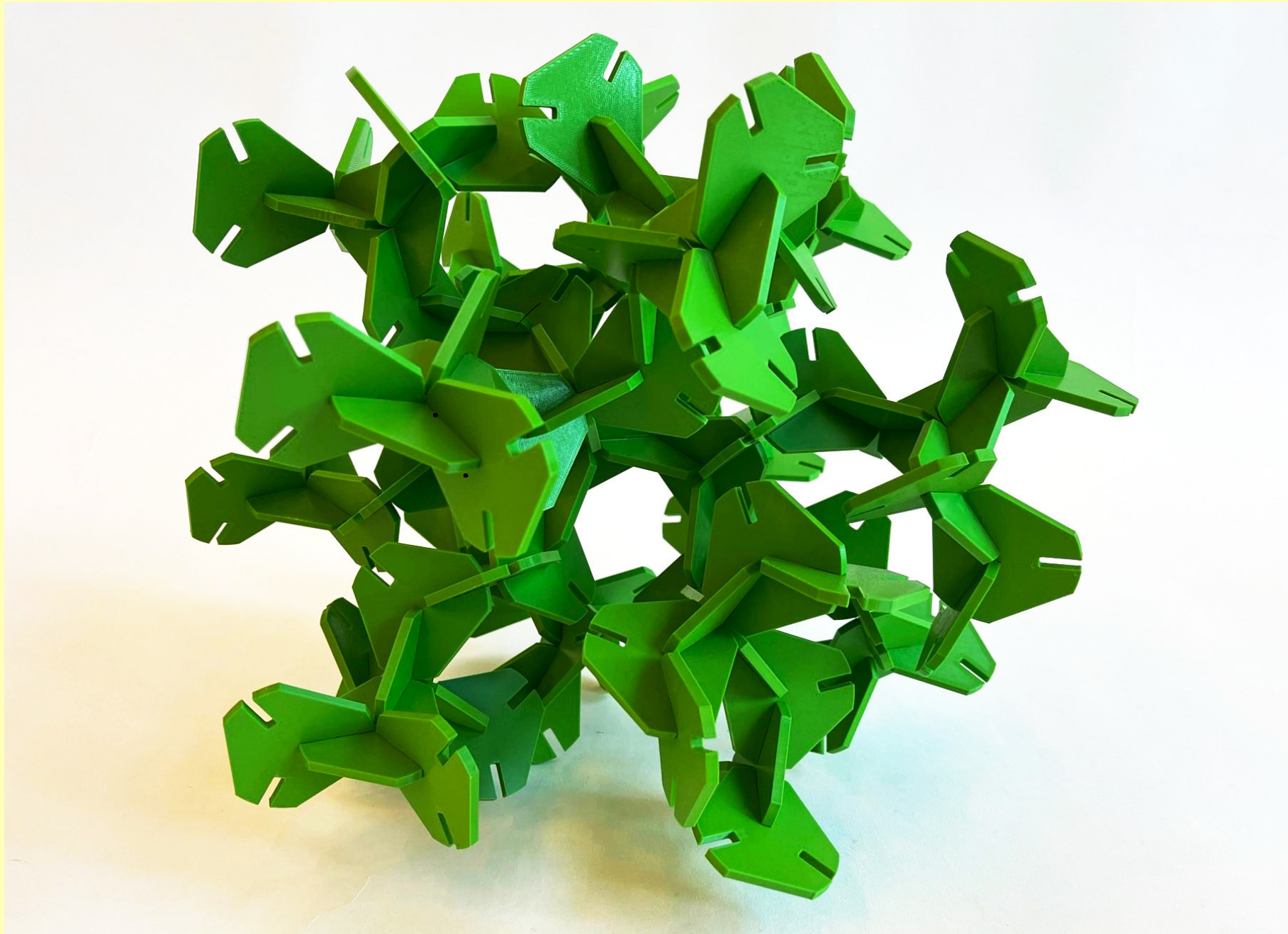


AN APERIODIC MODULAR SCULPTURE

SHINTARO FUSHIDA-HARDY,
JOINT WITH PETER HUXFORD

AN APERIODIC MODULAR SCULPTURE

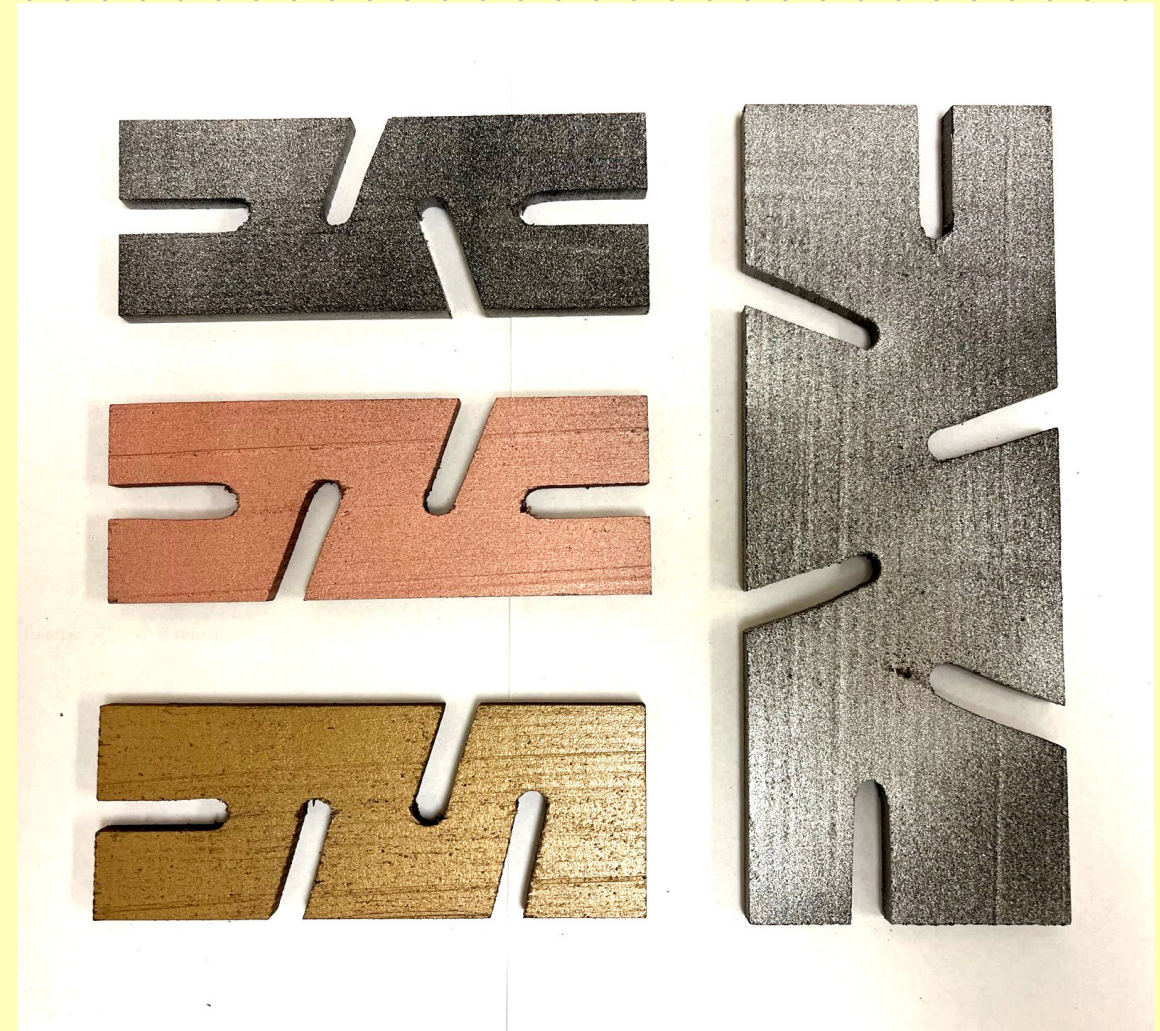
SHINTARO FUSHIDA-HARDY, WITH PETER HUXFORD



FROGBIT NETWORK, 2024

AN APERIODIC MODULAR SCULPTURE

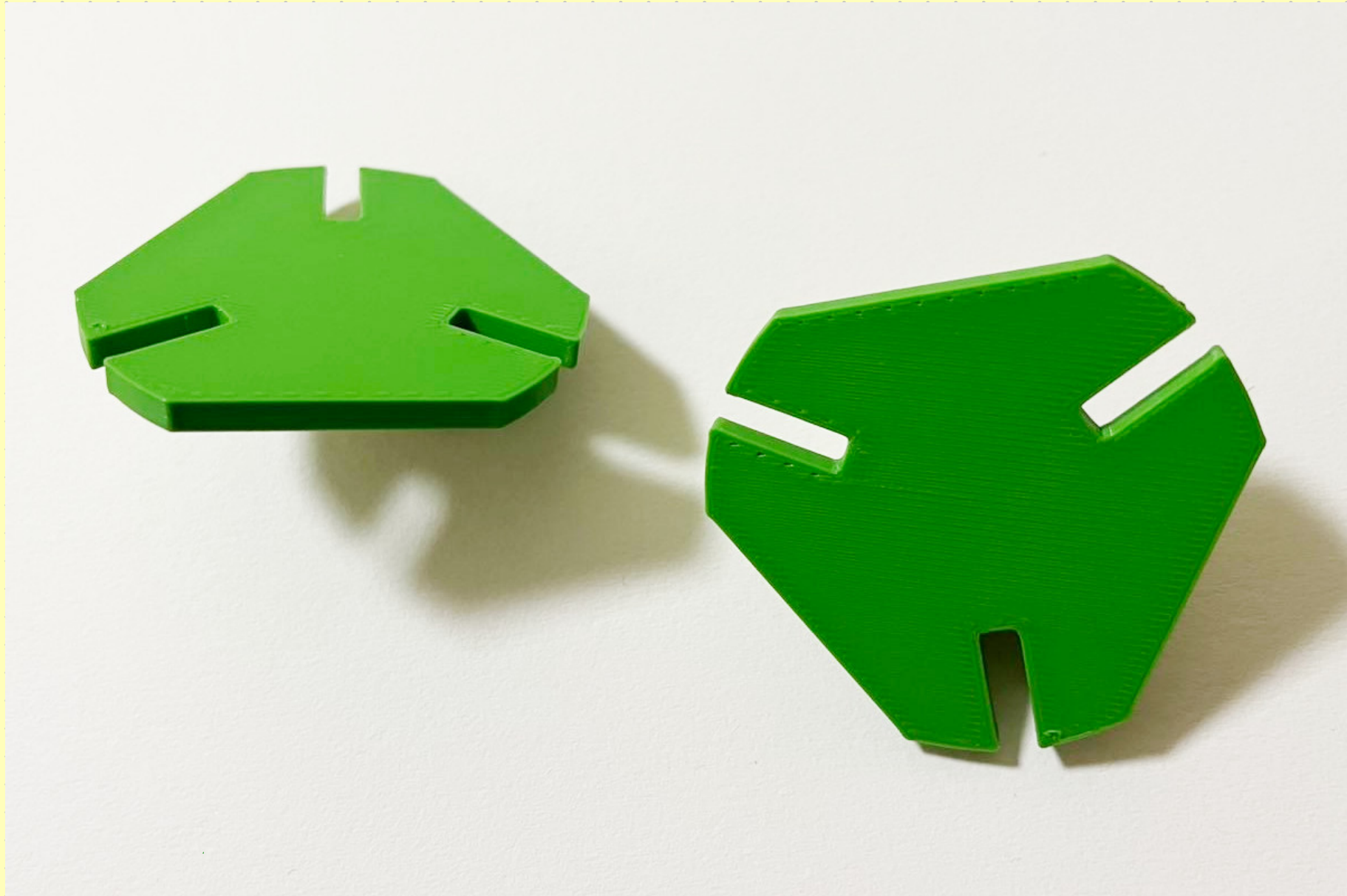
SHINTARO FUSHIDA-HARDY, WITH PETER HUXFORD



FLOWERMOUNTAIN, 2022

AN APERIODIC MODULAR SCULPTURE

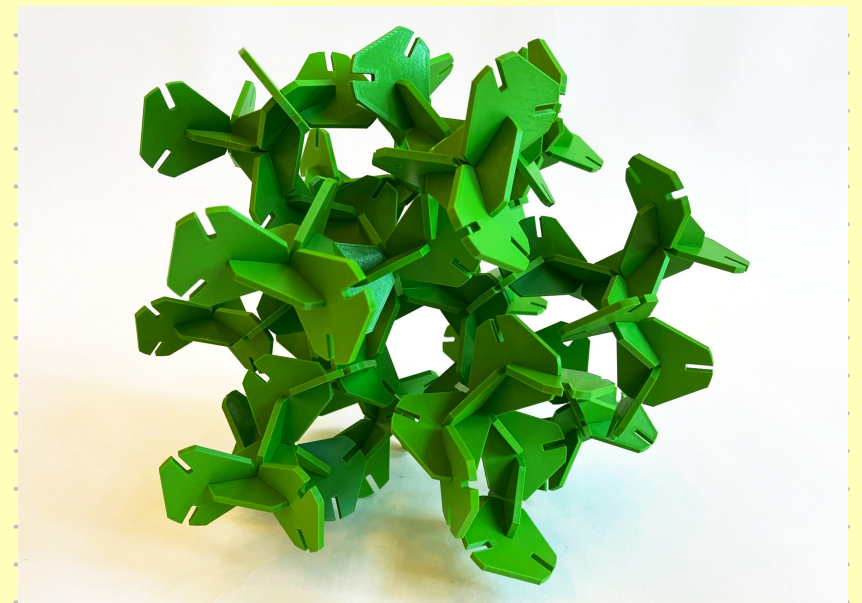
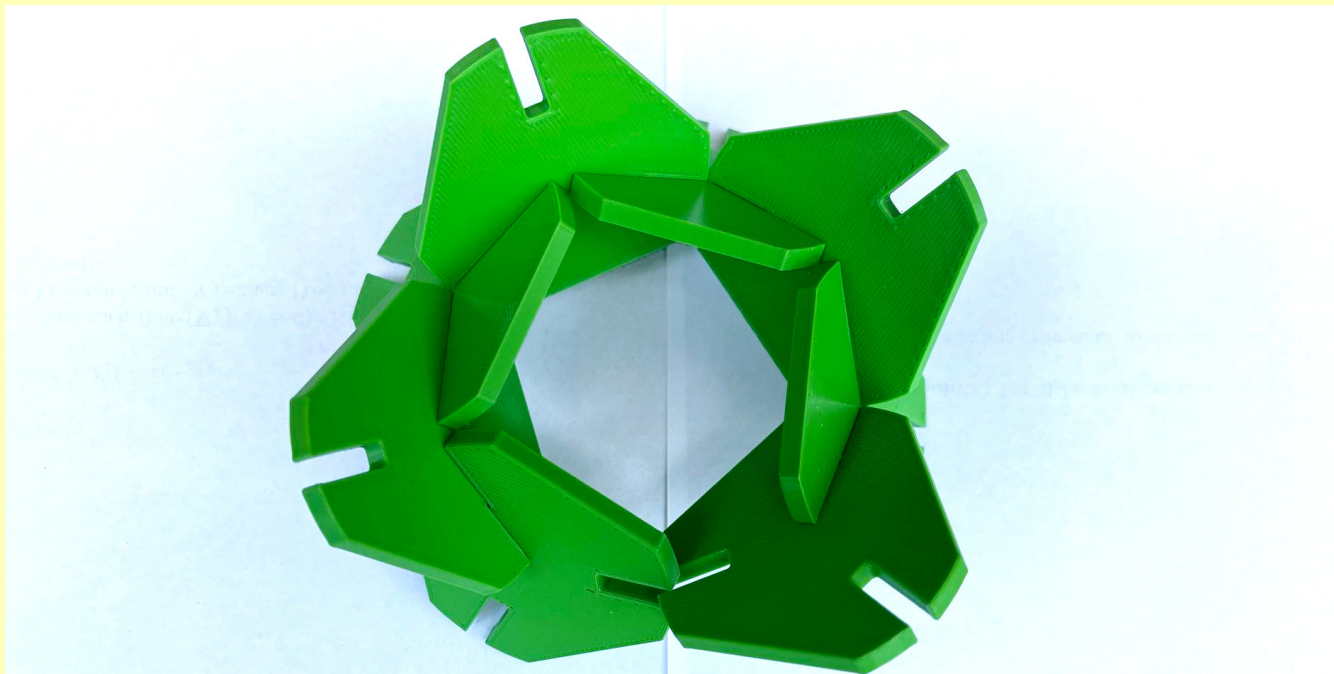
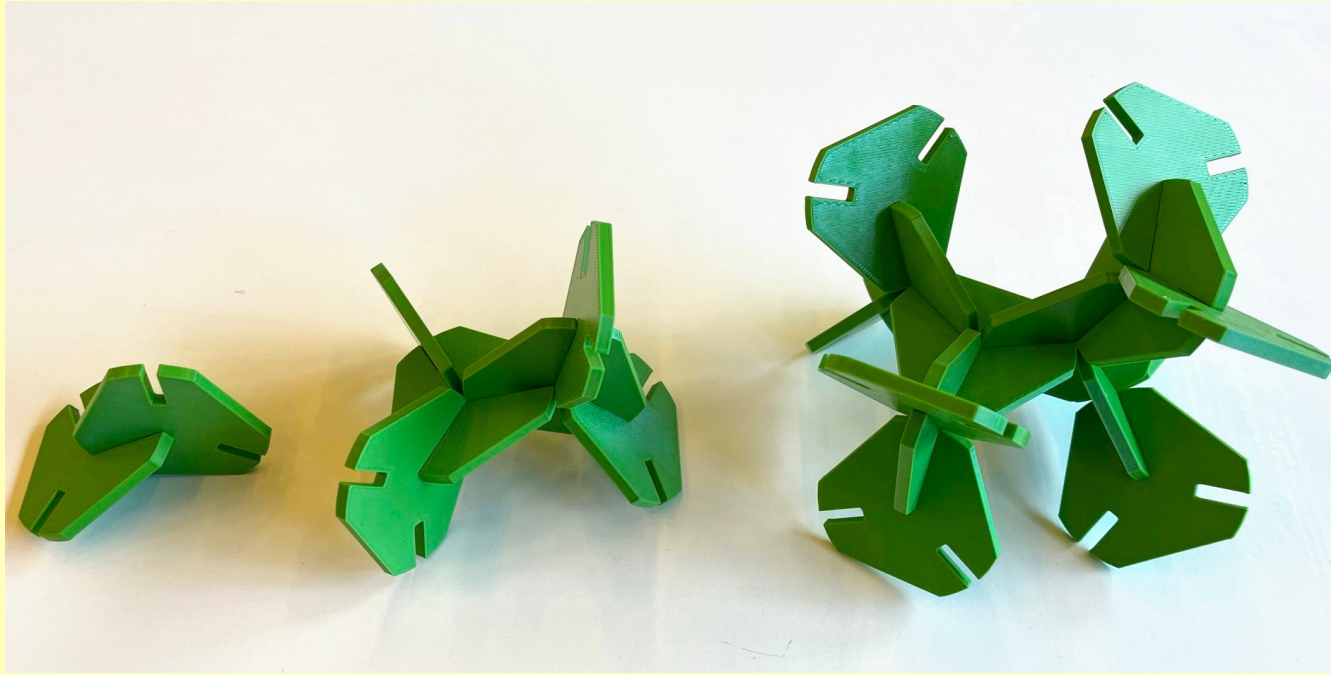
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THE MODULES

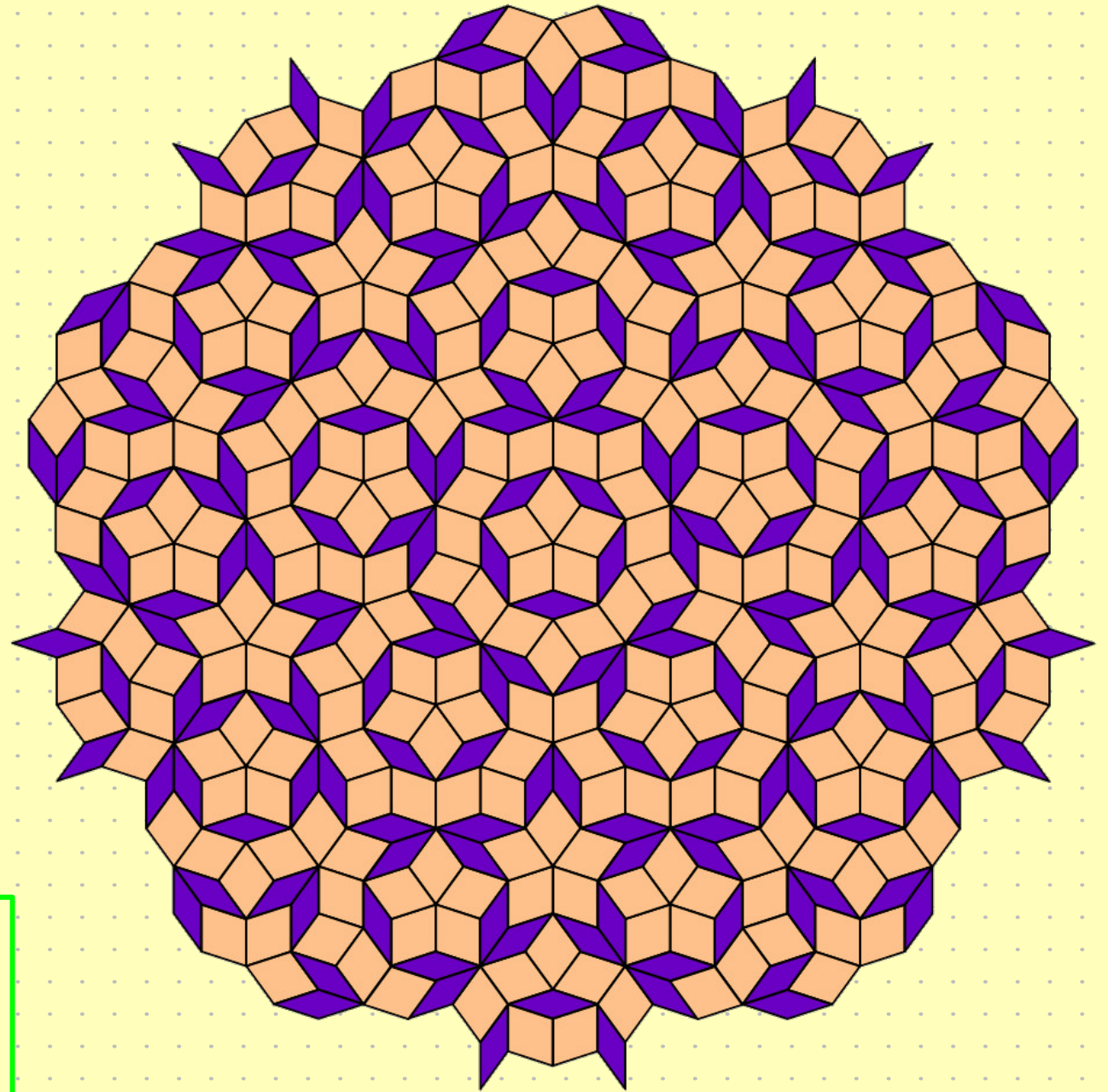
AN APERIODIC MODULAR SCULPTURE

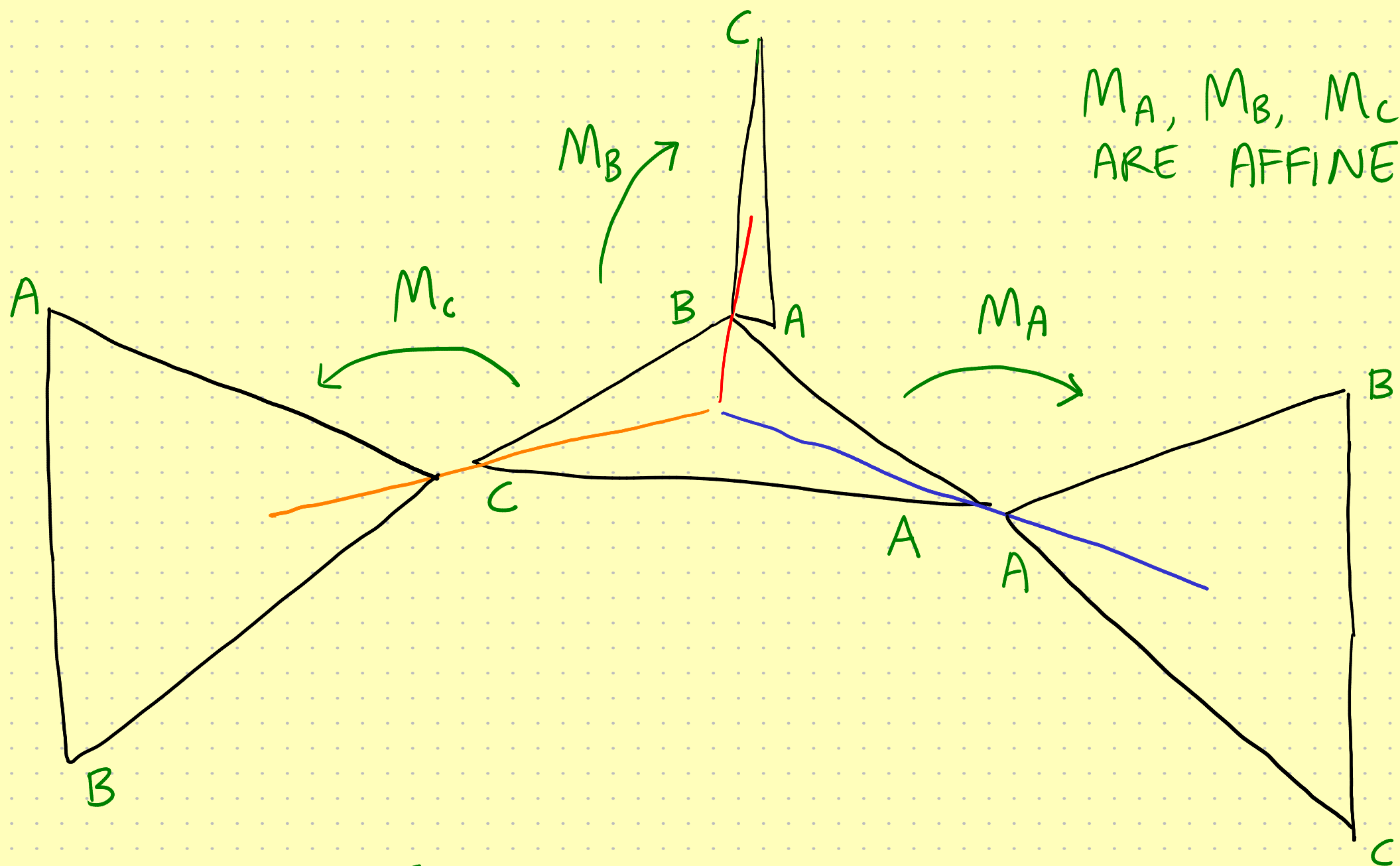
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APERIODIC
 $\longleftrightarrow$
NO TRANSLATIONAL
SYMMETRIES

PENROSE TILING,
EXHIBITING 5-FOLD
ROTATIONAL SYMMETRY

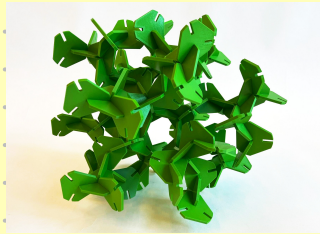




ROTATIONAL PARTS:

$$\text{ROT}(M_A) = a = \begin{pmatrix} -1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}, \quad b = \frac{1}{4} \begin{pmatrix} -1 & -\sqrt{3} & 2\sqrt{3} \\ -\sqrt{3} & -3 & -2 \\ 2\sqrt{3} & -2 & 0 \end{pmatrix}, \quad c = \frac{1}{4} \begin{pmatrix} -1 & \sqrt{3} & -2\sqrt{3} \\ \sqrt{3} & -3 & -2 \\ -2\sqrt{3} & -2 & 0 \end{pmatrix}$$

"WHAT ARE THE
SYMMETRIES OF



))



"WHAT IS
 $\langle a, b, c \rangle$ "

CONJECTURE:

$$\langle a, b, c \rangle = \langle a \rangle \star \langle b \rangle \star \langle c \rangle$$

$$= \mathbb{Z}/2\mathbb{Z} \star \mathbb{Z}/2\mathbb{Z} \star \mathbb{Z}/2\mathbb{Z}$$

$$\langle a, b, c \rangle = \mathbb{Z}/2\mathbb{Z} * \mathbb{Z}/2\mathbb{Z} * \mathbb{Z}/2\mathbb{Z} \quad ?$$

- NO TRANSLATIONAL SYMMETRY
- NO CLOSED LOOPS, OF ANY SIZE!

EQUIVALENT REFORMULATION: "IS $\langle ba, ac \rangle \approx F_2$?"

HOW CAN WE PROVE THIS?

- PING-PONG LEMMA IN $\mathbb{R}^3$, $SO(3, \mathbb{R})$ ETC X
- STATE OF THE ART:
 - CHOOSE SOME p , RUN ALGORITHM IN $SL(2, \mathbb{Q}_p)$. (CONDER, 2020) X

EQUIVALENT REFORMULATION: "IS $\langle ba, ac \rangle \approx F_2$?"

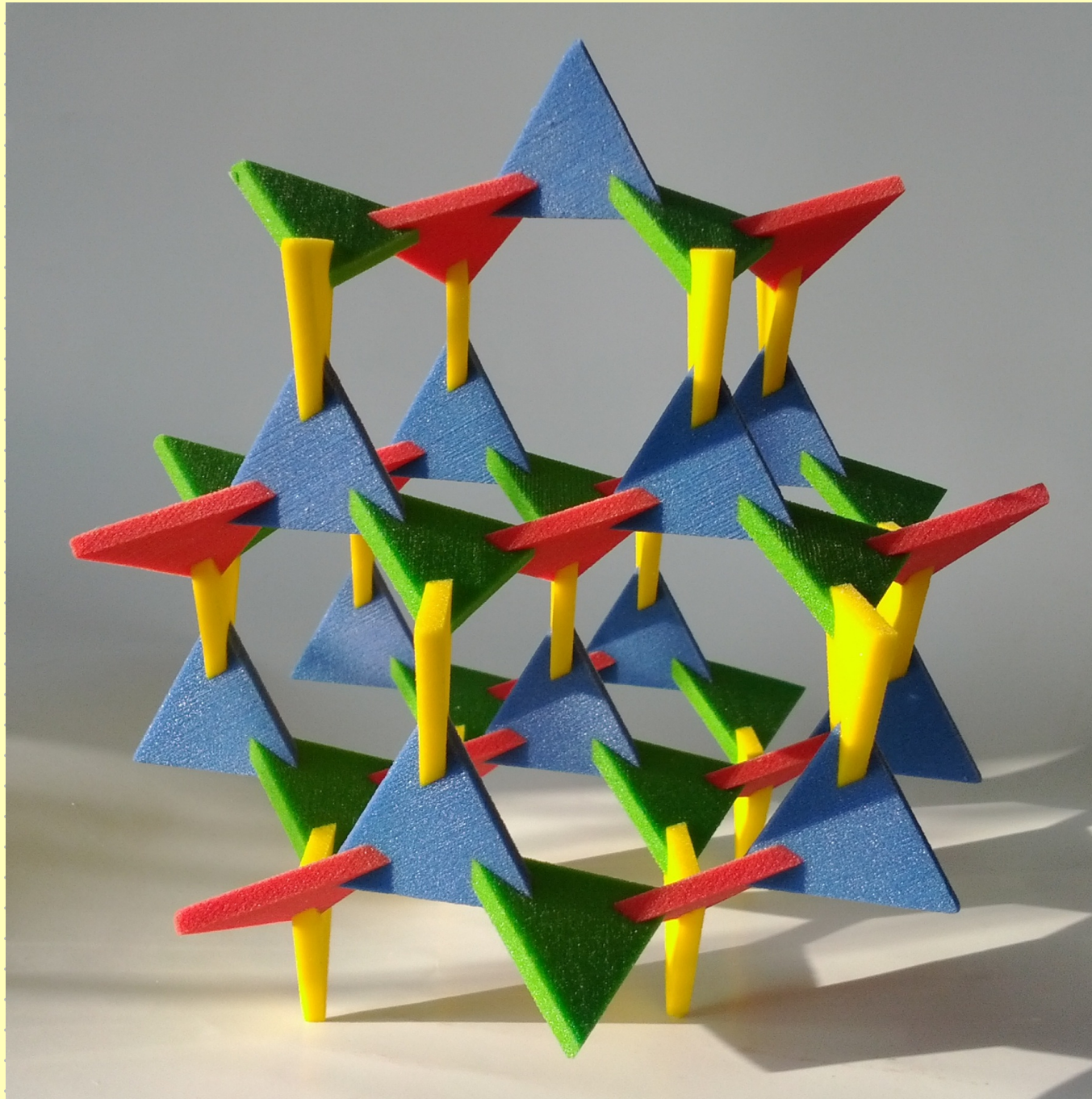
HOW CAN WE PROVE THIS?

- PING-PONG LEMMA IN $\mathbb{R}^3$, $SO(3, \mathbb{R})$ ETC X
- STATE OF THE ART:
 - CHOOSE SOME p , RUN ALGORITHM IN $SL(2, \mathbb{Q}_p)$. (CONDER, 2020) X

→ DOLGACHEV, ALLCOCK
PROVED "ROTATIONS ABOUT
DIAGONALS OF A CUBE"
ARE APERIODIC.

AN APERIODIC MODULAR SCULPTURE

SHINTARO FUSHIDA-HARDY, WITH PETER HUXFORD



BAMBOOZLE, 2012

K. VERHOEFF, T. VERHOEFF, A. BAKKER

THANK YOU!

