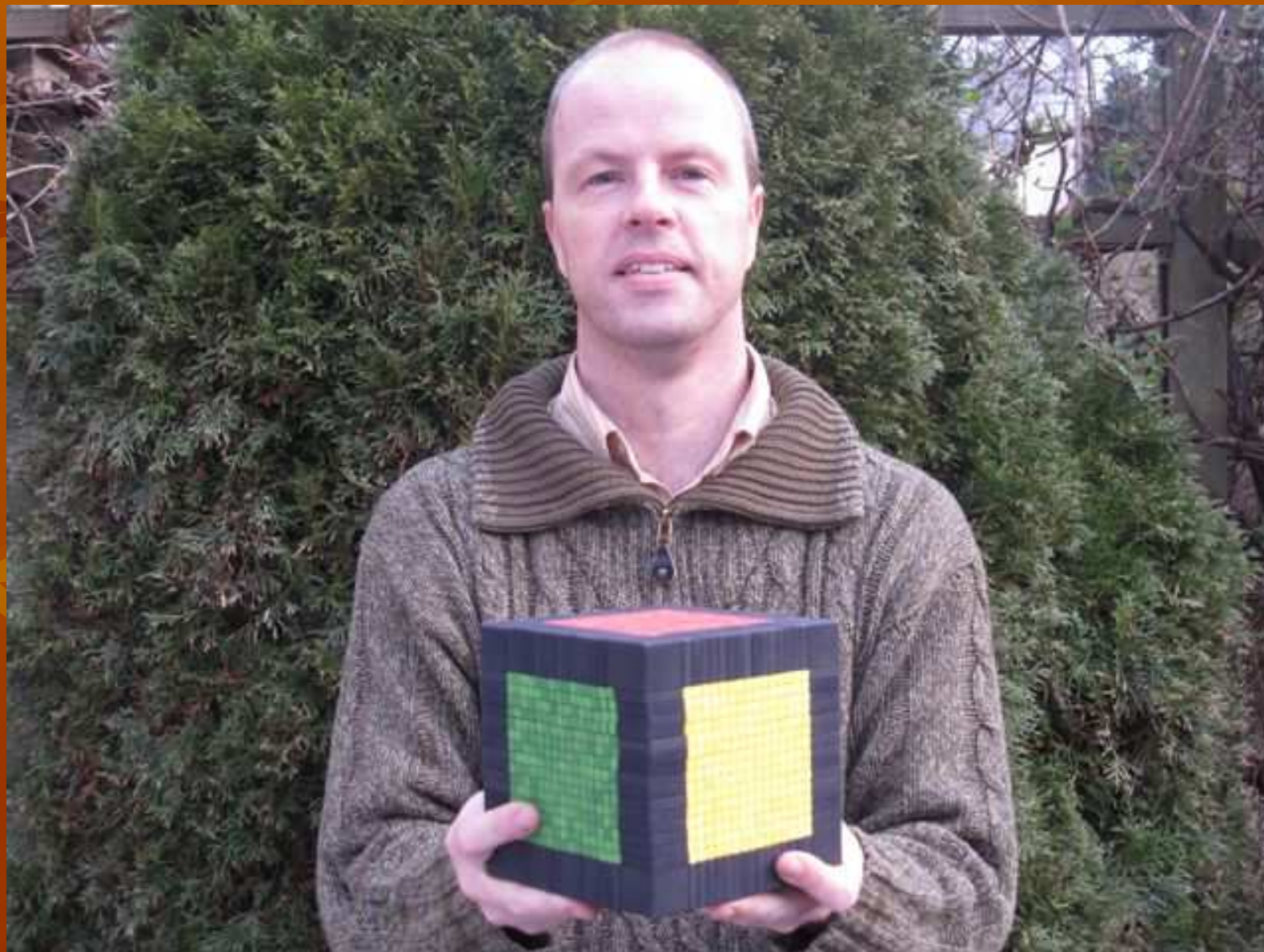
# The Shapeways 17x17x17



# The Shapeways 17x17x17



# The Shapeways 17x17x17



# Acknowledgements

- Shapeways
  - Fantastic Shapeways Shops and great 3D printing
  - Sponsoring this talk and the 17x17x17 prototype
- Claus Wenicker
  - Building first two 17x17x17 attempts
- Leslie Le
  - Sharing his 12x12x12 secrets
- José van Deventer
  - YouTube videos, endless support



# Acknowledgements

- Wim van Deventer
  - I dedicate this puzzle to the tender memory of my beloved father, who taught me to live life to the fullest



**Thank you!**

