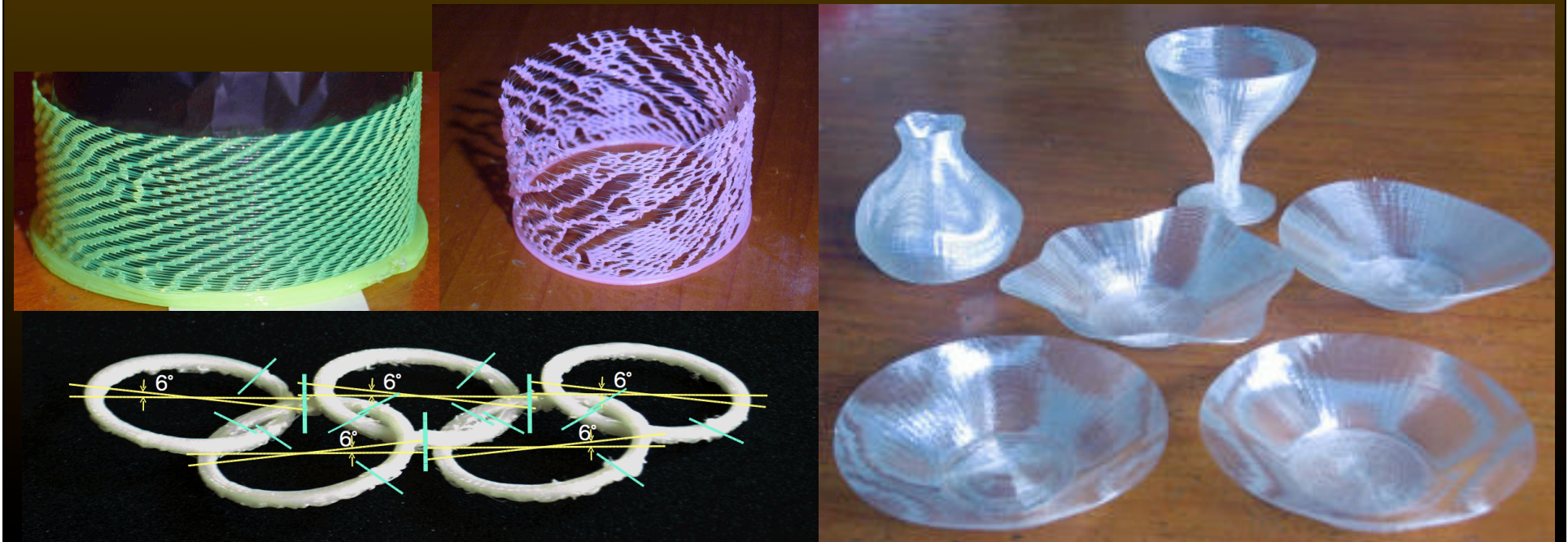


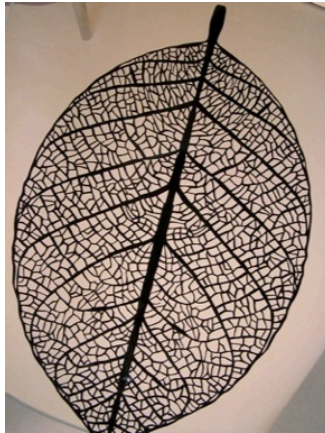
Developing Revolutionary 3D Design and Printing Methods

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Dasyn.com, Japan



Problems of Conventional 3D Design & Printing Methods

- ▶ **Conventional 3D models cannot express “direction”.**
 - Objects may have natural or artificial directions.



leaf vein



hair

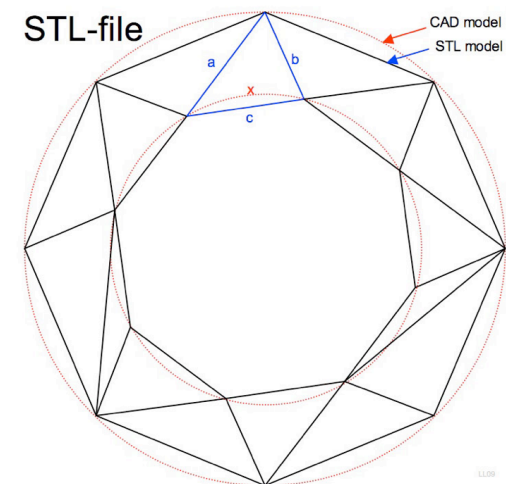


? (plant)



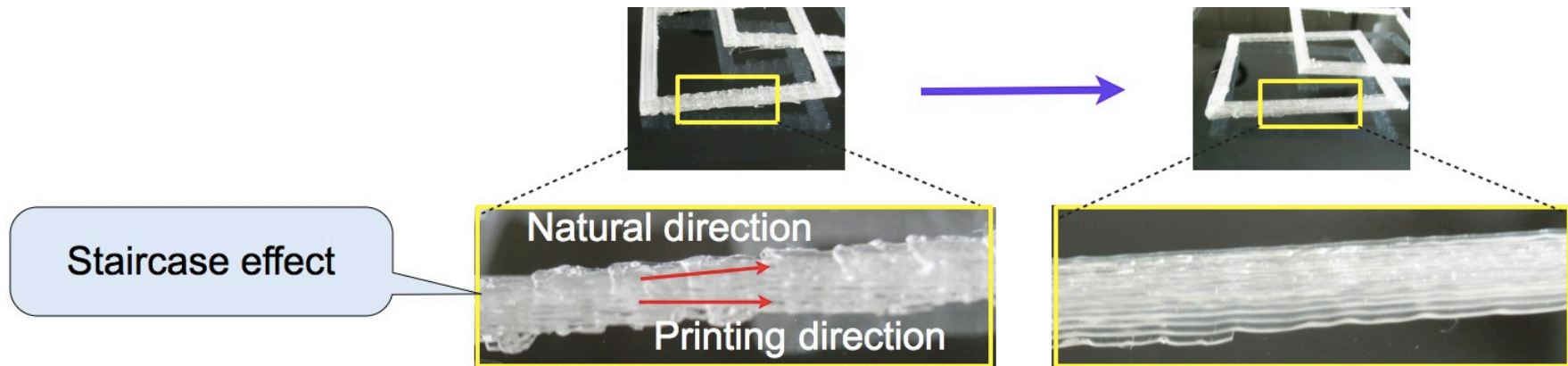
calligraphy

- ▶ **Conventional models and methods handles only the surface of 3D objects.**
 - CAD softwares output “STL files”, which only contains shape of the surface.



Problems of Conventional 3D Design & Printing Methods (cont'd)

- ▶ **Conventional methods slice and print 3D objects only horizontally.**
 - Non-horizontal direction cannot be expressed.
 - Especially, the printing direction of 3D printers may contradict with the “natural direction”.



Newly Developed 3D Design & Printing Methods

- ▶ **We develop new 3D methods to solve the problems.**
- ▶ **These methods enable**
 - designing “real 3D objects” including the internal structures and textures (not only surfaces).
 - printing patterns with non-horizontal directions.

Three Methods to be Introduced

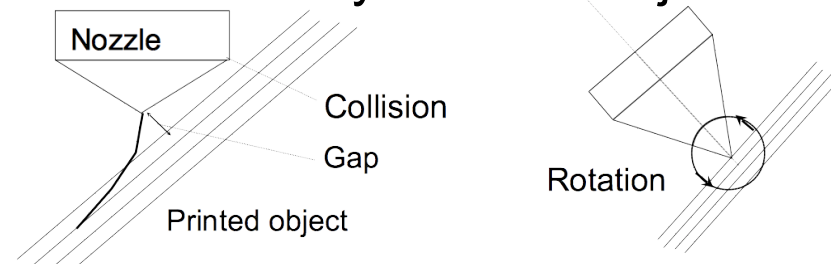
► 1. Direction-aware 3D *design* method

is a “real 3D design method” that makes transparent objects and objects with holes much more realistic.

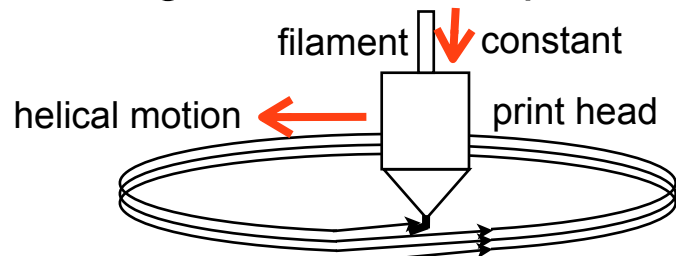


► 2. Non-horizontal 3D *printing* method

enables naturally-directed objects such as 3D calligraphies.



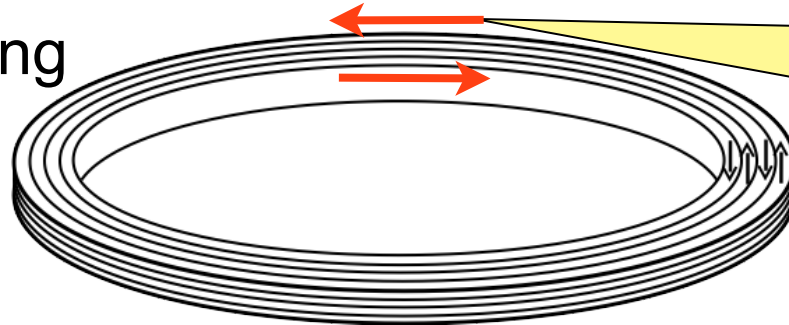
► 3. Self-organizing and naturally-randomized 3D printing method generates unexpected interesting 2D & 3D structures.



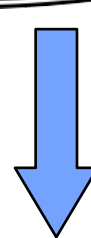
Example: Olympic Symbol

► Direction-aware design

directed ring

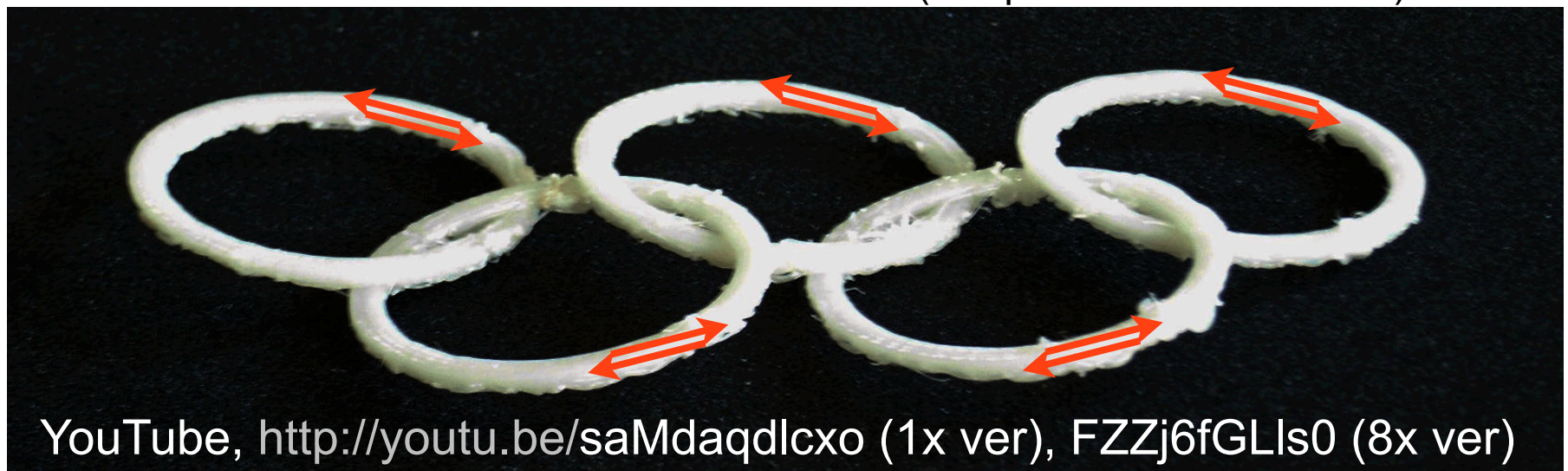


print direction
(circumferential direction)



Basic design technologies
(partition, rotation, combination, ...)
Basic printing technologies
(Pat pend. P2013-161928)

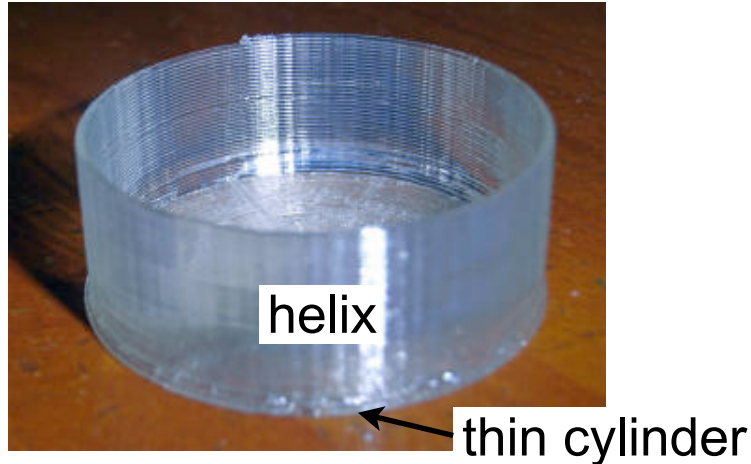
► Non-horizontal printing



YouTube, <http://youtu.be/saMdaqdlcxo> (1x ver), FZZj6fGLIs0 (8x ver)

Example: Dishes, Cups, Pods, and More ...

► Direction-aware design



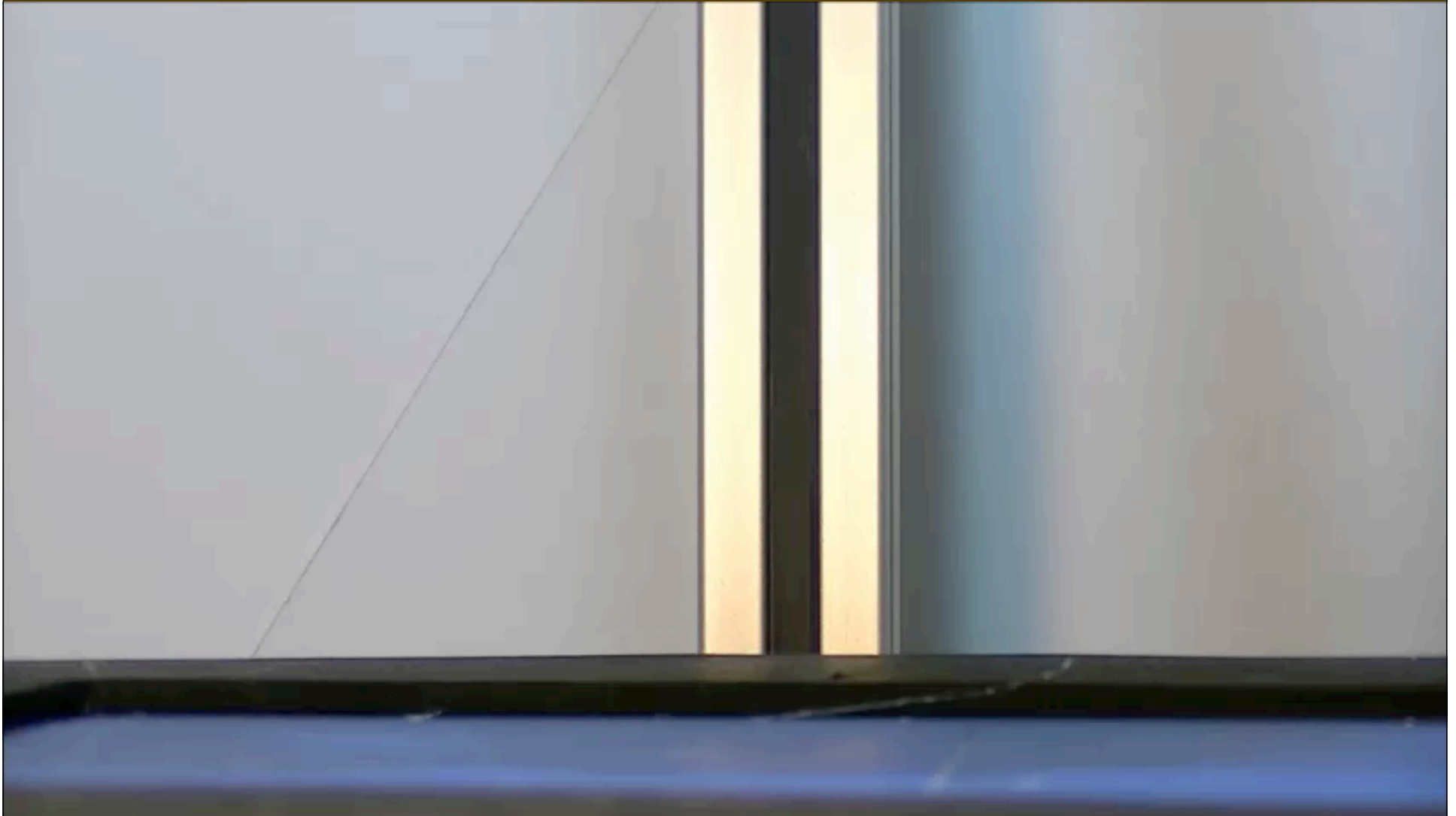
Advanced design technologies (deformation, light-reflection control)
Advanced printing technologies

(Pat pend. P2014-118197, P2014-118200, P2014-126753)

► Non-horizontal printing



Printing Process of Dish and Result

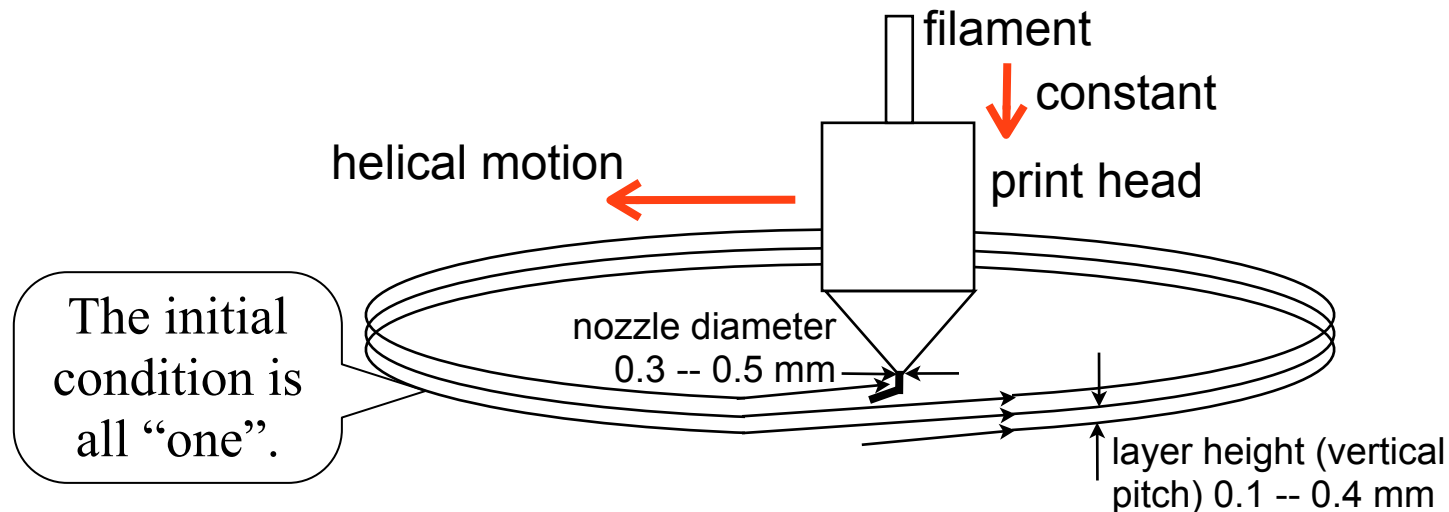


Uploaded soon to YouTube

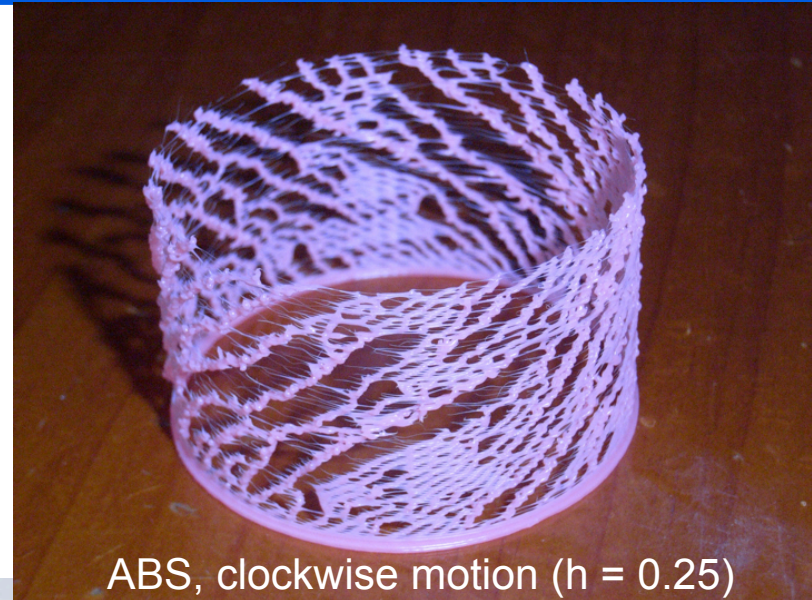
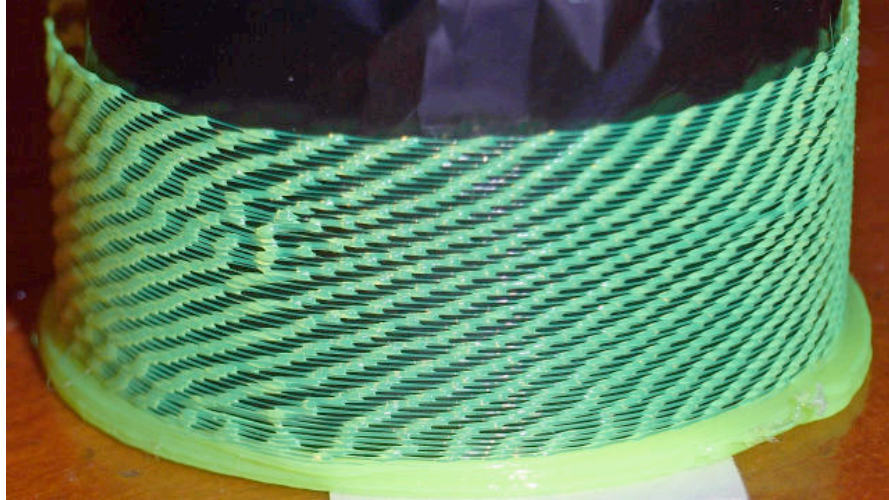
Self-organizing and Naturally-randomized Printing

► Self-organized patterns can be generated by

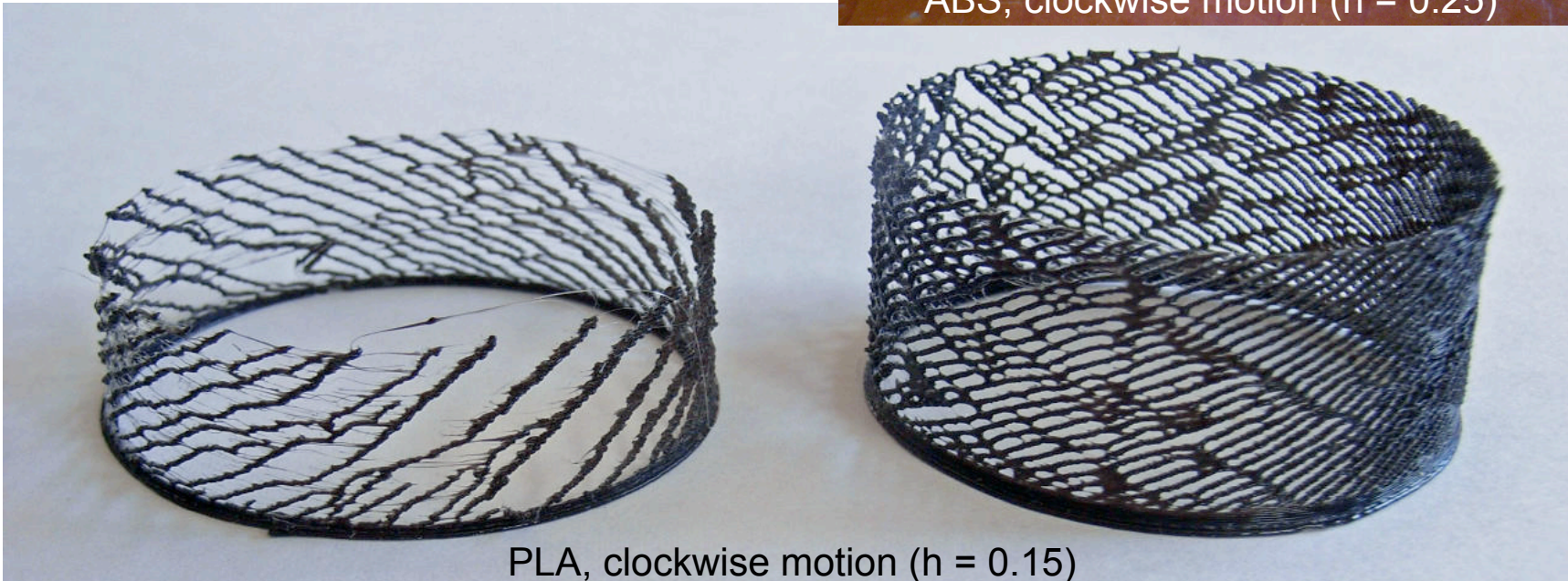
- Constant helical head motion
- Constant extrusion of filament
- Small amount of filament



Examples: Self-organizing and Naturally-randomized Printing

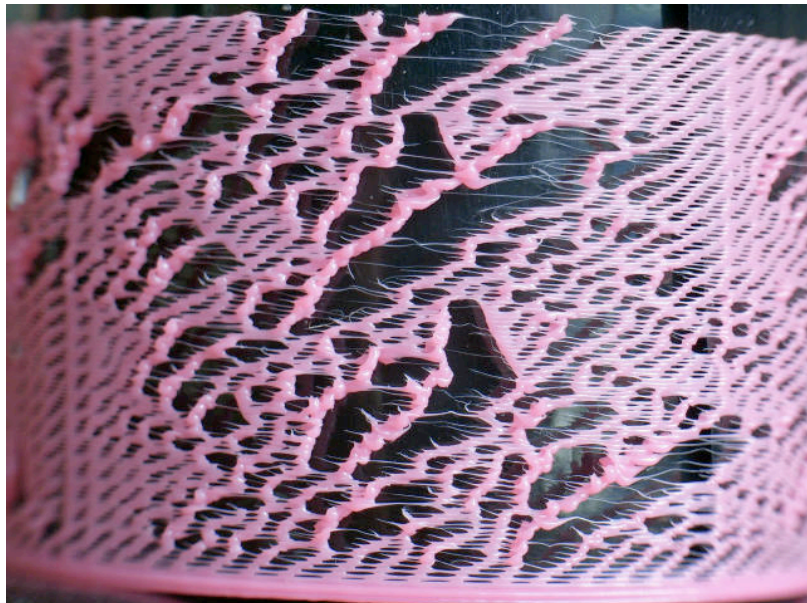
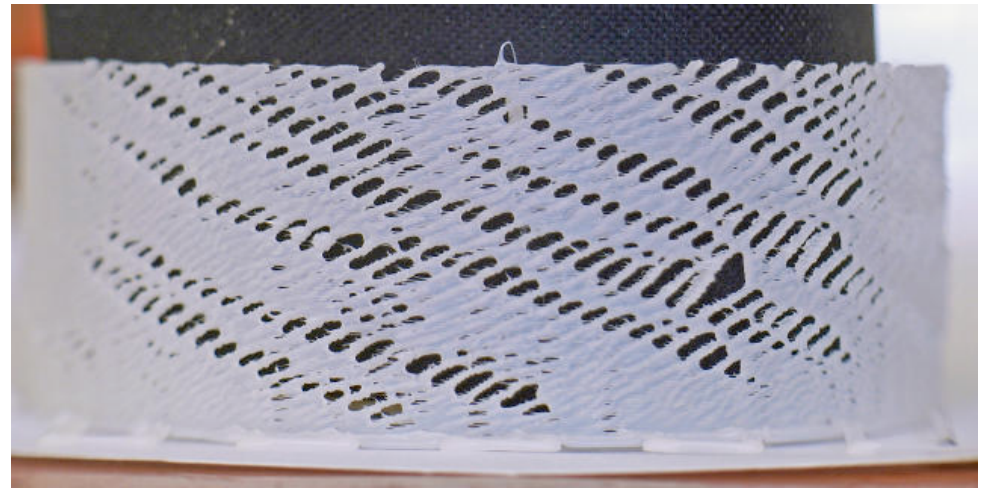


ABS, clockwise motion ($h = 0.25$)

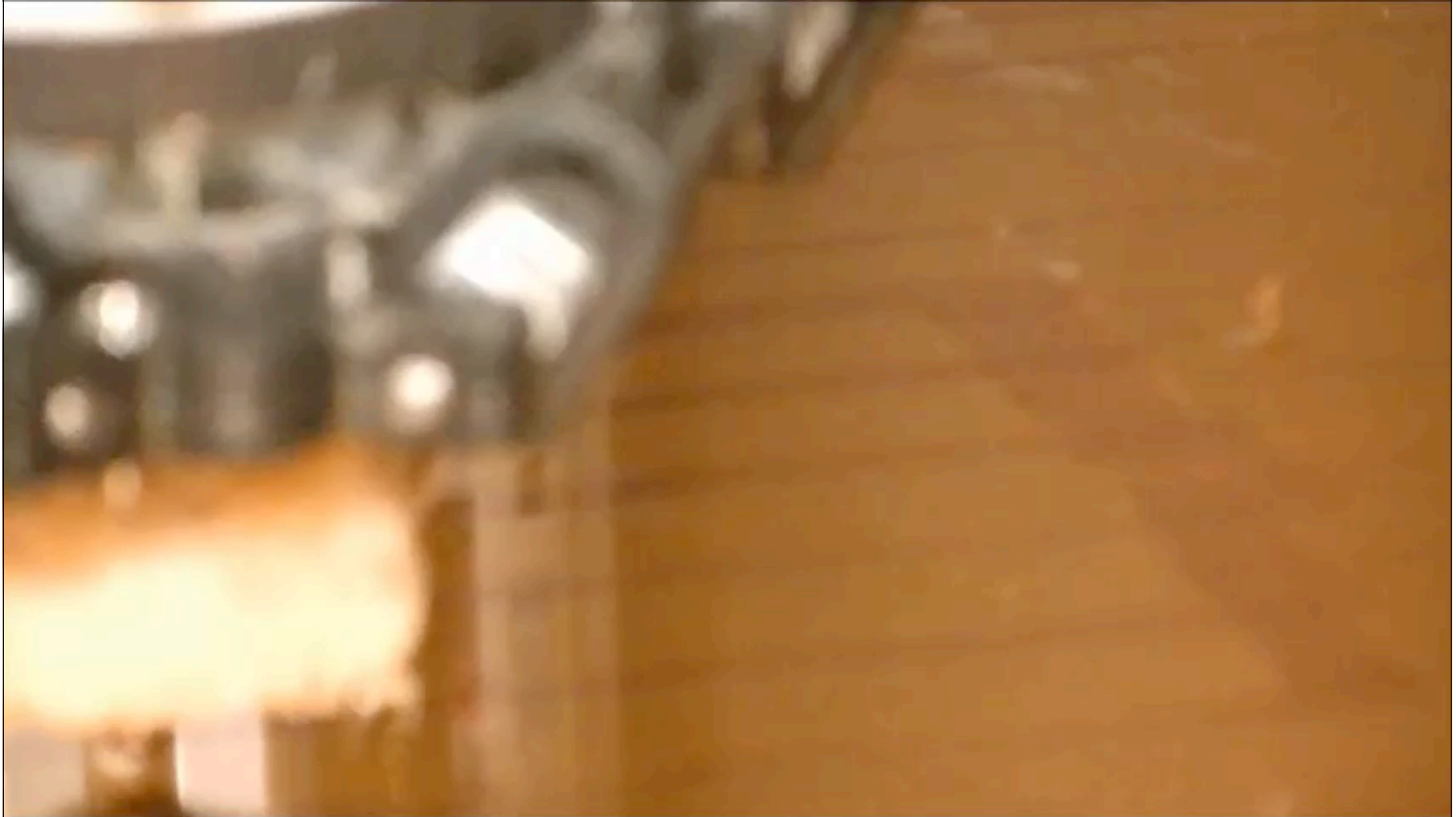


PLA, clockwise motion ($h = 0.15$)

Examples: Self-organizing and Naturally-randomized Printing (cont'd)



Printing Process of Self-organizing Pattern using Rostock MAX 3D printer



YouTube, <http://youtu.be/IJ15ysJR5l8>

Potential Applications

► Generative art



calligraphy

► 3D Calligraphy



Julien Breton



立体象書研究会

- Directed 3D calligraphy
3D printing based

?

Iron based



Shishu



Summary and Conclusion

▶ **Three revolutionary 3D design & printing methods are proposed.**

- 1. Direction-aware 3D design method
- 2. Non-horizontal 3D printing method
- 3. Self-organizing and naturally-randomized 3D printing method

▶ **We seek partners who will collaborate and develop applications of these methods.**

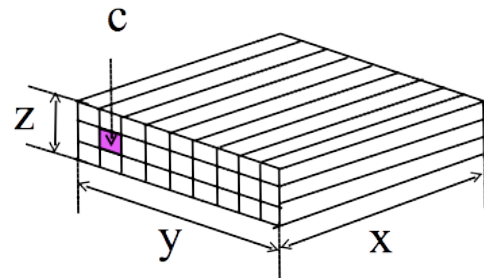
- Information available on Web: [Yasusi Kanada 3d printing](#)
- You can see and get print samples.

Don't look at ads! (not mine)

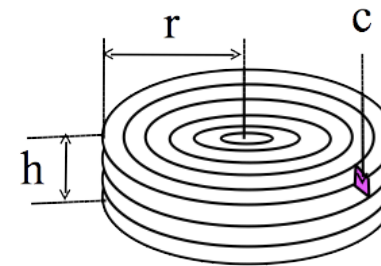
Appendix: 1. Direction-aware 3D Design Method

- ▶ **Parts for 3D CAD are “hashed” (or “peeled”) in this method.**

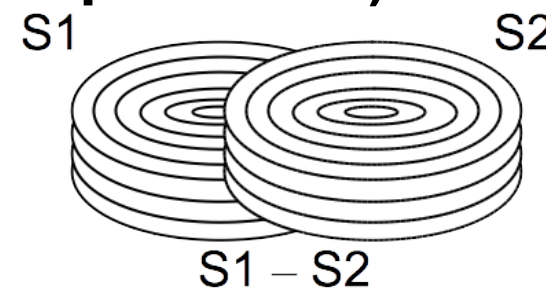
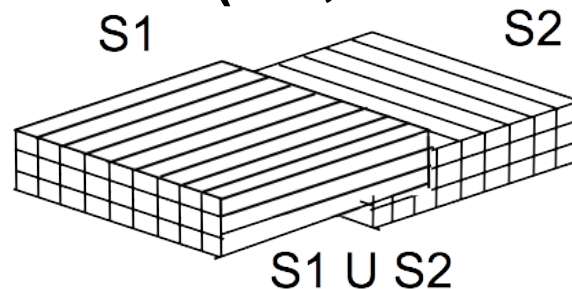
Cross section



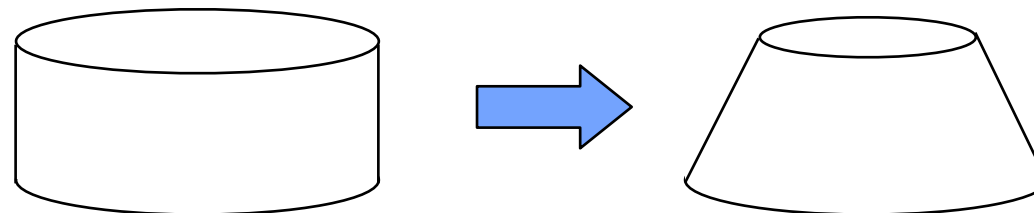
Cross section



- ▶ **Parts are combined by using operations such as union or intersection (i.e., extended set operations).**

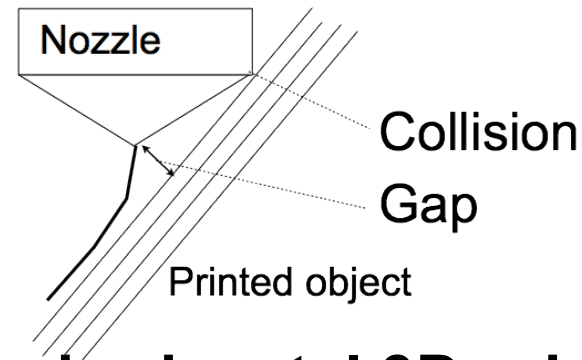


- ▶ **Parts may be “deformed” to generate more complex shapes.**



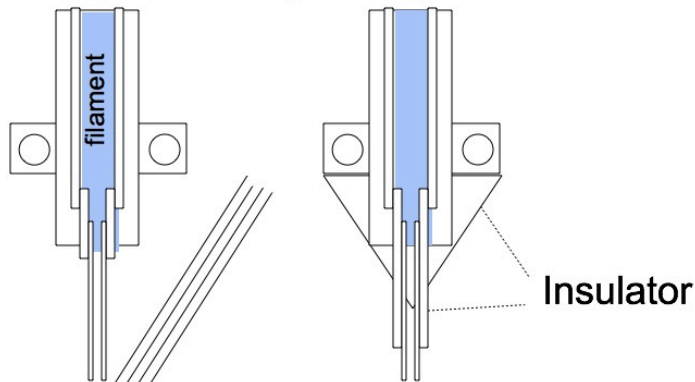
Appendix: 2. Non-horizontal 3D printing method

► Problems in steep printing

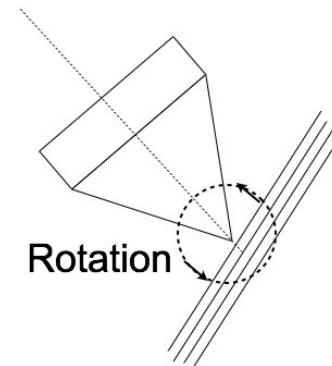


► Conceptual methods for non-horizontal 3D printing.

- Needle-shaped nozzle



- Five-axis print-head



► Conventional 3D printers are not the best but work.

- Delta-type printers, such as Rostock MAX, →

