

ICI 64th Annual Technical Conference & Equipment Expo,
Marriott Cincinnati at Rivercenter, Covington, KY, 2017.

ADVANCING SCULPTURE

Rob Arps
Founder/CEO
Form 3D Foundry
Portland, Oregon, USA 97202
rob@form3dfoundry.com

Eyal Chernichovsky
Process Engineer & Production Program Manager
Form 3D Foundry
Portland, Oregon, USA 97202
eyal@form3dfoundry.com

ABSTRACT

The rise of digitally driven artistry is ubiquitous. It is a critical time to bridge the implications of the rise in three dimensional design to investment casting. Through a recent project called, *The Cloisters on the Platte*, we present our process called, *Advancing Sculpture* — a new framework of solutions to these obstacles.¹

INTRODUCTION TO ADVANCING SCULPTURE

There is a vast resource of rising digitally driven artists who do not have exposure to current investment casting processes as well as the classical professionals who are unfamiliar with the benefits of advanced sculpture technologies. Our motivation is to address and shed light on these producer-consumer opportunities for professionals who are unaware of the possibilities of these processes for bringing their art into the world as tangible objects. In addition, an original physical sculpture may alternatively be rendered for malleability and scale in computational design. Digital technology has enhanced archival levels. The digital speaks to quantum computation which can in fact supersede and elevate the physical level of permanence. Our focus is to explore, develop, deploy and address the need to provide value-added resources.

¹ Cloisters on the Platte, Footage for Stations of the Cross. <http://cloistersontheplatte.com/stations-of-the-cross/>

How do we begin the process of creating a sculpture at Form 3D Foundry? When our 3D agency was commissioned to create *The Stations of the Cross* for *The Cloisters on the Platte*, we arrived at a crossroads.²



Fig. 1 Cloisters on the Platte, Omaha, Nebraska

Work for the project began in, 2014. Our 3D agency was involved in the full design process to complete the stations. Traditional applications involving classic enlargement require laborious mold making processes, post-processing of unfinished cast parts, assembly, and machining. Conventional methodology would have taken twelve years to create *The Stations of the Cross* from inception to completion.



Fig. 2-5 Sketch of *Station of the Cross*, pinch model figures, 3D Digital, and 3D Print Model

² On core competencies, see C.K. Prahalad, G. Hamel.

We were tasked with accomplishing this within three years, by August 2017. Utilizing traditional methods of sculpting was out of the question.

While maintaining our quality standards, our solution was to cut production time down by 75%. To do so, we coupled our traditional, classical method of artistry with inventive solutions.

Aiming to improve upon our own performance standards, we adopted automotive and aerospace technologies and invented an interwoven cache of systems to manipulate and use data output in such a way to print and mill in 3D. Form 3D Foundry is at the forefront of complex digital system implementation. There are currently no known simulations oriented to this process in the realm of fine art sculpting.

Our interest is to broaden the variety of techniques such as adopting new and different technologies to refine and redefine what it means to sculpt. It is about bringing practitioners from different fields together to share ideas and to foster new interactions and relations. Thus, the origin of *Advancing Sculpture*. We are headed in a new direction with new medium technology.

APPROACHING THE BIGGER MARKET

How do we approach a bigger market than ever before and introduce more art mediums to the investment casting processes? How do we go about educating this new generation in the investment casting market? How do we approach an expanded market and allow more art mediums to be introduced to investment casting?

Advancing Sculpture explores new mediums of art through the digital asset. We have the ability to generate, acquire and manipulate data through multiple avenues including 3D scanning, 3D modeling and analysis programs for different stages of the process.

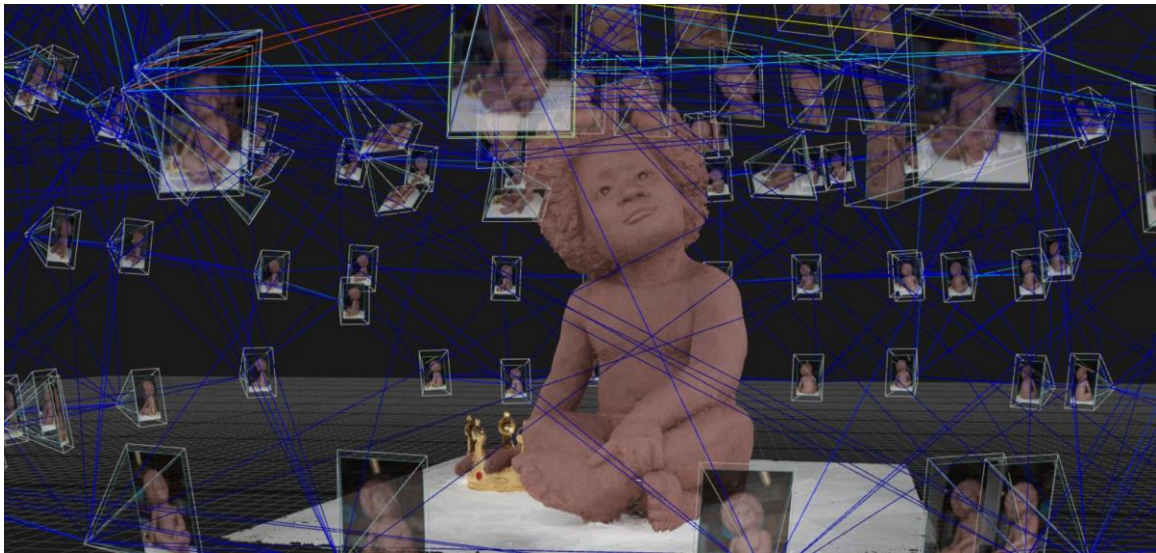


Fig. 6 Sculpture 3D Scanned
SCANNING³

- 3D Scanning
- Digital Data Archiving
- Life Scanning
- On-site Scan Services

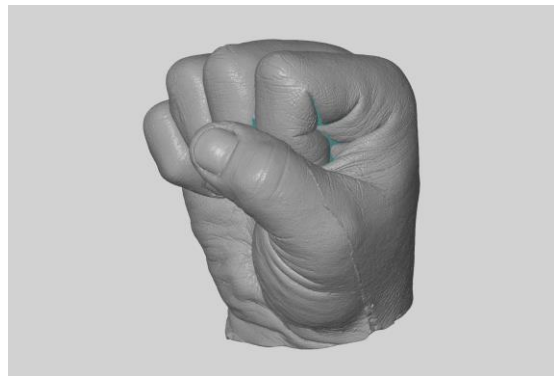
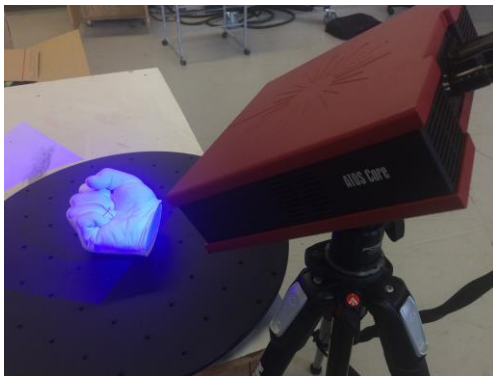


Fig. 7. 3D Scanning

³ F.I. Apollonio a , M. Gaiani a , *, W. Basilissi b , L. Rivaroli c. Photogrammetry driven tools. 53.



Fig. 8-9. Onsite scan service
Digital Data Scanned

Fig 10.



SCULPTING

3D Digital Sculpting⁴

- Tradition Sculpting
- Sculptural Enlargements and Reductions
- Theatrical Props

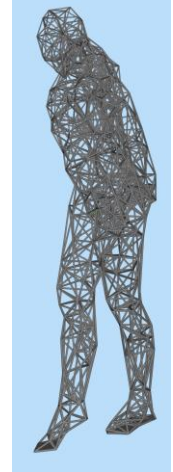
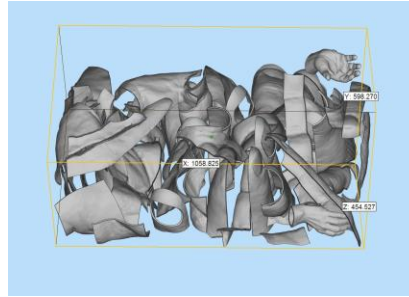
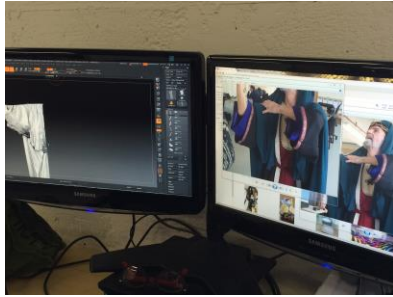


Fig. 10-12. Theatrical Props, Nested Enlargement and 3D Digital Sculpting

3D PRINTING

- Voxel 3D Printing
- Rapid Prototyping
- Complex Geometry and High Quality Surface Finishes
- Architectural Replications



Fig. 13-14. Voxel Prints

⁴ J. Voss Andreae.

MACHINING

- CNC Milling
- Blue PIB & White Polystyrene
- Polyurethanes
- Wood



Fig. 15-17 CNC

Milled White Polystyrene, 3D Printed Maquette and
CNC Milling in Blue PIB

ARTIST SERVICES

- Sculptures from Artist's Concepts⁵
- Project Design Services
- Pattern Making for Sculptors and Jewelers
- Mold-Printing and Investment Casting



Fig. 18-20 Sculptures from Artists' Concepts and Mold Printing

⁵ B. Cooper Virtual Concepts to 3D Print.

BROADENING SOLUTION

We recognize collaboration is needed for greater speed and precision to help expand productivity and are exploring this landscape through a rapidly evolving economy. “The artist turns passionate explorations of the wonderful into works of art, and the scientist translates them into words and equations; but what drives innovation in science is inseparable from the elemental urge to express ourselves artistically.”⁶ The world is shifting with digital assuming permanence.⁷

Computational design and complex geometries are now possible through the combination of digital design and investment casting. Rather than dealing with tangible objects, an original piece can now be built using 3D archiving through a digital file.

Form 3D Foundry uses additive manufacturing and has foundry-skilled production employees, all under one roof. This gives us the ability to deliver and manufacture quality sculpture on a previously unattainable timeline.

“What stands beyond [generic aphorisms] is the development of true dynamic models which exist today but due to high computational time/cost are only limited to small niche domains.” We would like to open this floor through *Advancing Sculpture* so that “these obstacles are overcome [and] we may see the emergence of design computing environments where one could design interactively within a running simulation enmeshing intuition about building statics, human behavior, etc.”⁸ As a 3D modeling-based agency functioning as a digitally proficient art-based investment casting foundry, Form 3D Foundry is the opposite of the norm. Achieving fidelity in artistic and organic shapes is uniquely labor intensive because of the density of data it is necessary for preservation. We’re ideally suited to providing these services because of our experience and proficiency in digital asset management.

We conduct constant research on digital scanning, 3D design software and additive manufacturing chemicals for investment casting. We implement production practices from precision cast foundries and combining them into the fine art foundry process. We are leveraging the potential created by managing digital assets through design engineering and broadening new infrastructures for foundries.

The education of new technologies for potential clients, bureaus and the new generation edification of digital artists to investment casting markets is paramount. Our underlying

⁶ D. Gurnon, J. Voss-Andreae, J. Stanley (2013). “Integrating Art and Science in Undergraduate Education”.

⁷ Refer to digital archiving. G. Stiny, O. Gün, 8.

⁸ See, S. Dritsas for overcoming obstacles of design computing environment. 41.

quest is for the continuation of enhanced value and refinement of the fine art making process.

REFERENCES

B. Cooper.

<https://zine.electricobjects.com/interviews/birch-cooper>

Cloisters on the Platte, Soldier at Station II, Time 1:25

<http://cloistersontheplatte.com/stations-of-the-cross/>

C.K. Prahalad, G. Hamel (1990). "The Core Competence of the Corporation".

<https://hbr.org/1990/05/the-core-competence-of-the-corporation>

D. Gurnon, J. Voss-Andreae, J. Stanley (2013). "Integrating Art and Science in Undergraduate Education".

[http://julianvossandreae.com/wp-](http://julianvossandreae.com/wp-content/uploads/2013/03/2013_02_26_IntegratingArtAndScienceInUndergraduateEducation.pdf)

[content/uploads/2013/03/2013_02_26_IntegratingArtAndScienceInUndergraduateEducation.pdf](http://julianvossandreae.com/wp-content/uploads/2013/03/2013_02_26_IntegratingArtAndScienceInUndergraduateEducation.pdf).

F.I. Apollonio a , M. Gaiani a , *, W. Basilissi b , L. Rivaroli c. Photogrammetry Driven Tools to Support the Restoration of Open-Air Bronze Surfaces of Sculptures: An Integrated Solution Starting from the Experience of Neptune Fountain in Bologna.

<https://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XLII-2-W3/47/2017/isprs-archives-XLII-2-W3-47-2017.pdf>

J. Voss Andreae. <http://julianvossandreae.com/works/>

O Yüce Gün (2012). "Theorists of Design and Computation".

<http://www.mimarlarodasiankara.org/dosya/dosya29eng.pdf>

BIOGRAPHY

ROB ARPS

Rob Arps is Founder and CEO of Form 3D Foundry. With over twenty years of classical artistry in traditional sculpting methods under his belt and fascination of science and technology, Rob's natural progression in 2000 integrated engineering tools and software from the automotive and aerospace industry into his art practice. This began improvements in cost and time without sacrificing quality. The results of increasing productivity and profitability, without compromising quality were immediate. Ultimately, technology created a sea change of radical improvements, unheard-of possibilities, and limitless potential. More importantly, Rob's unique and innovative use of technology has afforded him the opportunity to collaborate with some of the most creative and successful artists, architects, and design houses in the country.

EYAL CHERNICHOVSKY

As Form 3D Foundry Design Process Engineer and Production Program Manager, Eyal Chernichovsky is recognized for an inventive problem solving aptitude alongside analytical skills. Eyal finds that the simplest and most cost effective solutions in production and fabrication situations are the ones that he takes most satisfaction in because of the fundamentals they take to attain; a process geared towards a totality in additive manufacturing, computational design, a 3D dimensional brain (sometimes 4D), a deep understanding of the medium at hand and passion for art, design and engineering as one.