Biological Printing

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1. Introduction

During the past decade medical researchers at Wake Forest Institute for Regenerative Medicine (WFIRM) have developed technologies to generate human tissue for manufacture of human organs such as kidneys, bladders, and heart valves. Human organs have been created via Rapid Prototype processes similar to the systems that Digital Sculptors have used to print sculptural forms during the past couple of decades.

2. Background

Although the basic manufacturing techniques are similar, the huge difference is that medical researchers have developed printable materials from cloned human cells that can be transplanted into the bodies of donors whose cells were cloned. It is projected that we will soon be able to replace most human organs (including skin) with precisely matched genetically compatible parts that will dramatically reduce the problem of rejection by the host body after transplants. There have already been some successful human trials with transplanted bladders. Beyond being impressed with the impact of another great medical achievement for quality life extension, my more immediate reaction upon learning of this significant research two years ago was that the threshold for a new aesthetic had been reached. It was now possible to achieve a goal that I had set twenty years ago: To build sculpture with living tissue to actuate organically kinetic sculpture much like the first virtual sculpture animation works that I was producing at that time.

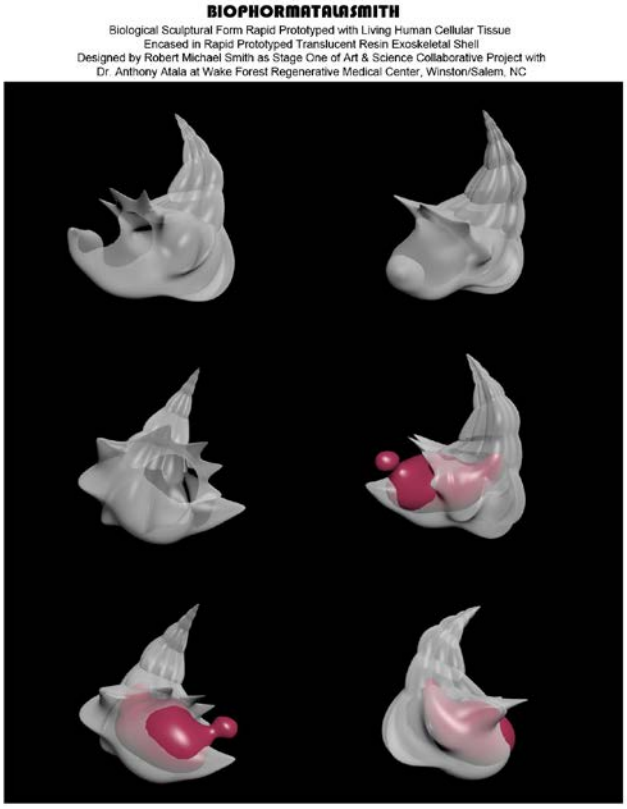
During the early 1990s, while working on the critically acclaimed CD-ROM game, "Millennium Auction," I developed characters that represented future artists engaged with making art that utilized advanced technologies that were considered as science fiction. Since then I have personally realized the technical ambitions that I had set forth within several of those fictional future artists such as virtual art museums/sculpture parks, virtual sculpture projections, virtual sculpture accessible on the Internet, and physical sculpture manufactured by robotic devices. However, even I was skeptical that any time soon I would achieve the "Human Meat" sculpture that was also anticipated in the story of that game.

That time has in fact arrived. The Art & Science collaboration project with Dr. Anthony Atala at Wake Forest Institute for Regenerative Medicine has achieved Stage One, which is the first rapid prototyped human tissue of an invented sculptural form that I designed directly in a CAD program.

3. Future Research

Later stages of this project will investigate means to keep the various human tissue sculptural forms alive for extended periods, probably within a sealed aquarium system. I will design endoskeleton and exoskeleton forms to allow more complex form with greater support for later developments of my bio-sculpture creatures. Eventually we expect to manufacture internal capillary systems that will aid development of self-sustaining bio-organisms.

We have already been in serious discussions with artificial intelligence and robotics engineers to eventually wire these more complex life forms to enable "smart" technologies that will control life-like responses as well as motion to be programmed into the sculptural creatures. The resulting bio-mechanical sculptural organisms will be capable of a number of research tasks to simulate various environment effects on human tissue including zero-gravity and extra-terrestrial exploration.



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