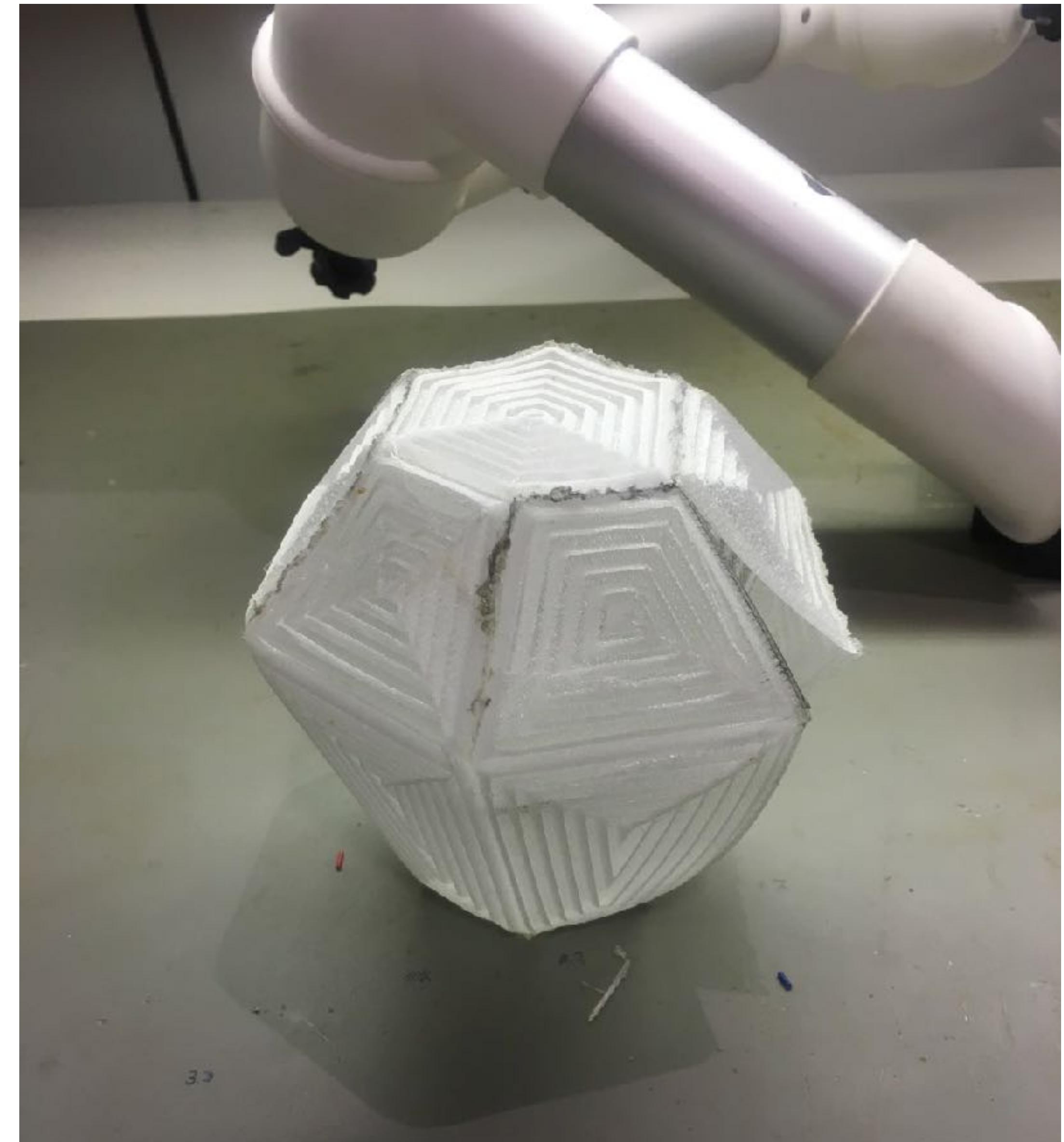
The background image shows a stack of several 3D-printed rectangular components. These components feature a repeating grid pattern of small, dark, square-like features, likely representing a conductive ink or metal filament used for printing electronic components. The components are light-colored and have slightly irregular edges.

**Soft Sensing for MM3D Light
Designing - Stampare con il filamento
conduttivo e componenti elettroniche**



Muri ad angoli



• Order in Space

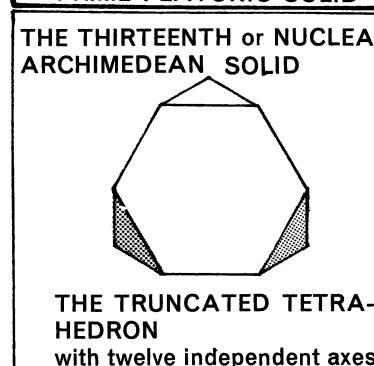
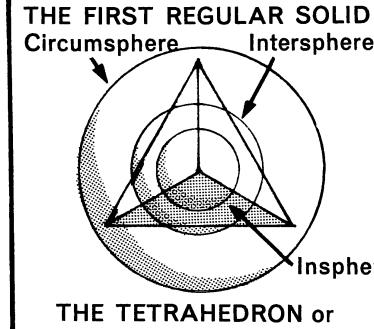
• Critchlow

APPENDIX 1

A PERIODIC ARRANGEMENT OF THE ELEMENTS OF SPATIAL ORDER (compiled by the author, 1965)

MEMBERS OF
2, 3, 4-FOLD →
SYMMETRY

Apices	4
Edges	6
Faces	4
Face angles	60°
Dihedral angles	70° 32' 3"
Circumsphere radius	1.7321
Intersphere radius	1
InspHERE radius	0.5774
Centre angle θ	109° 28'
Volume	0.11785 f^3



Apices	12
Edges	18
Faces	4 : 4
Face angles	60° 120°
Dihedral angles	70° 32' 3" 109° 28' 3"
Circumsphere radius	1.1055
Intersphere radius	1
InspHERE radius	0.9045
Centre angle θ	50° 28'
Volume	0.394 f^3

NOTES ON TERMS USED IN THIS CHART

Regular means that all faces, angles and angles between faces are the same. There are only five, without admitting interpenetration; three are triangulated.

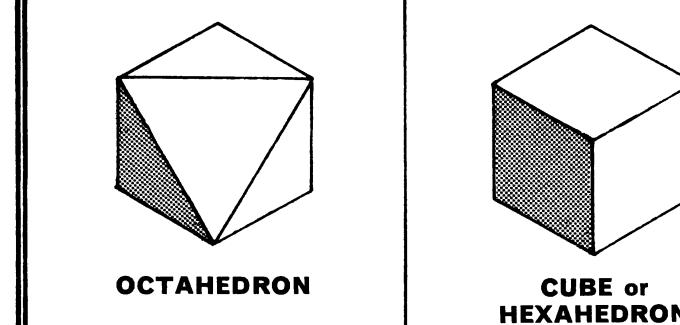
Semi-regular means that the faces which make up the solid are in themselves regular, but that there is more than one type of face. Both regular and semi-regular figures lie with all vertices or 'points' in a containing sphere, the circumsphere.

Dihedral means between two faces.

InspHERE means the sphere touching the centre of the faces inside the solid.

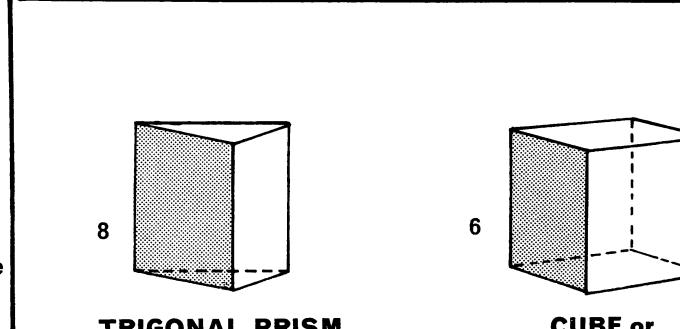
Intersphere touches the centre edges of the figure.

THE SECONDARY REGULAR 'PARENT' SOLIDS COMPLETING THE FIVE PLATONIC FIGURES



THE SECONDARY REGULAR 'PARENT' SOLIDS
COMPLETING THE FIVE PLATONIC FIGURES

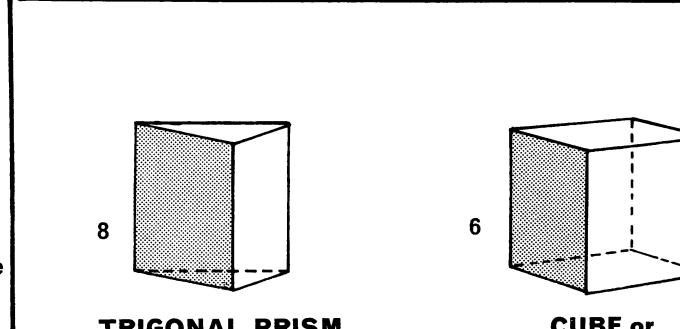
Ap.	6
E.	12
F.	8
F.a.	60°
D.a.	109° 28' 3"
C's.r.	1.4142
Int's.r.	1
Ins.r.	0.8165
C.a.θ	90°
Vol.	0.47140 f^3



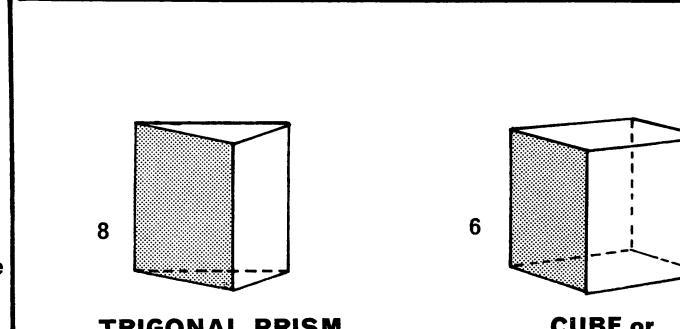
THE SECONDARY REGULAR 'PARENT' SOLIDS
COMPLETING THE FIVE PLATONIC FIGURES

Ap.	24
E.	36
F.	14
F.a.	90° 120°
D.a.	125° 16' 4" 109° 28' 6"
C's.r.	1.0541
Int's.r.	1
Ins.r.	0.9487
C.a.θ	36° 52'
Vol.	12.71 f^3

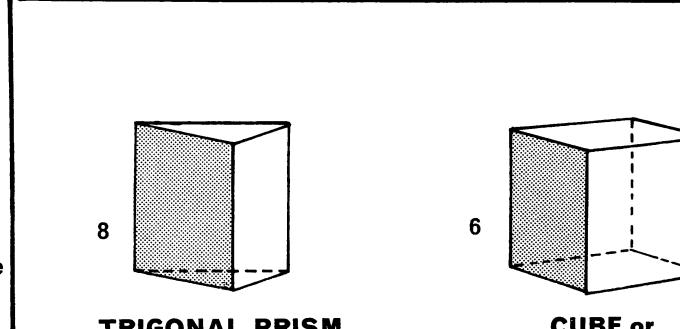
Ap.	12
E.	24
F.	14
F.a.	60° 90°
D.a.	125° 16' 4" 109° 28' 6"
C's.r.	1.1547
Int's.r.	1
Ins.r.	0.8660
C.a.θ	60°
Vol.	2.37 f^3



Ap.	48
E.	72
F.	26
F.a.	90° 120° 135°
D.a.	144° 44' 4" 135° 4" 125° 16' 6"
C's.r.	1.0241
Int's.r.	1
Ins.r.	0.9765
C.a.θ	24° 55'
Vol.	45.63 f^3



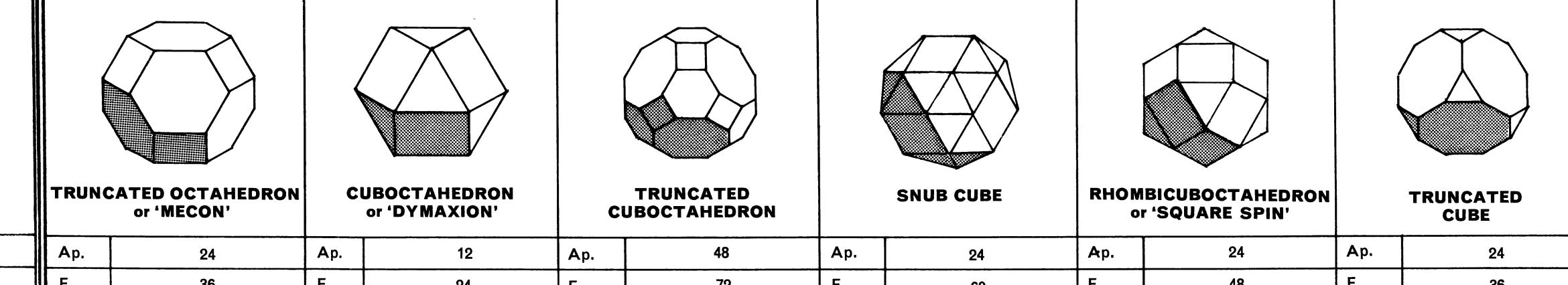
Ap.	24
E.	48
F.	26
F.a.	60° 90°
D.a.	144° 44' 4" 135° 4" 125° 16' 6"
C's.r.	1.0773
Int's.r.	1
Ins.r.	0.9282
C.a.θ	43° 41'
Vol.	7.68 f^3



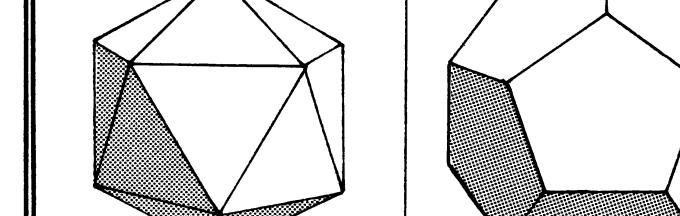
Ap.	24
E.	36
F.	14
F.a.	60° 135°
D.a.	125° 16' 4" 90° 90°
C's.r.	1.0420
Int's.r.	1
Ins.r.	0.9597
C.a.θ	32° 39'
Vol.	17.76 f^3

THE ARCHIMEDEAN OR SEMI-REGULAR SOLIDS

SIX TRUNCATIONS OF THE OCTAHEDRON AND SIX TRUNCATIONS OF THE ICOSAHEDRON: THE TWELVE DEGREES OF FREEDOM

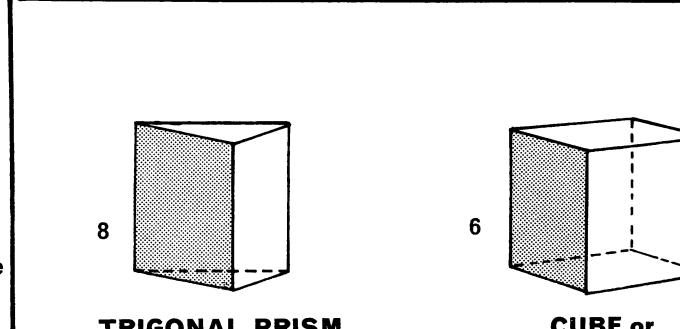


MEMBERS OF
2, 3, 5-FOLD →
SYMMETRY

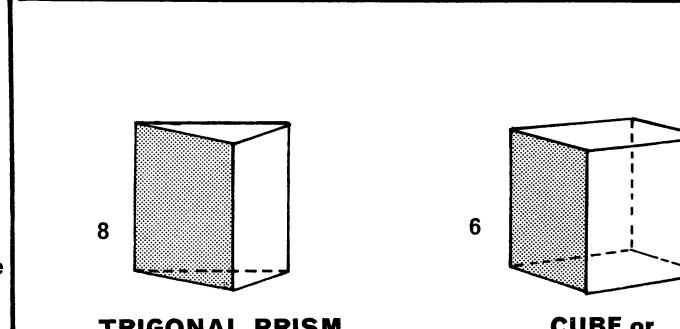


THE SECONDARY REGULAR 'PARENT' SOLIDS
COMPLETING THE FIVE PLATONIC FIGURES

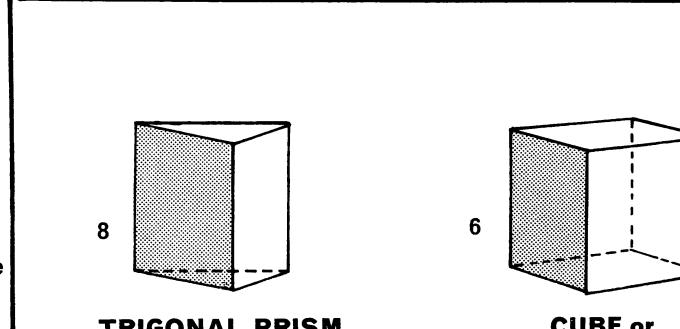
Ap.	12
E.	30
F.	20
F.a.	60°
D.a.	138° 11' 3"
C's.r.	1.1756
Int's.r.	1
Ins.r.	0.9342
C.a.θ	63° 26'
Vol.	2.18170 f^3



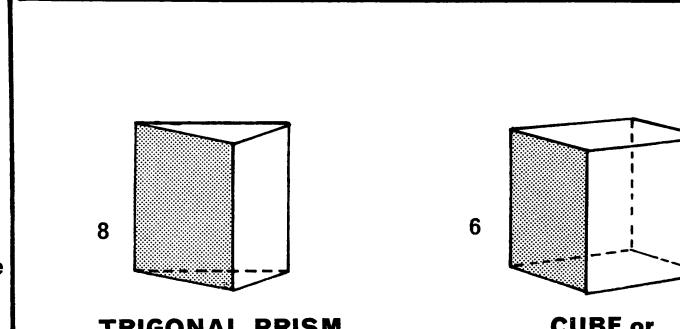
Ap.	30
E.	60
F.	32
F.a.	108° 120°
D.a.	142° 37' 6" 138° 11' 6"
C's.r.	1.0210
Int's.r.	1
Ins.r.	0.9794
C.a.θ	23° 17'
Vol.	57.56 f^3



Ap.	120
E.	180
F.	62
F.a.	90° 120° 144°
D.a.	159° 6' 148° 17' 6" 140° 37' 6"
C's.r.	1.0515
Int's.r.	1
Ins.r.	0.9511
C.a.θ	36°
Vol.	14.31 f^3



Ap.	60
E.	150
F.	92
F.a.	60° 108°
D.a.	164° 11' 3" 152° 56' 3" 140° 37' 6"
C's.r.	1.0280
Int's.r.	1
Ins.r.	0.9727
C.a.θ	26° 49'
Vol.	37.72 f^3



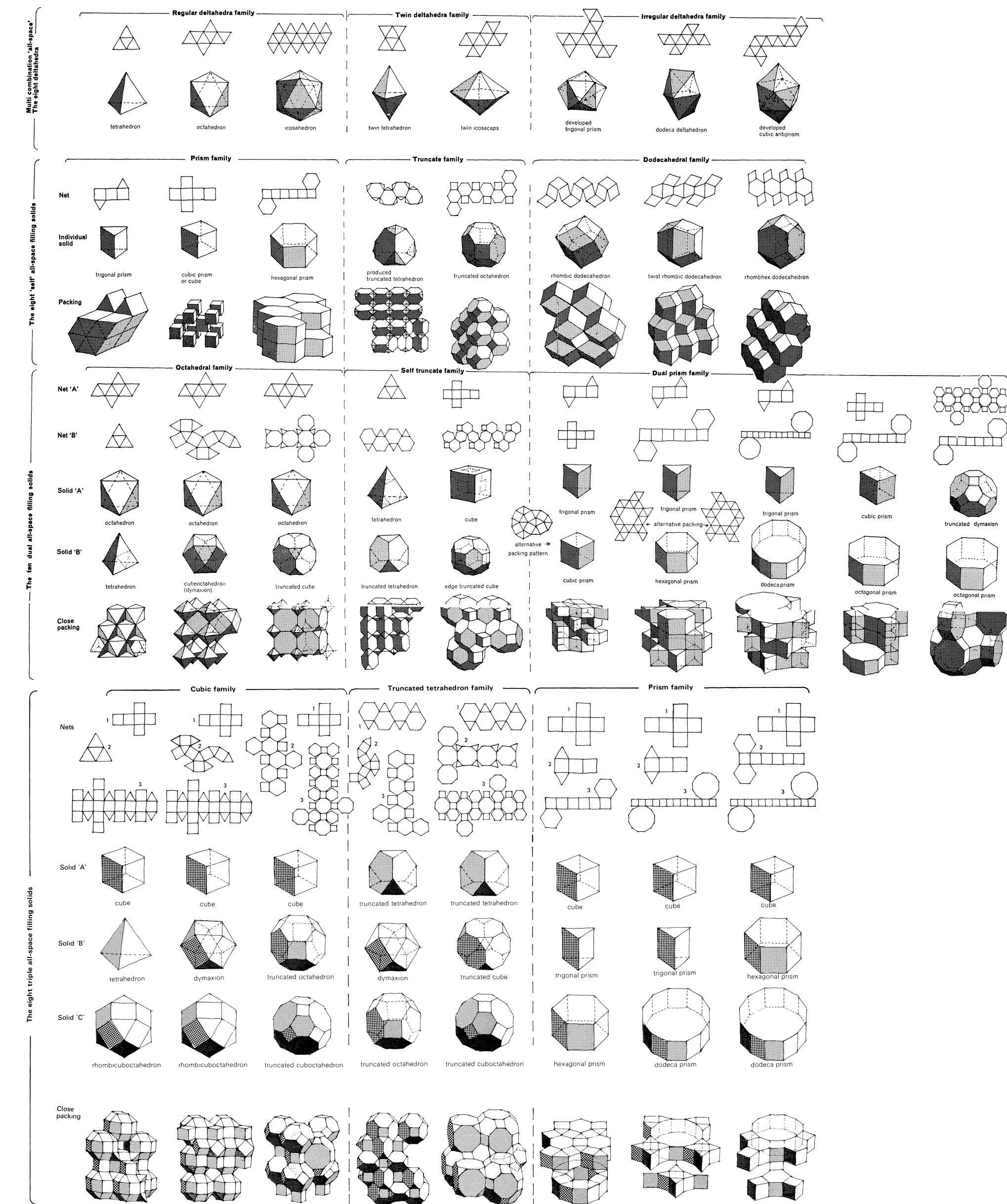
Ap.	60
E.	120
F.	62
F.a.	60° 144°
D.a.	159° 6'

• Order in Space

• Critchlow

APPENDIX 2

A PERIODIC ARRANGEMENT OF THE MULTIPLE SINGLE, DUAL AND TRIPLE ALL-SPACE FILLING SOLIDS EXHIBITING A PERIODICITY OF EIGHT, PUNCTUATED BY A 3, 2, 3 SYMMETRY (compiled by the author, 1965–66)



tinkercad.com

The image displays two screenshots of the Tinkercad platform. The top screenshot shows the main homepage with a central heading 'A hub for every goal.' and three buttons: 'Open Electronics Lab Hub', 'Open Circuit Scribe Hub', and 'Open PCB Design Hub'. To the right is a screenshot of a circuit editor titled 'Control a motor with a potentiometer', showing a breadboard setup with various components like resistors, capacitors, and a motor. The bottom screenshot shows the 'Learn' section of the website, featuring a large penguin icon, a heading 'I want to learn about...', and a 'Step-by-Step Lessons' section. It includes images of an Arduino Uno board and basic 3D models of a battery and a wrench.

A hub for every goal.

If you are a beginner, you can start with simple experiments in the Electronics Lab or Circuit Scribe. Experienced users can skip ahead and go straight to PCB Design.

Open Electronics Lab Hub

Open Circuit Scribe Hub

Open PCB Design Hub

Control a motor with a potentiometer

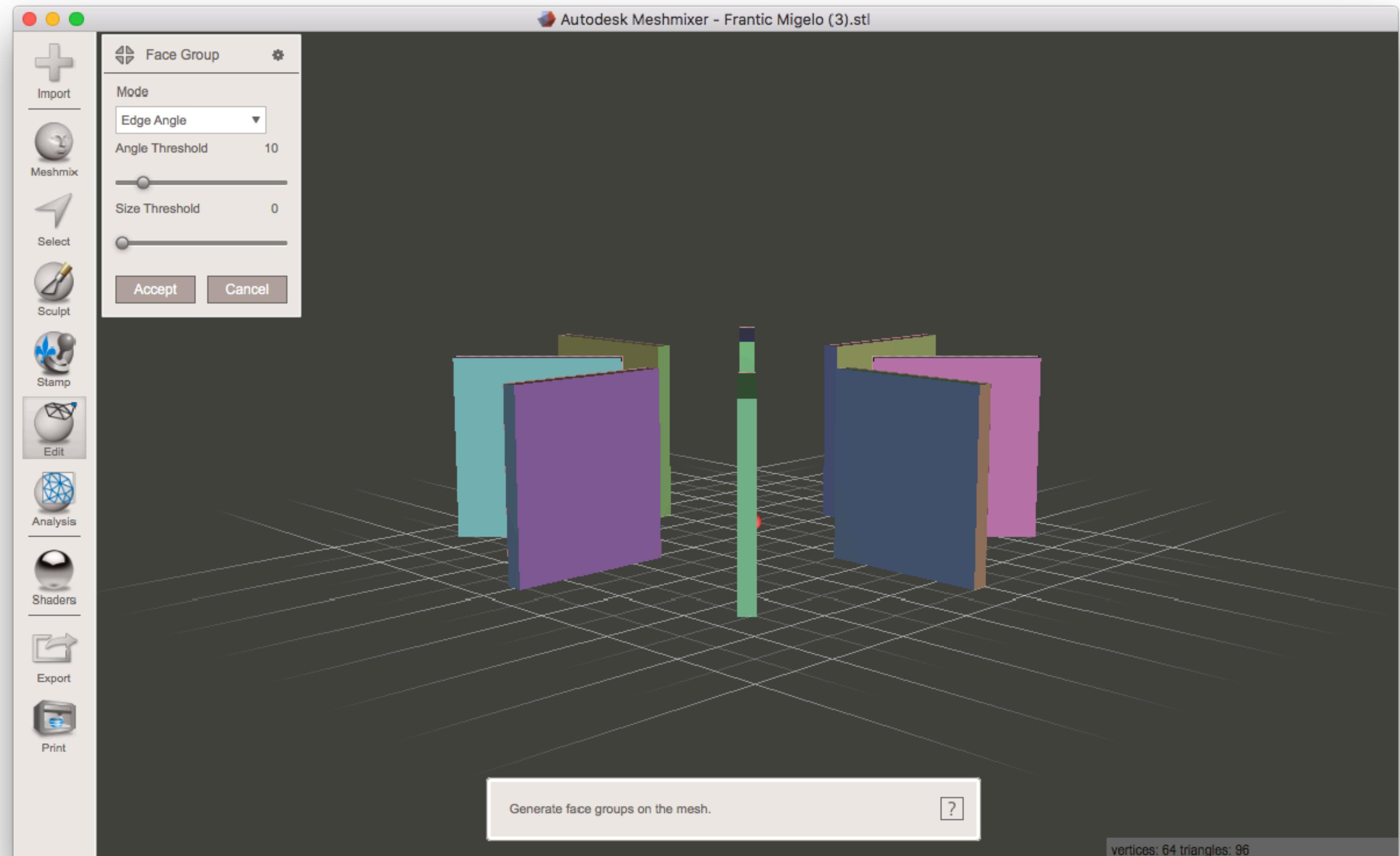
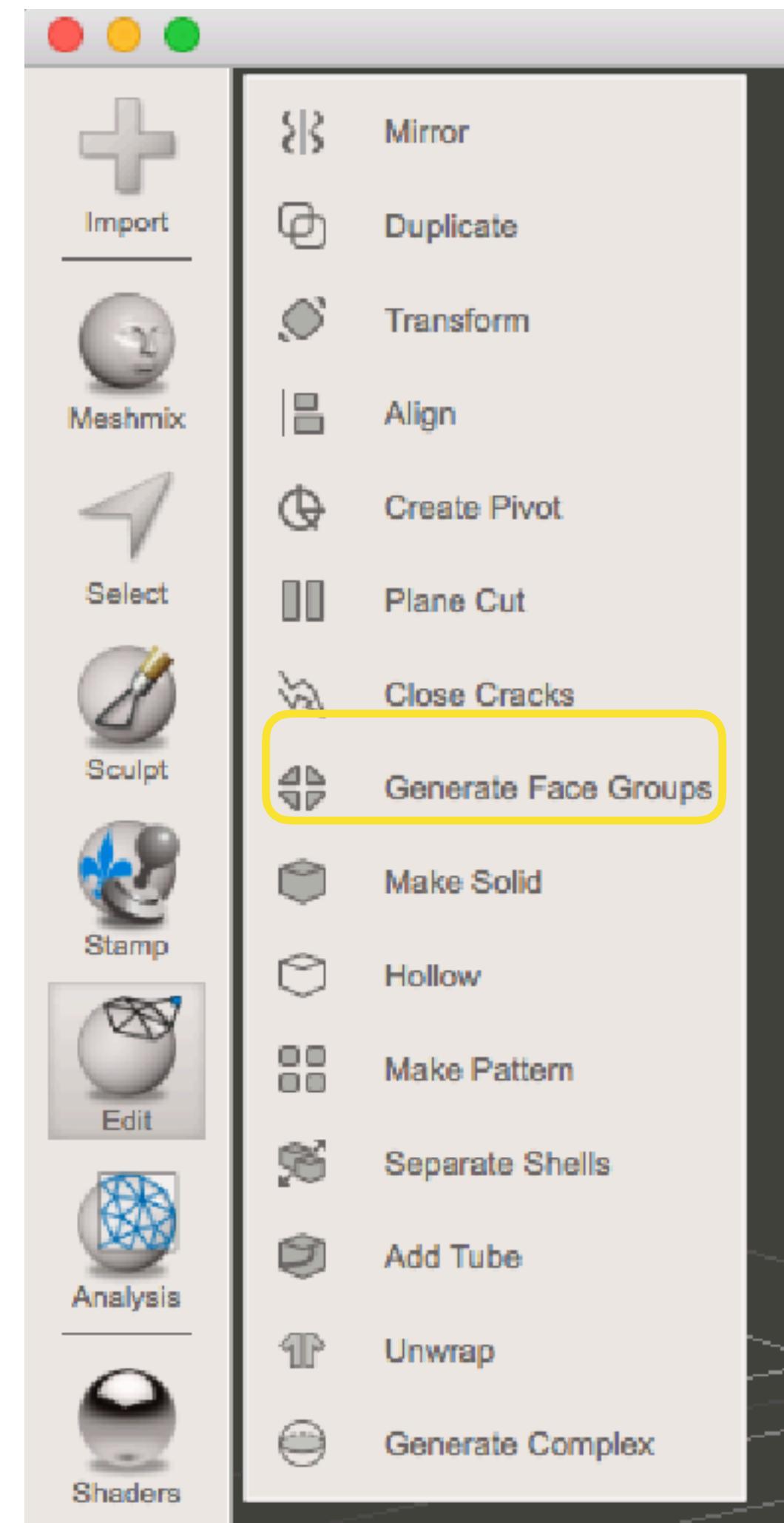
I want to learn about...

3D Design Circuits

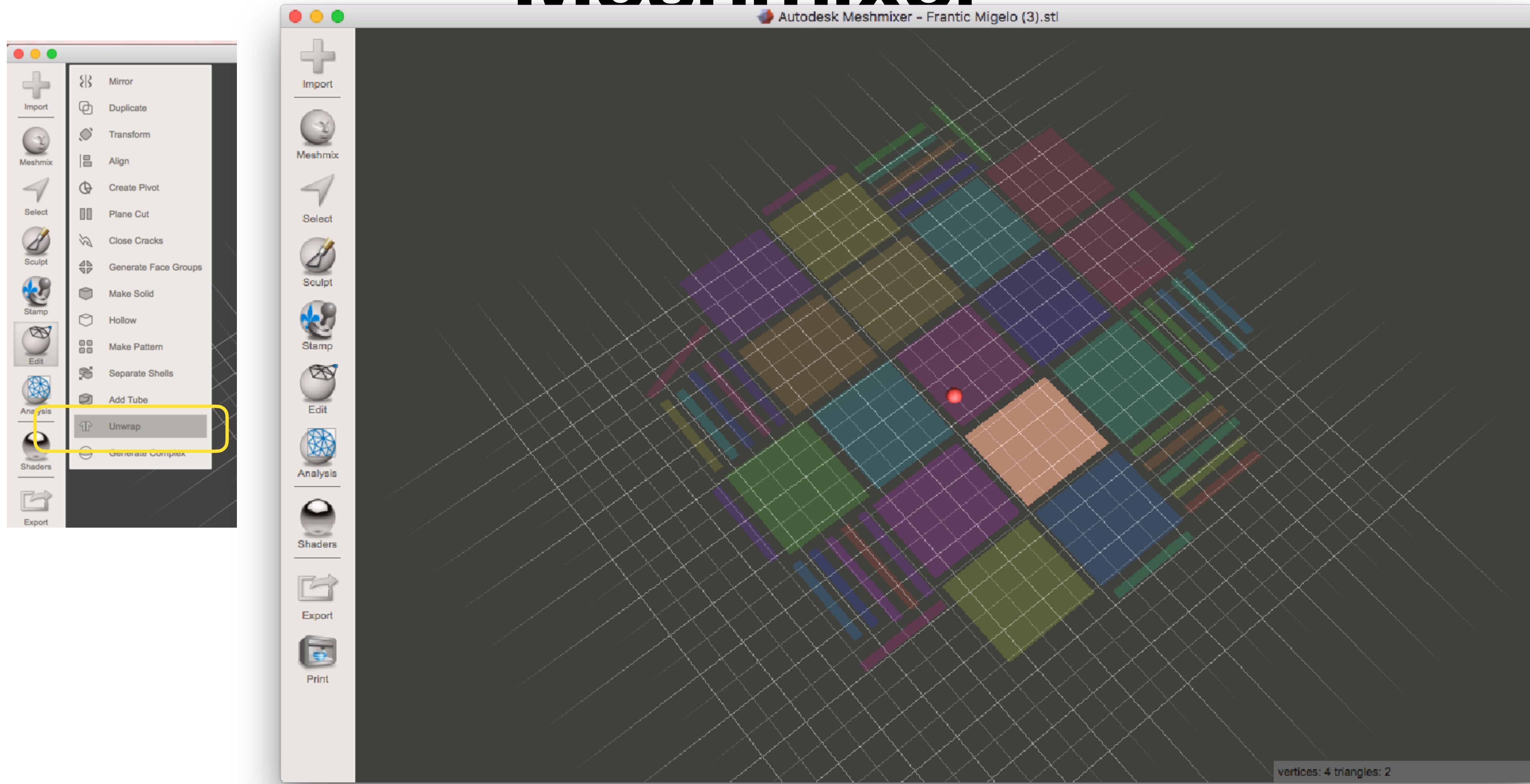
Step-by-Step Lessons

Basics Projects

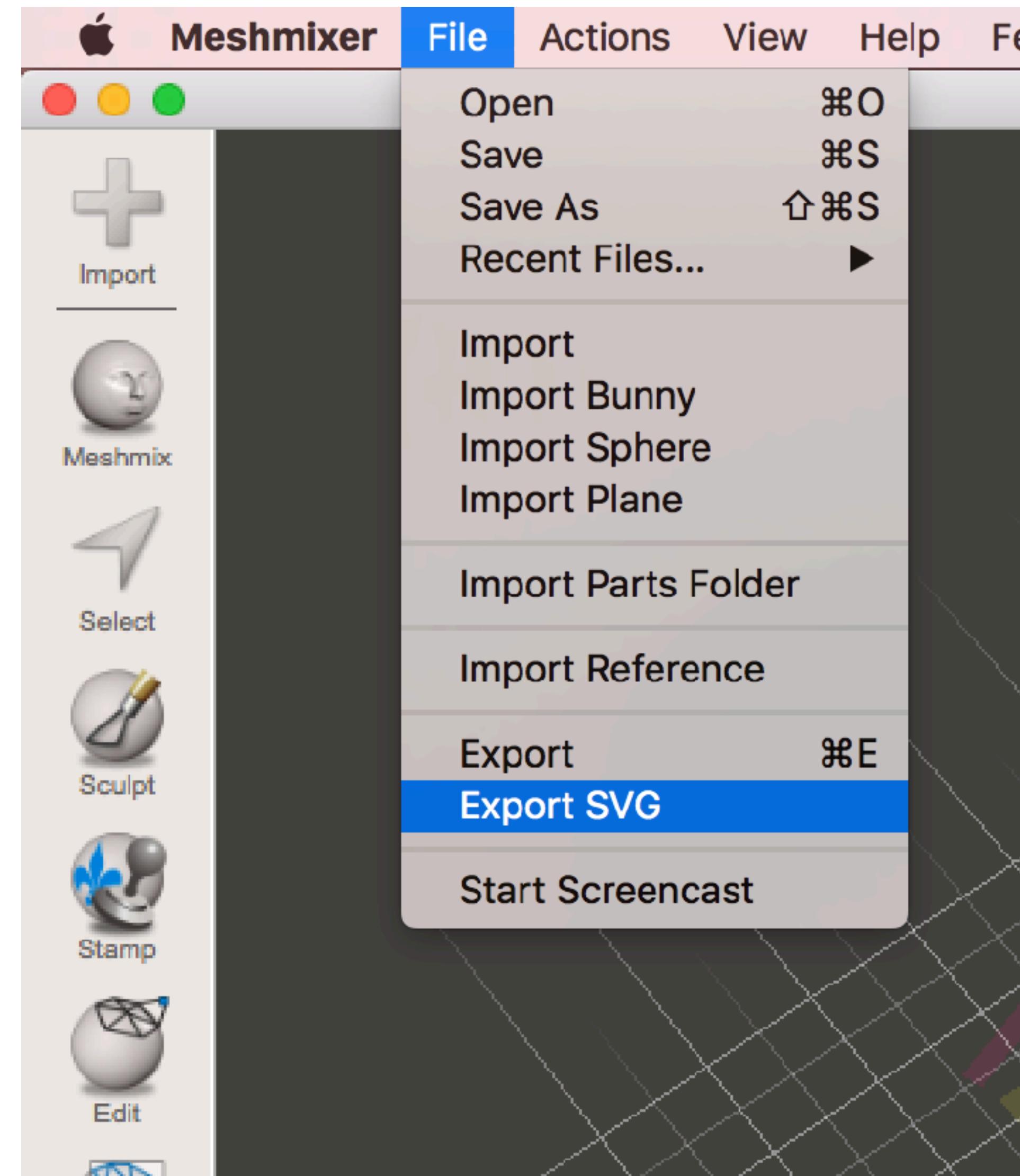
Meshmixer



Meshmixer



Meshmixer



Essere la macchina

Digital & Materials Fabrication

CHI 2015, Crossings, Seoul, Korea

Being the Machine: Reconfiguring Agency and Control in Hybrid Fabrication

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ABSTRACT

This paper details the design and evaluation of *Being the Machine*, a portable digital fabrication system that places digital fabrication activity outside of the traditional fab lab environment. *Being the Machine* invites people to (re)consider materials found in their everyday and personal environment as part of the fabrication activity. We expand the design space involving hybrid (physical-digital) fabrication by describing how our system draws from art to support critical and reflective modes of making. In interaction with our system, participants distributed control between human and machine actors to support their preferred mode of making. These patterns reveal new opportunities and challenges for future hybrid fabrication systems, and suggest that designing for qualities of *experience*, like meditation and reflection, could support meaningful making experiences for many different kinds of makers.

Author Keywords

Hybrid fabrication; art; 3D printing; everyday materials.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI):
Miscellaneous.

INTRODUCTION

Digital fabrication has been a growing topic of interest in HCI. The vision of personal fabricators suggested by Gershenfeld in 2007 is looking more like reality as digital fabricators proliferate outside of privileged laboratory settings [6] and become more economically accessible for a wide variety of people. As digital fabrication is poised to enter our schools and homes, it is important to consider the values and assumptions that are implicit and not yet studied

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<http://dx.doi.org/10.1145/2702123.2702547>

in the designs of digital fabrication systems [1,20,28]. The way a fabrication system is designed configures relationships between humans, machines, materials, and digital models, and reflects the ideology of the designers: ideas of who or what should have agency or control in the making process. These configurations can have powerful effects on what people feel, experience, or express while engaging in digital fabrication activities.

We look to the values of art practice to suggest new configurations of humans and machines in hybrid making and present *Being the Machine*, a system that guides users in building 3D models from everyday materials by following instructions typically given to 3D printers. Technically, the system uses a single laser point to communicate the position of a 3D printer head. Much like a 3D version of the game connect-the-dots, users follow the movements of the laser point while “extruding” materials to create a physical version of their digital model.

By inviting the user to become the machine, *Being the Machine* aims to:

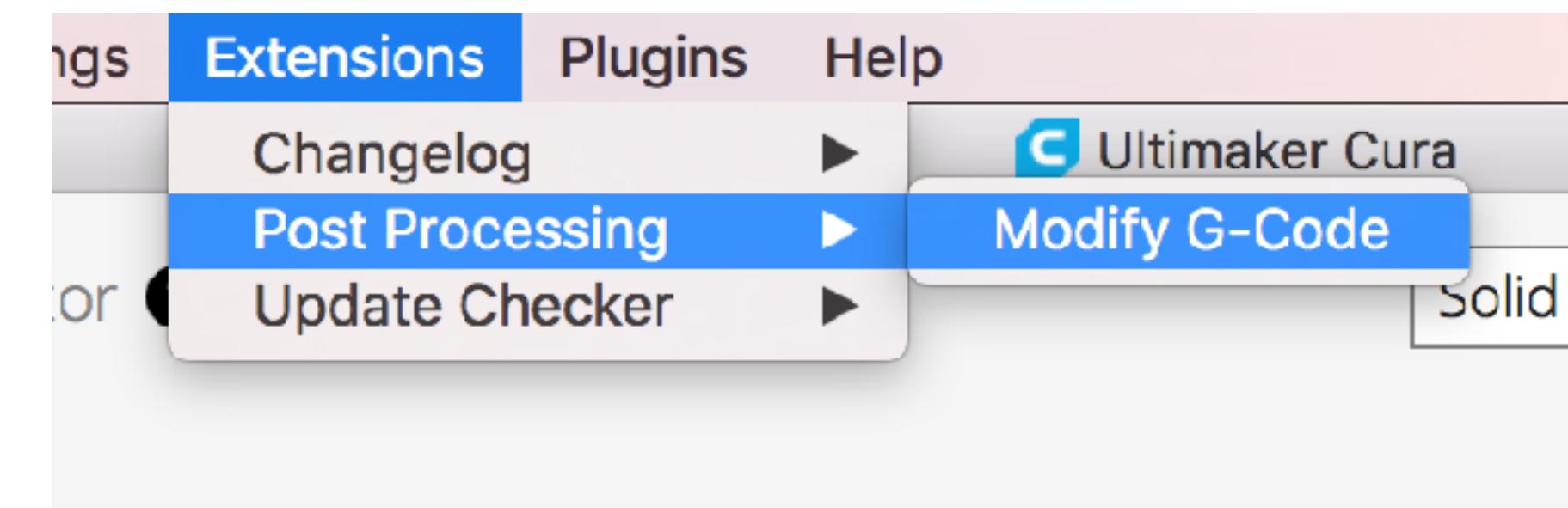
- Elicit active and personal reflections on human-machine relationships by reconfiguring expected roles of humans and machines in hybrid making, exposing tensions between agency and control.



Figure 1: *Being the Machine* guides people in building 3D models with everyday materials. One user made a pair of glasses using found Magnolia leaves.

Pausa per la stampante

- ;script: PauseAtHeight.py
- ;current z: 0.670000
- ;current height: 0.400000
- M83
- G1 Z1.670000 F300
- G1 X190.000000 Y190.000000 F9000
- G1 Z15 F300
- M84 E0
- M104 S230; standby temperature
- M0 ;Do the actual pause
- M109 S230; resume temperature
- G1 E4.000000 F199.998000
- G1 Z1.670000 F300
- G1 X94.884000 Y82.723000 F9000
- G1 F9000
- M82

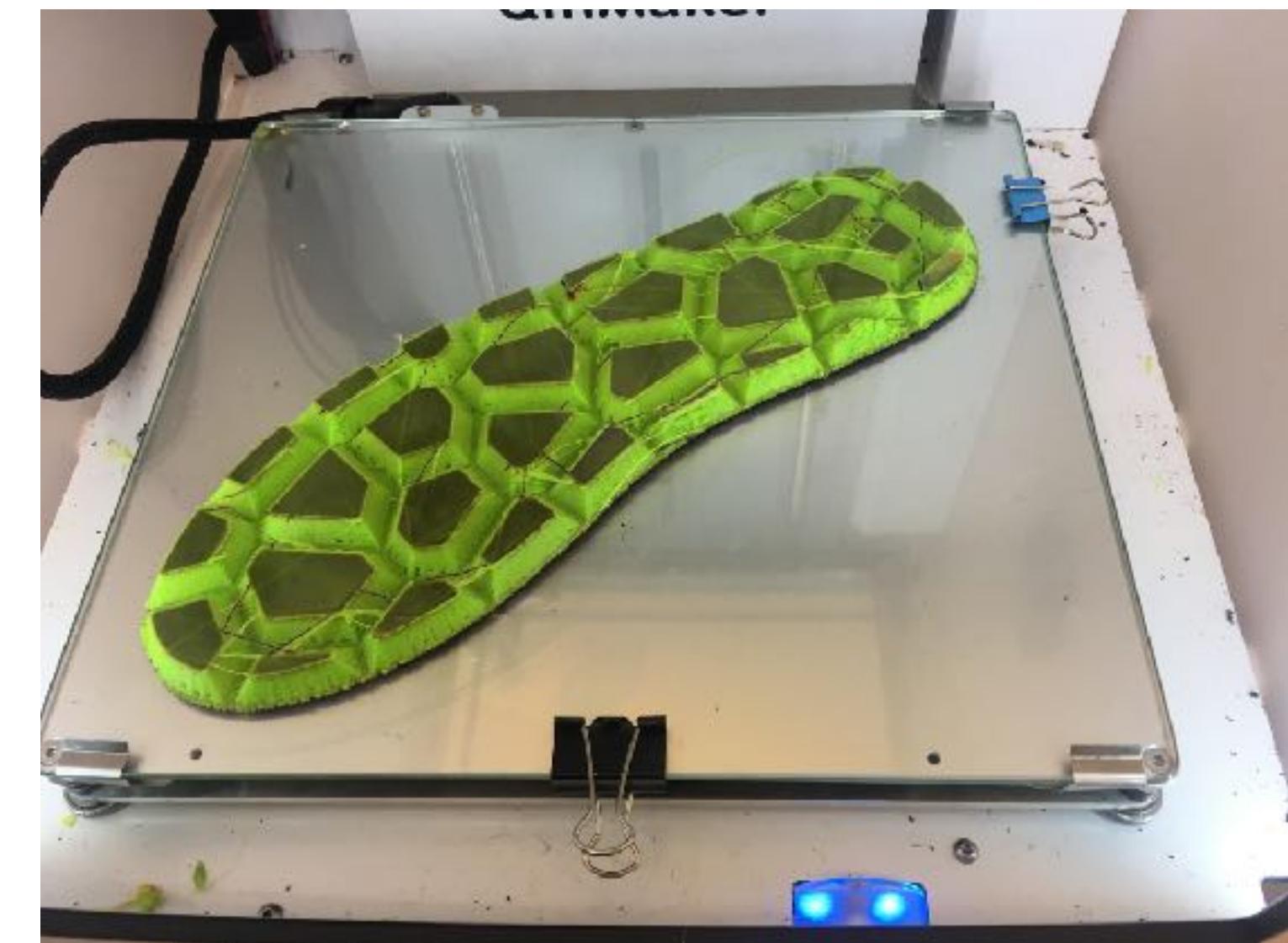
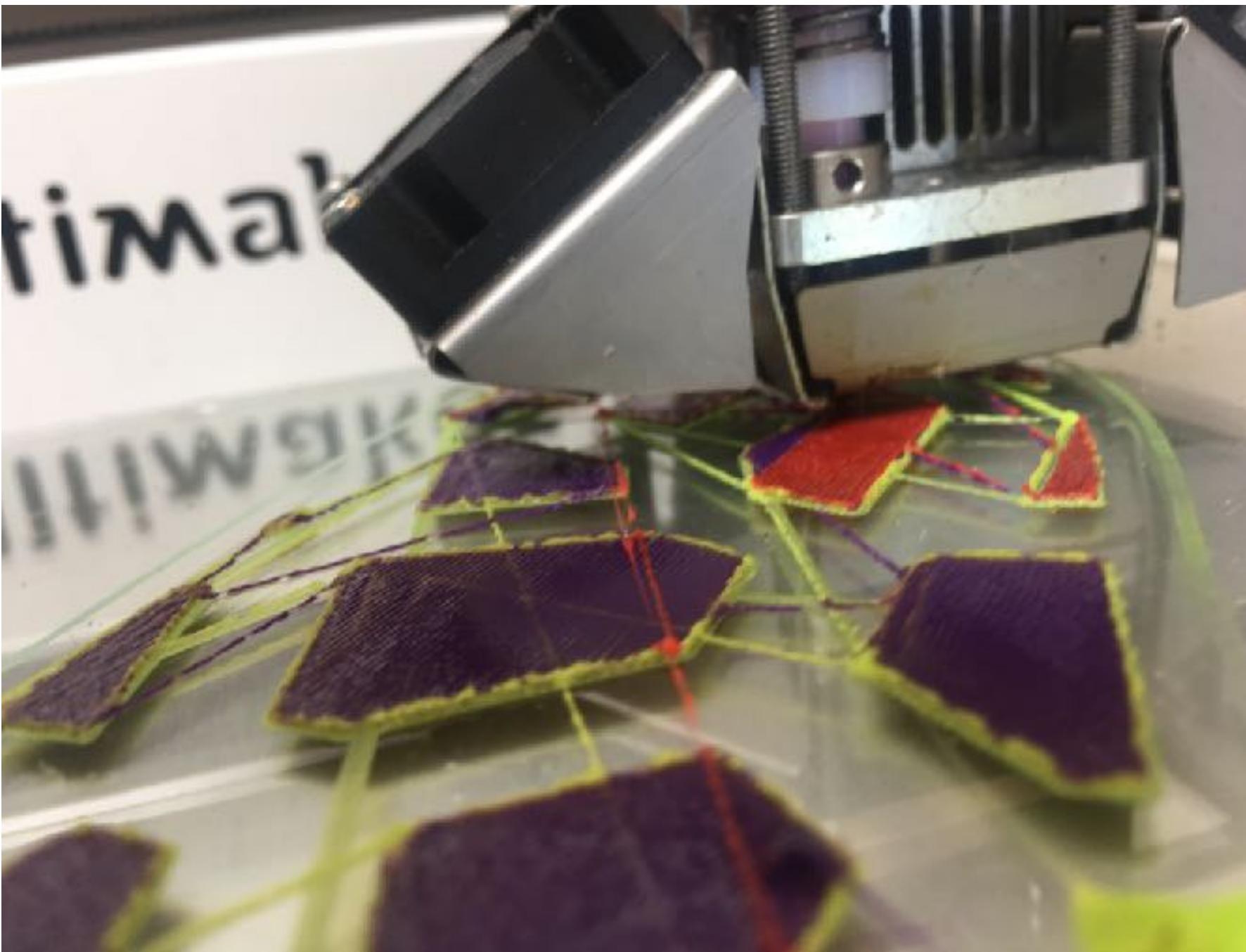
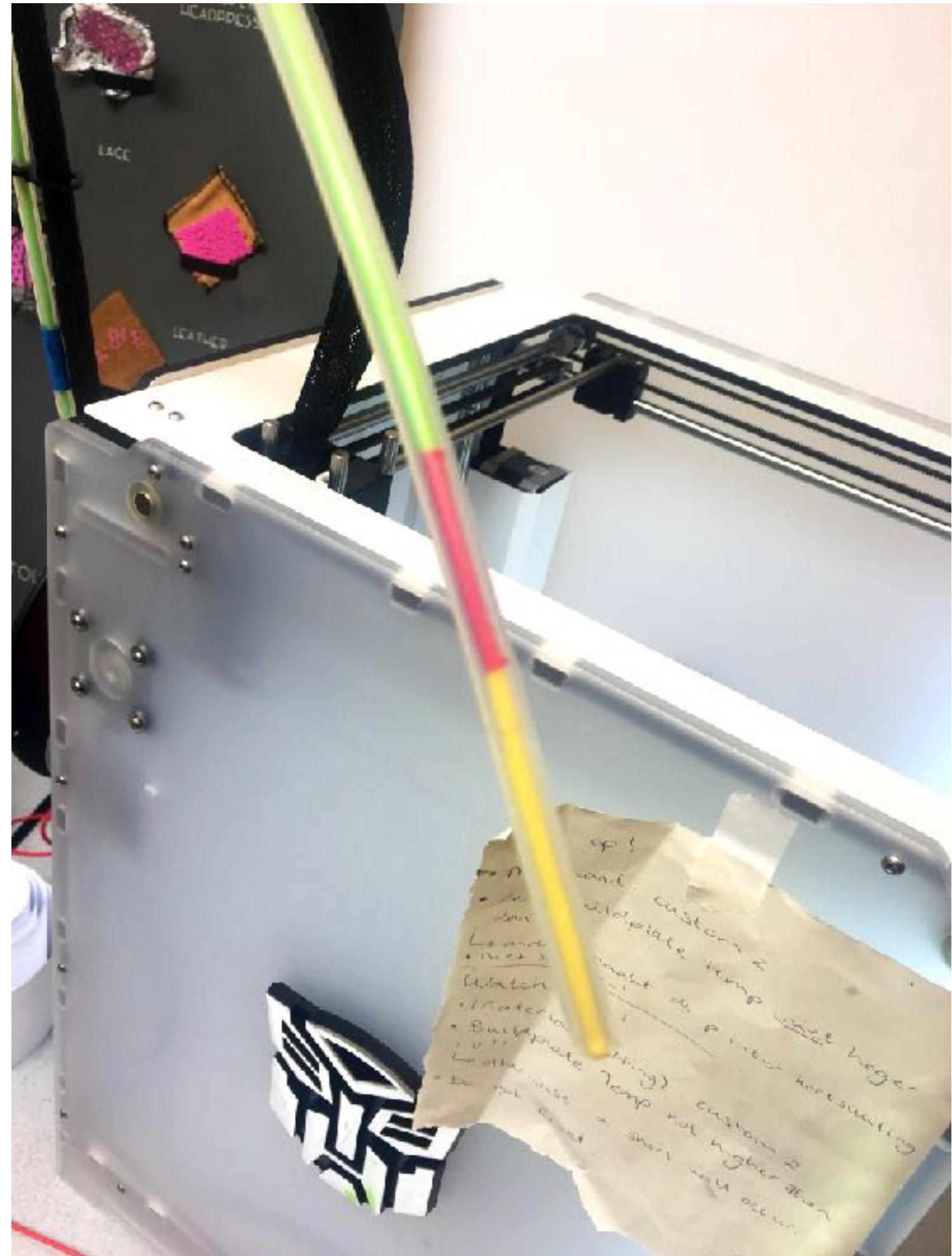


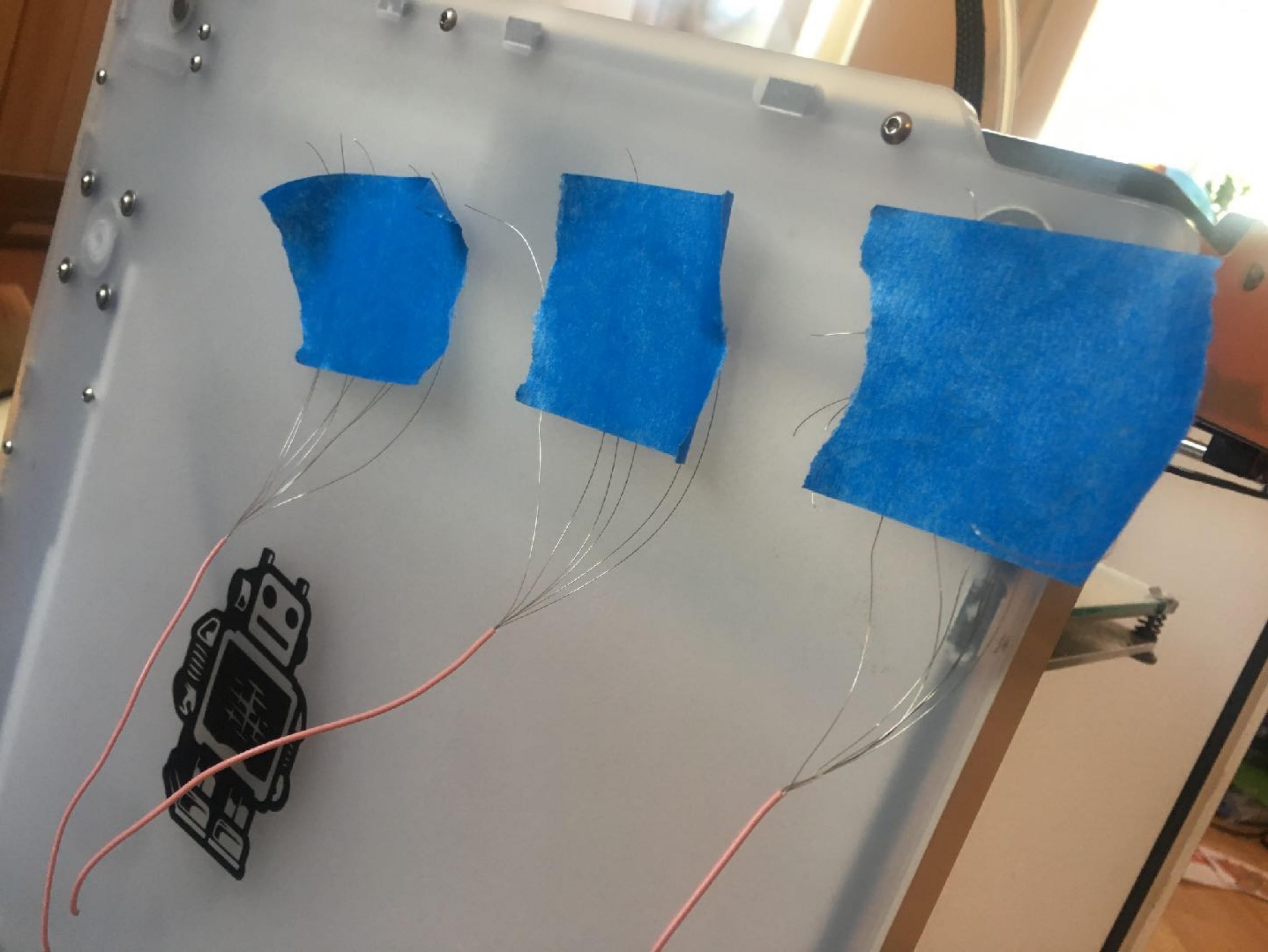
Pause at height

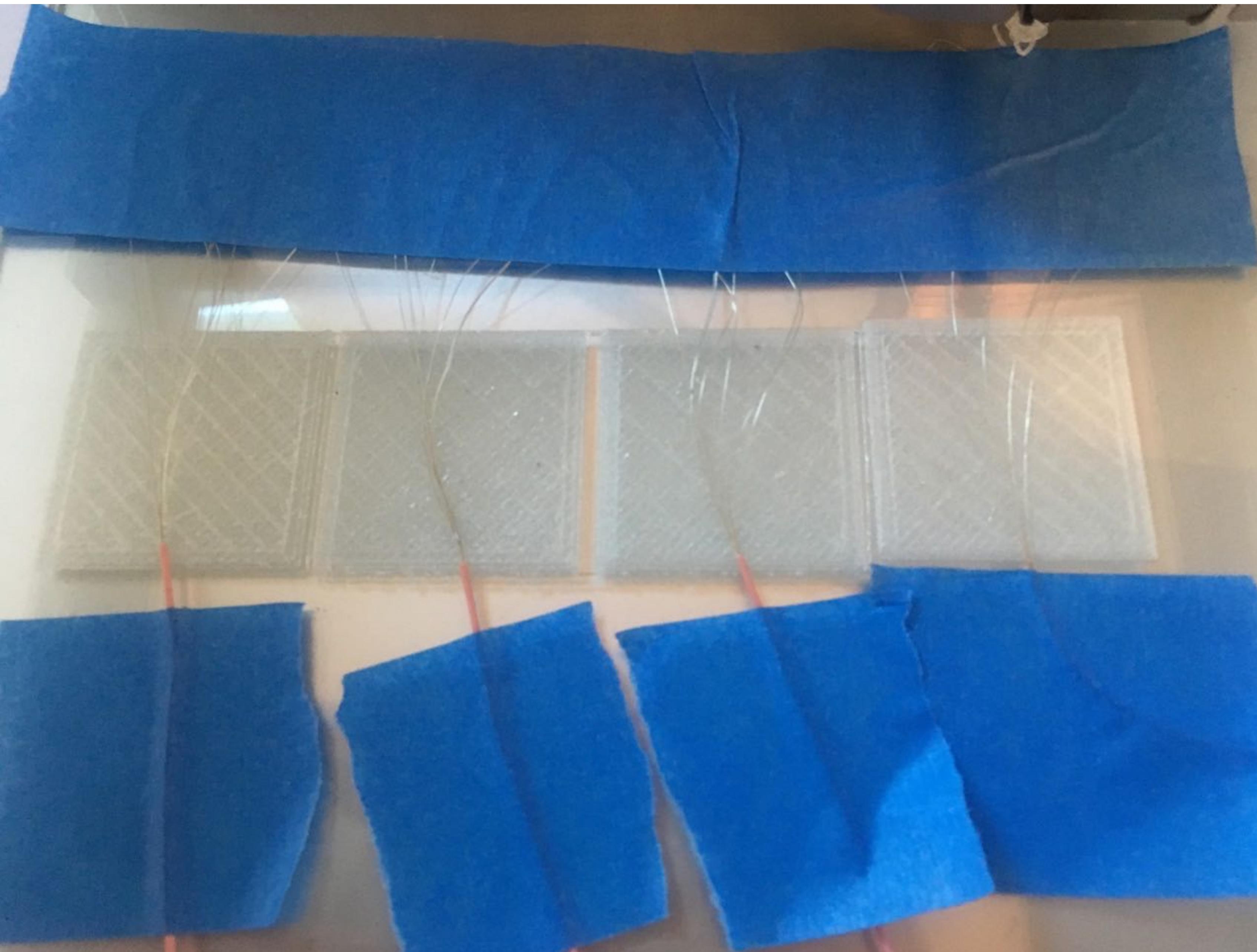
Pause Height	5.0	mm
Park Print Head X	190	mm
Park Print Head Y	190	mm
Retraction	25	mm
Retraction Speed	25	mm/s
Extrude Amount	4	mm
Extrude Speed	3.3333	mm/s
Redo Layers	1	layers
Standby Temperature	230	°C
Resume Temperature	230	°C

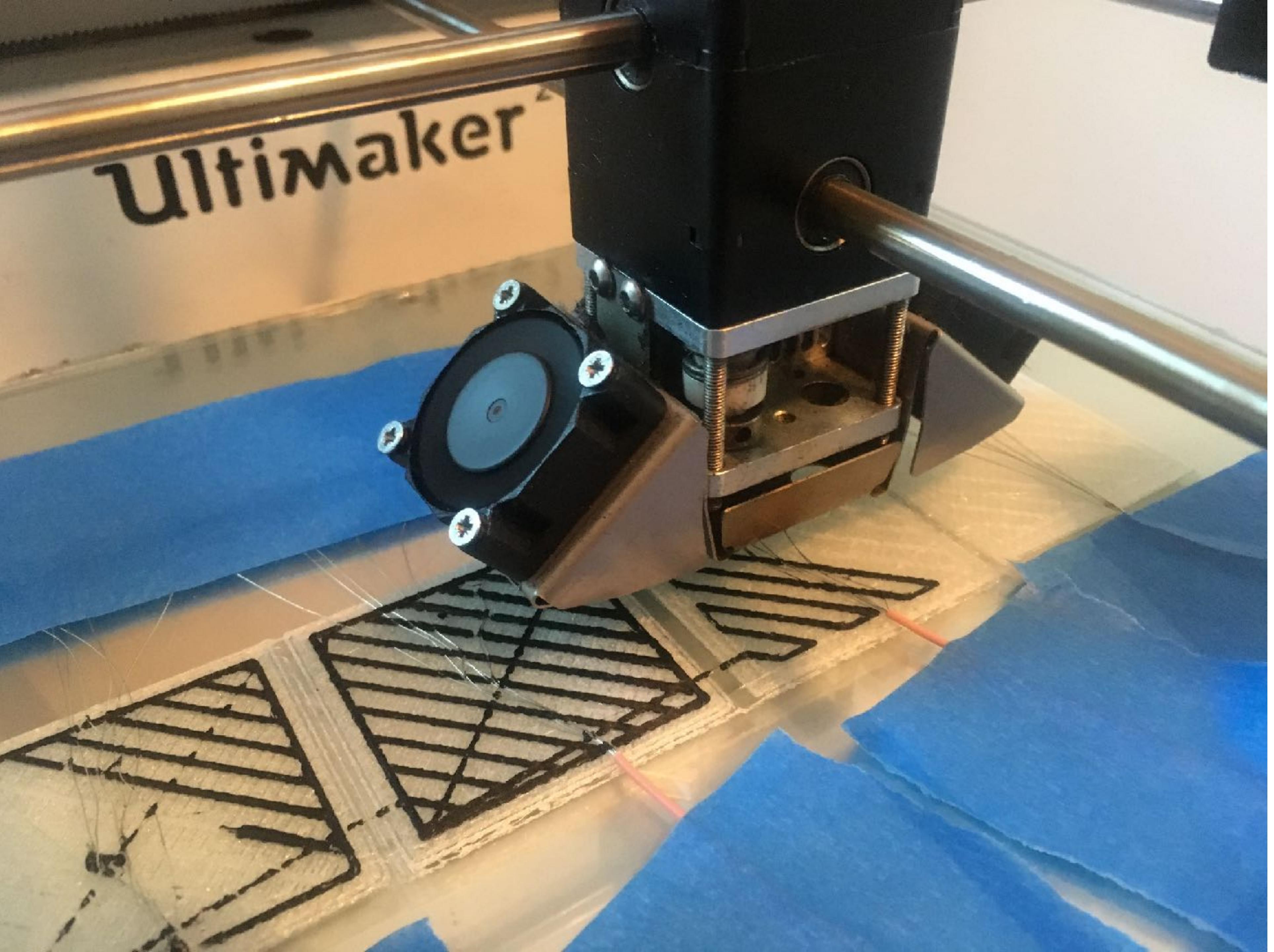
Taglia Incolla

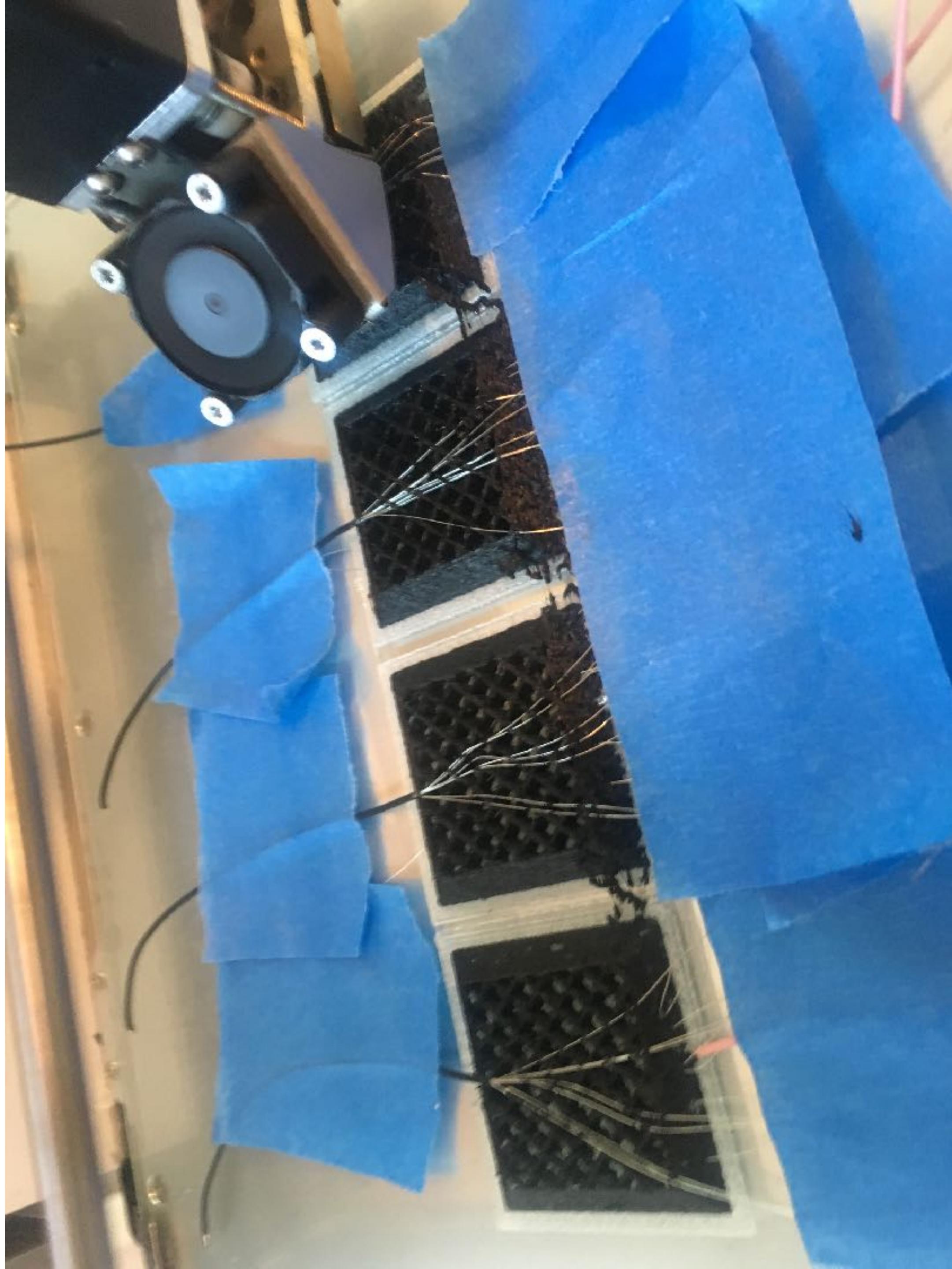
Multi Filament Bowden

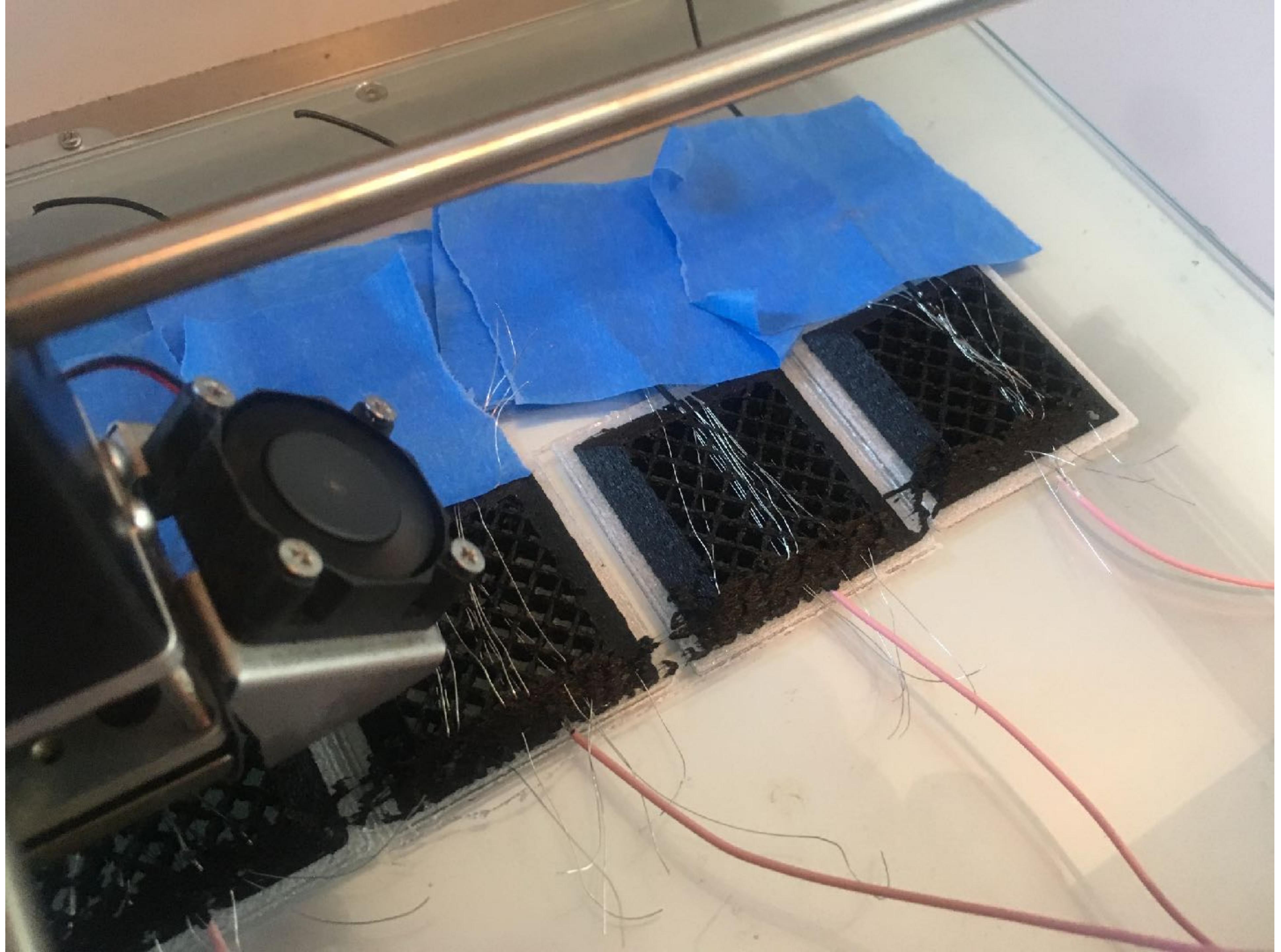


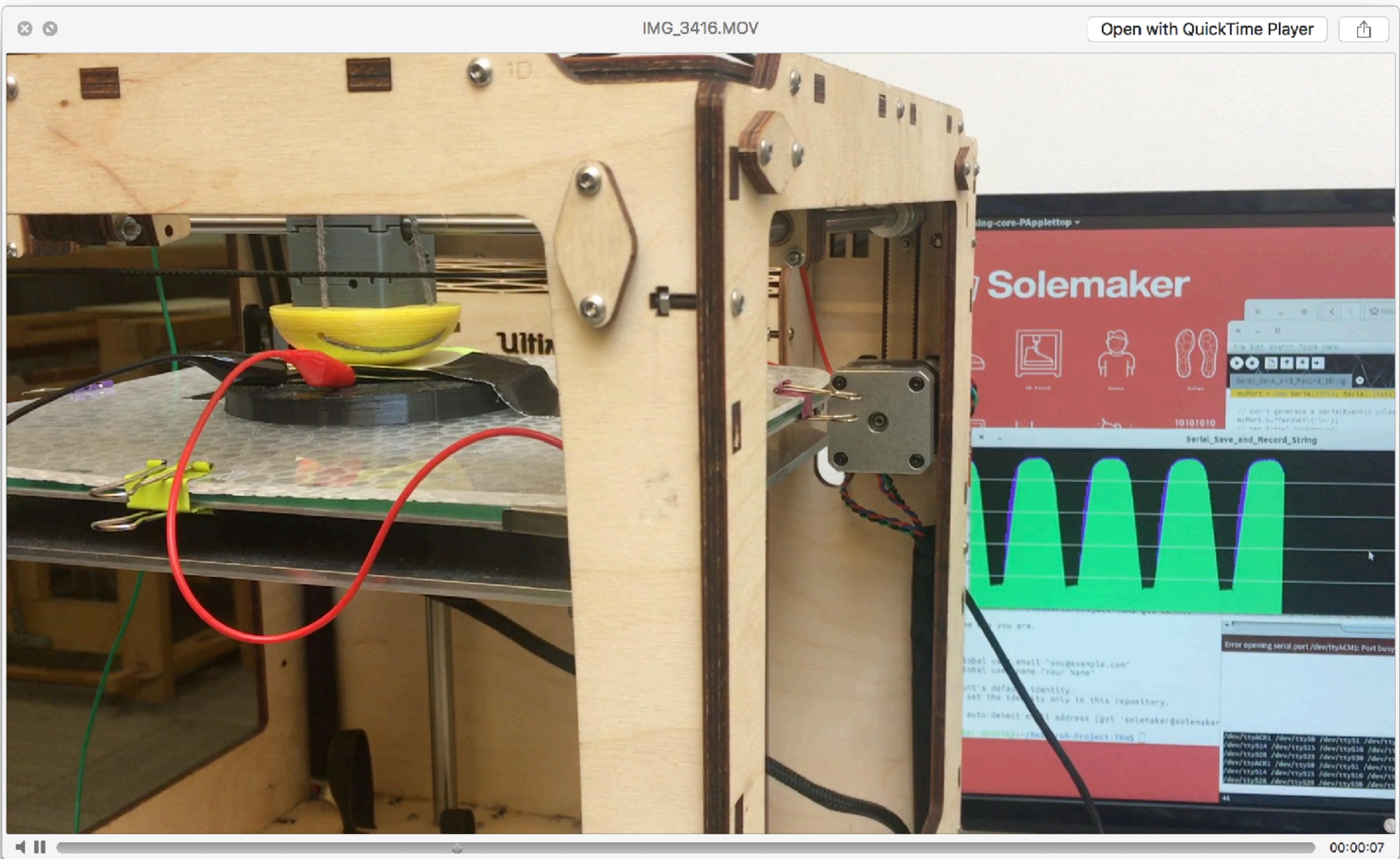




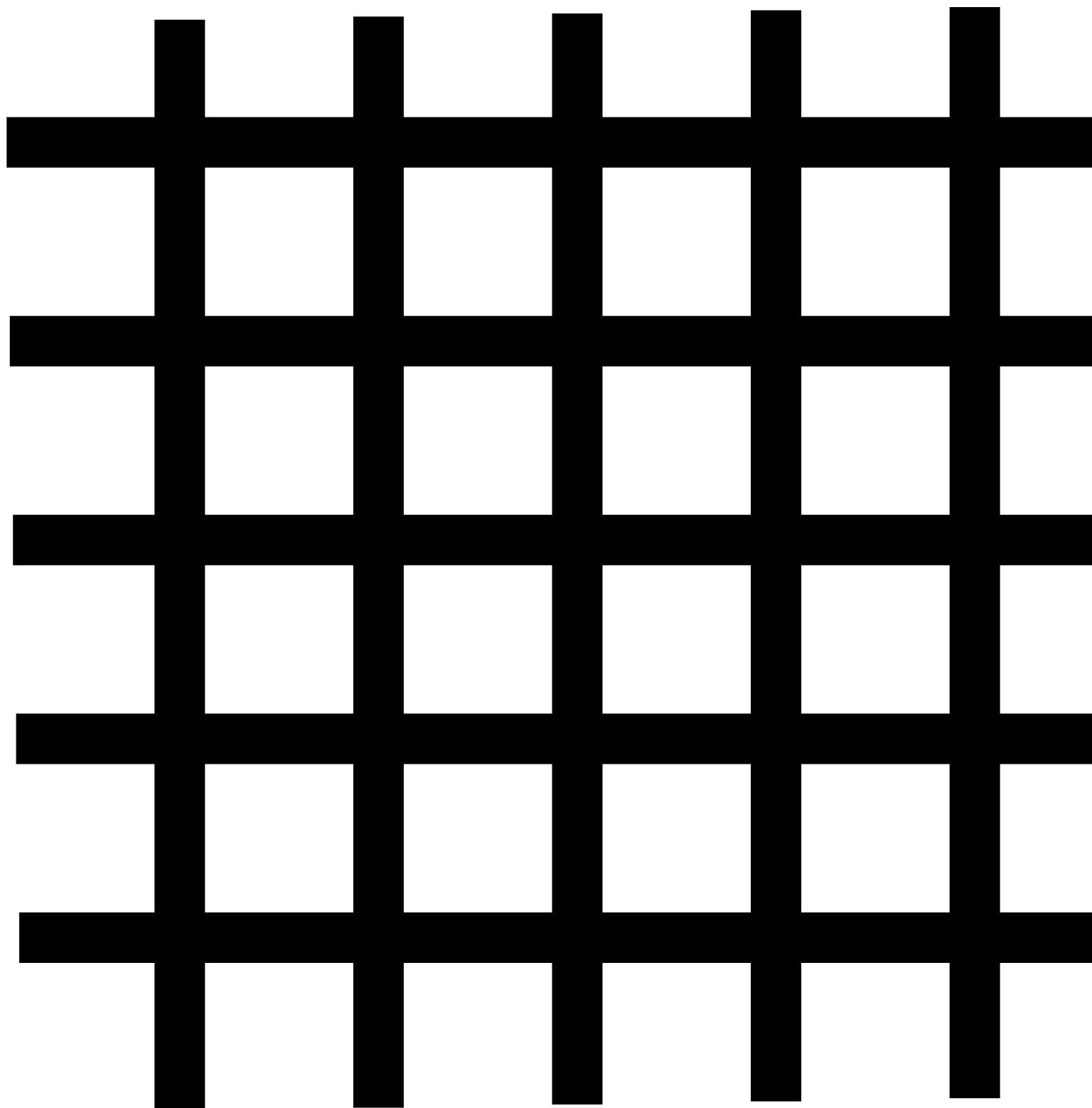








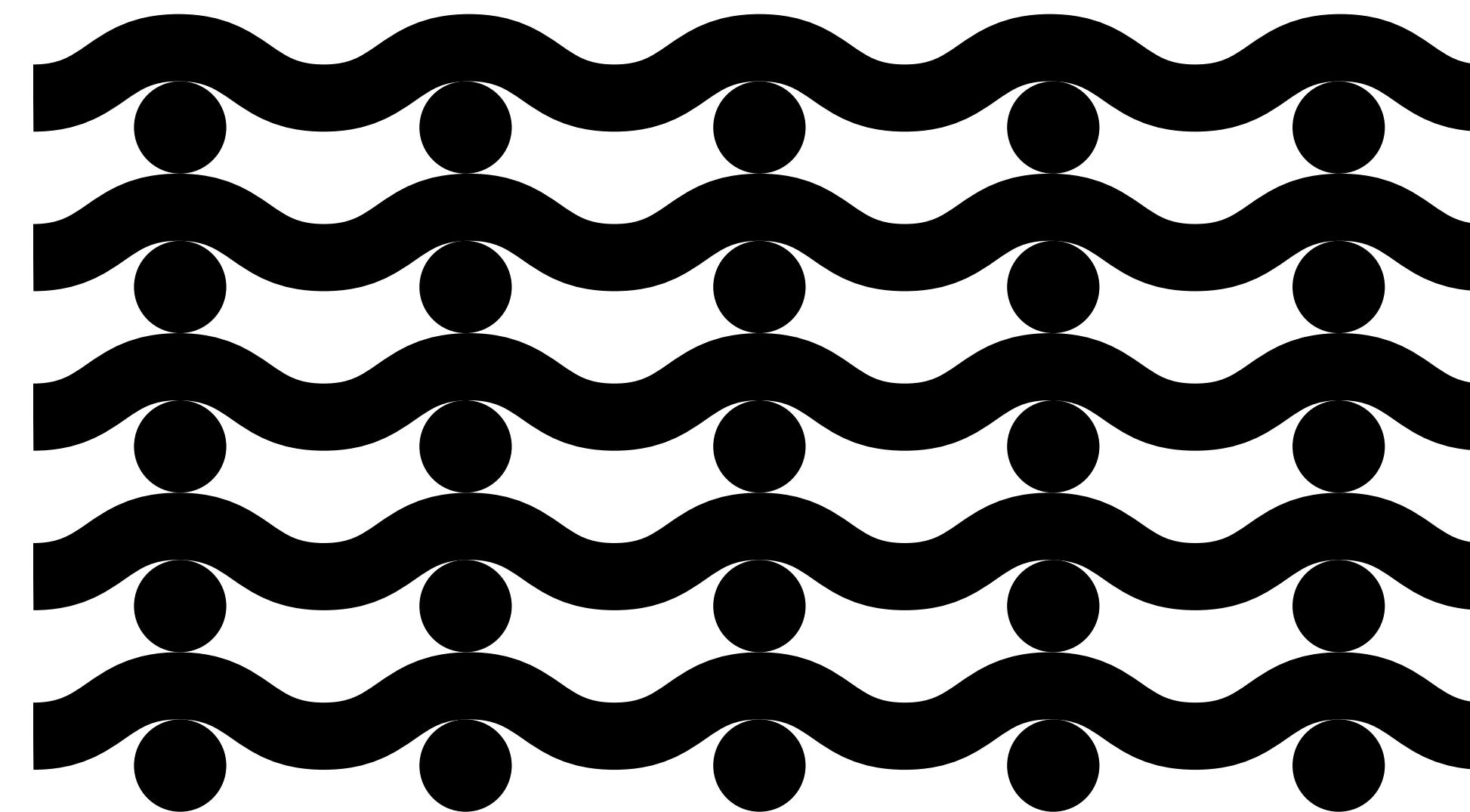
Perche funziona

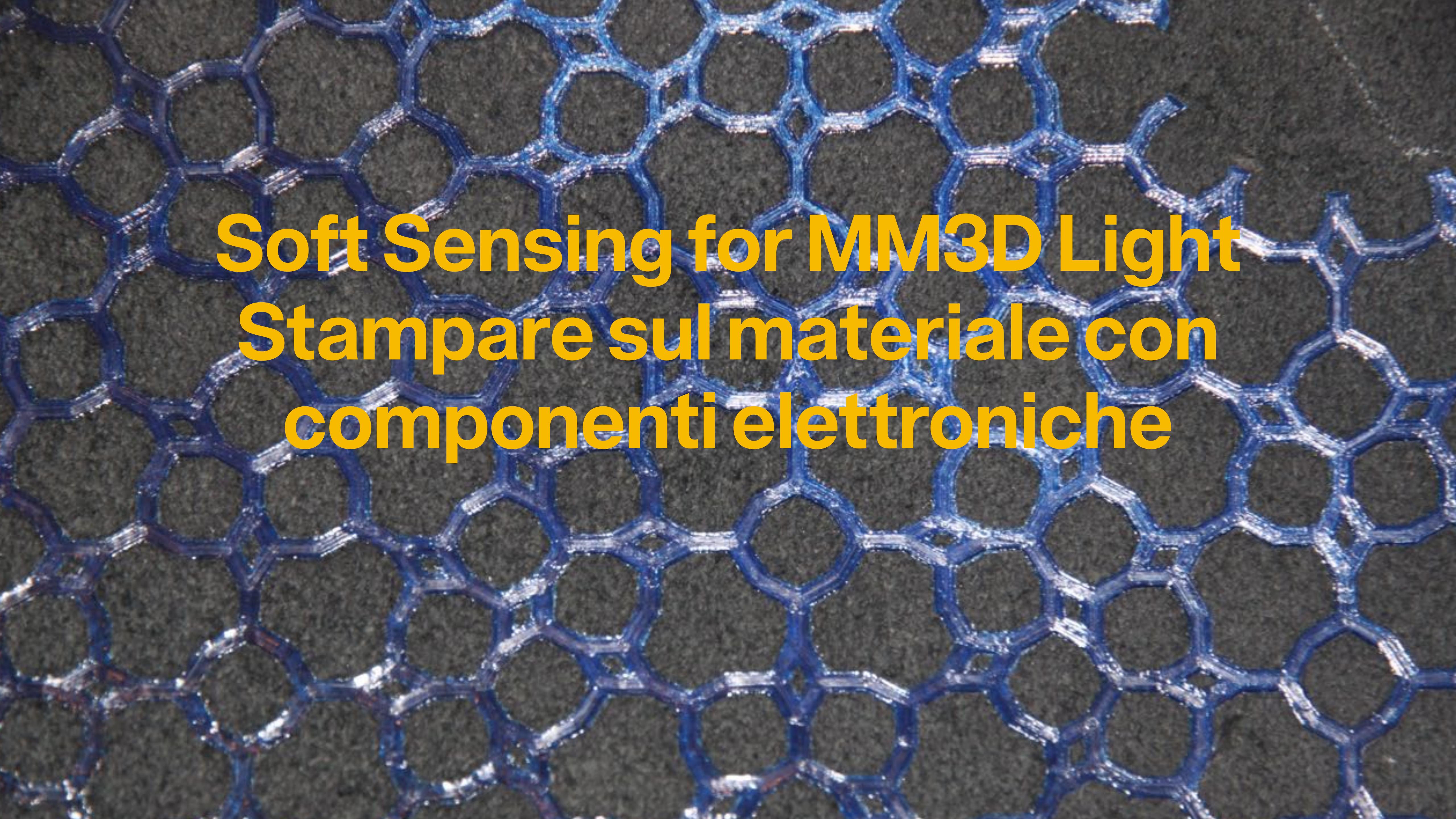


 **Infill**

Infill Density %

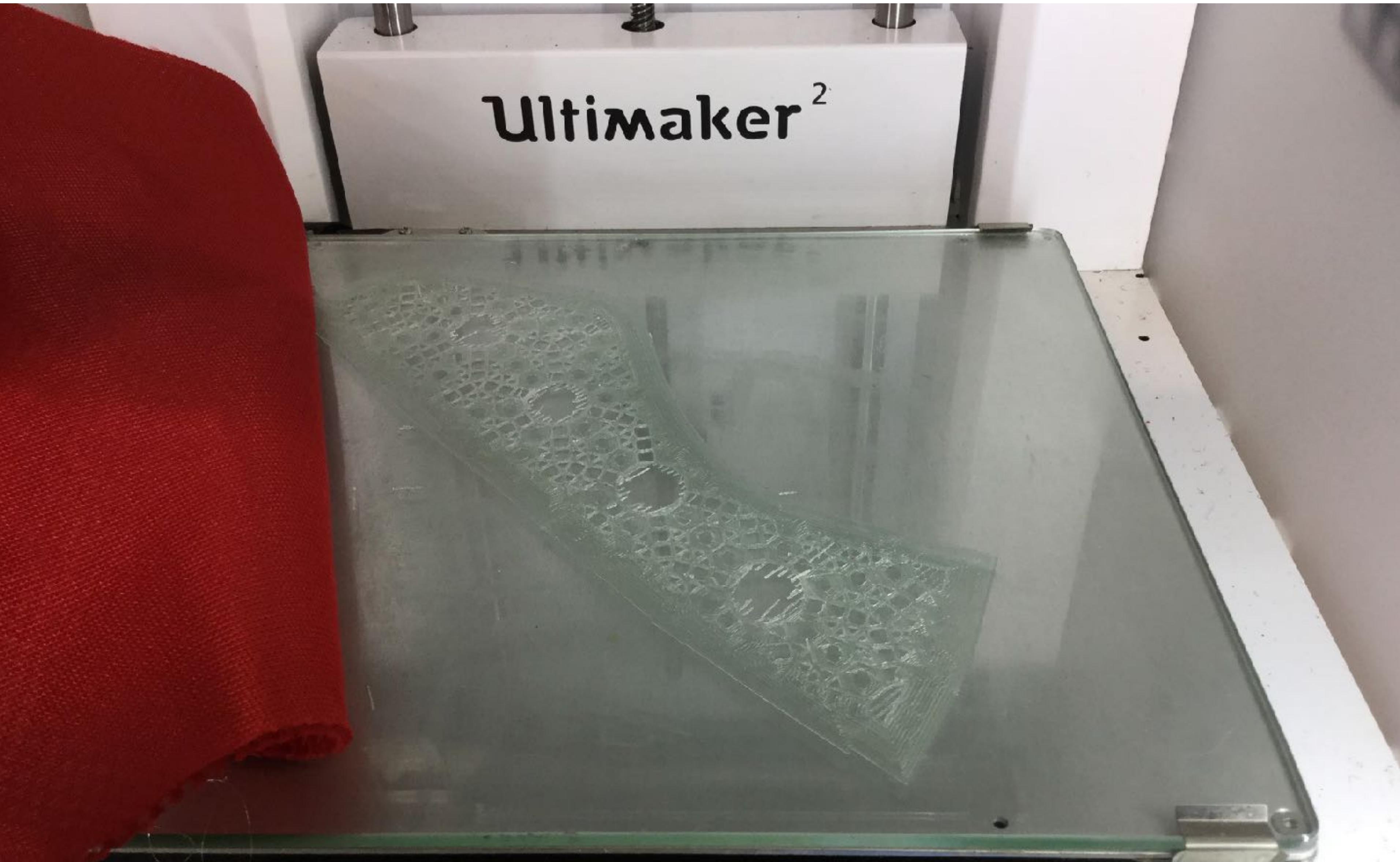
Infill Pattern

A screenshot of a software interface showing the "Infill" settings. The title bar says "Infill". Below it are two sections: "Infill Density" with a slider set at 20% and "Infill Pattern" which is currently set to "Lines". There are also undo and redo buttons.



Soft Sensing for MM3D Light
Stampare sul materiale con
componenti elettroniche

Posto Giusto



Physical Bonding

- Cerca tessuti plastici
- Nylon, Polyester, Acrilico
- Cottone, Lana, Naturale richiedono Mechanical Bonding
- PLA 190°C ABS 230°

Plastics that stick

- Cerca a quale temperatura un tessuto diventa liquido

Spacer Fabric

- Filo Con Diverse Plastici

Componente Elettronici

- Spacer permette componente che sono meno alto della spacer di essere messo sul board.
- Un po di cucitura aiuta
- Vai PIANO i primi livelli

Stretch

- Si può stampare sul tante cose diverse.
- E' Importante che il materiale e' sotto stretch.