Tool: 3D Printing

3D printing (Additive Manufacturing) is a technology that builds physical objects by layering materials sequentially. Unlike traditional subtractive manufacturing methods (such as cutting or carving), 3D printing directly relies on digital models (3D CAD designs) to construct objects. It offers high freedom, personalized customization, and rapid manufacturing advantages.

Among the many features of 3D printing, the unique nature of additive manufacturing has deeply intrigued me. To gain a deeper understanding of the 3D printing process and principles, I have chosen the traditional Chinese stone lion as my printing object. This sculpture is renowned for its intricate details and fine carvings, leading me to explore the following questions:

• Can 3D printing fully reproduce the intricate details of the Chinese stone lion?

• What unexpected challenges or interesting phenomena will arise during the printing process?

Characteristics of 3D Printing:

1 Additive Manufacturing: 3D printing constructs objects layer by layer, much like "printing" in a three-dimensional space. Each layer accumulates, eventually forming a complete 3D object.

2 Material Diversity: 3D printing supports various materials such as plastics, resins, metals, ceramics, and even biocompatible substances.

3 Support Structures: Essential in 3D printing, especially for complex geometries, support structures prevent deformation, collapse, or print failure, ensuring a successful build.

Questions and Experimental Directions

1. Can the cross-sections of 3D prints be converted into 2D graphics?

• Each layer in 3D printing is essentially an independent cross-section. If we extract these slices individually, can they be visualized as 2D graphic representations?

• Can this method be applied to graphic design, creating a new visual language?

2. What significance does the negative space formed by retaining only the support structure, while removing the main object, hold?

• In traditional 3D printing, support structures exist purely as auxiliary elements, but if we remove the main object and focus solely on the negative space created by its supports, what new meanings might emerge?

3. How can 3D printing support structures become the primary subject of observation?

• Support structures originally exist to assist the main object, but what if we reverse the perspective—making the support structure the focus while the main object recedes into the background?

• Would this approach challenge our traditional understanding of sculpture, architecture, and design?

4. Do different objects generate unique visual languages through their support structures?

• Since different objects have varying geometric properties, their support configurations differ significantly.

• If we collect, classify, and visualize the support structures of different printed objects, could we establish a unique system of structural studies?

• Can this approach evolve into a new design methodology or an artistic expression?

3D Printing and Mortise-and-Tenon Structures: The Clash of Tradition and Modernity, the Subversion of Support and Subject

In my ongoing iterative experiments, I decided to integrate traditional Chinese mortise-and-tenon structures into my research, attempting to reinterpret this ancient architectural wisdom through 3D printing technology.

Mortise-and-tenon, as the pinnacle of traditional Chinese woodworking, requires no nails or glue, relying solely on the interlocking force and mechanical balance between wooden components to form a stable self-locking structure—without any additional support.

I selected seven classic mortise-and-tenon structures for 3D printing experiments. However, the essence of mortiseand-tenon lies in precise calculations and a self-sustaining logic, whereas the nature of 3D printing is layer-by-layer stacking, which requires support structures to prevent collapse. When using 3D printing to construct mortise-andtenon architecture, it paradoxically relies on a large number of additional support structures for stability.

I see these extensive support structures as more than a technical necessity; they symbolize a clash between tradition and modernity, a dialogue between human craftsmanship and machine-driven construction.

This experiment ultimately led me to shift my focus from the architectural body to the 'negative space' formed by the support structures.

Reevaluating the Role of Support: From Tool to Subject

In traditional manufacturing logic, support structures are merely auxiliary tools, removed after their function is fulfilled—much like scaffolding on a construction site or temporary supports in sculptural carving. However, when support structures themselves become the focus of observation, can we redefine their significance?

If the main subject is removed, leaving only the support structures, does it imply that:

• The traditionally "auxiliary" concept is transforming into a new form of independent visual expression?

• This challenges our categorization of objects—are support and subject, function and ornament, technology and art, still distinct boundaries?

Foucault's The Order of Things and the Subversion of Objecthood

Michel Foucault, in The Order of Things, explores how knowledge is classified, assigned value, and shapes our perception of the world (Foucault, 1970).

He asserts that the meaning of objects is not fixed,

but rather determined by the way we construct their classification systems.

This concept is validated in the 3D printing support structure experiment:

• Traditionally, support structures are auxiliary, while the primary object is central.

• However, when we shift our perspective, the support structure itself becomes the subject—while the main object remains but is hidden in the background—thus subverting the original notion of objecthood.

If support structures were once considered secondary but now take center stage, does this challenge our established understanding of form, function, and classification systems?

Foucault argues that what we recognize as an object is not inherently given but is a result of constructed knowledge systems.

The transformation of support structures—from an overlooked functional element to a symbolic artistic language—illustrates this very process.

It is no longer merely a byproduct of the printing process; instead, it presents a new way of seeing, a critical reflection on fixed thinking.

The role of support structures in 3D printing has evolved from a technical necessity to an independent visual subject—not just an experiment in materials and technology but a reconstruction of observational logic.

Support structures are no longer temporary; instead, they can be examined, analyzed, and even imbued with new meaning.

After weeks of iteration, this experiment has led me to a bold question:

If support structures are no longer auxiliary, is
3D printing creating a new definition of objects? A new architectural language?

• If support becomes the subject, are we also reconstructing the way we observe the world itself?

Reference

Foucault, M. (1970) The Order of Things: An Archaeology of the Human Sciences. London: Tavistock.

Draft 3





