Electroform(alism)

ANYA SIROTA
University of Michigan

ELECTROFORM(ALISM)

Detroit, Michigan
2013 - present

2014-2015 ACSA Architecture Awards Program
Faculty Design Award Submission

01. APPLIED DESIGN RESEARCH

Electroform(alism) explores hybrid ways of making - reviving Nineteenth Century metal electroforming techniques and adjusting them to contemporary design and fabrication methods. In re-imagining electroforming as an intrepid, present-day process that moves beyond the simple replication of metallic objects on a master form, the strategy tests novel aesthetic, material, and economic possibilities in service of mass customization. Using expendable and embedded substrates, the prototypes generate distinct metallurgical ornament and articulated skins. More importantly, perhaps, the process also conceives of a new mode of small scale fabrication – one that is adaptive, nomadic and generative in economically challenged scenarios.

02. PROCESS AND ADAPTATION

Electroforming is a deceptively simple process, produced through the deployment of a series of variable and contingent components: matrix material, chemical bath, and substrate. Conventionally, the practice begins with a mold, or master, whose surface is made conducting with a thin coat of graphite powder or paint. A wire is attached to the conducting surface and the mold is suspended in an electrolyte solution. Electro-deposition of the material - typically alloy foil, silver, nickel, or copper - is activated using electrical currents. When the mold is coated to the desired thickness, the object is removed from the bath and divorced, partially or totally, from the original mold.

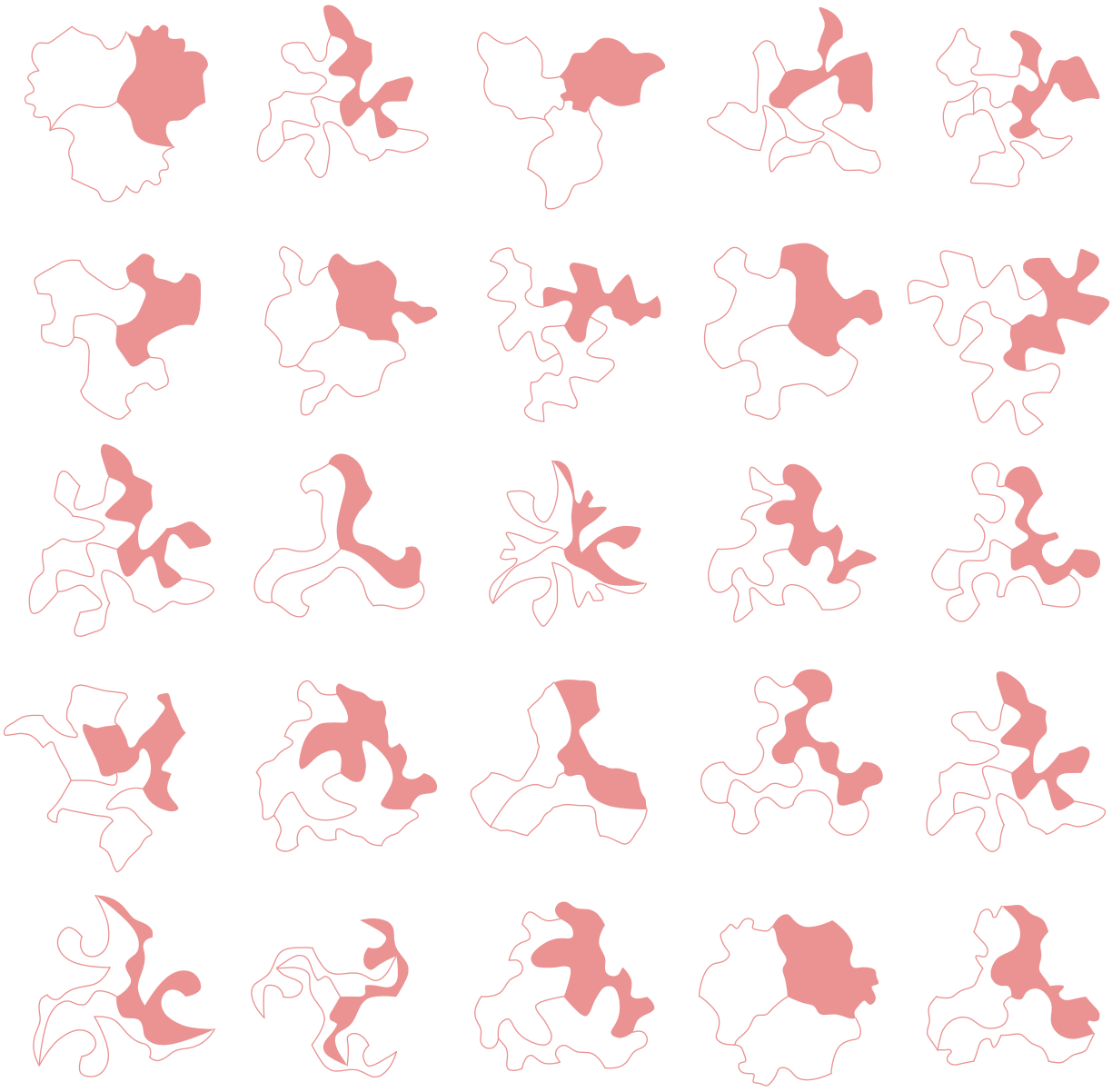
The outward straightforwardness of the procedure disguises an extraordinary range of effects that can be achieved through the adjustment of the matrix mix, plating bath composition, and conditions of the depositor. All of these factors contribute to the production of components that cannot be realized via sheet metal fabrication techniques. When correctly calibrated, the operation economically allows for unmatched dimensional accuracy, thin material sections, complex curvatures, and refined detailing with no limit to the size of the object that can be electroformed. And most exciting, the process can be adapted to contemporary logics of mass customization by preconceiving the master as a disposable, embedded or inexpensive artifact. The resultant operations enable the fabrication of economical variation.

03. ORNAMENTAL SKIN

Electroform(alism) exhibit vitrine, La Placette, Lausanne, Switzerland, 2014

In developing our series of prototypical articulated modules, the research explored ways of maximizing variation while relying on a single interlocking unit. Each simple component is identical in plan. The units are designed in clusters of three discrete topographies in order to suggest the possibility of a tessellated heterogeneous field. With a preliminary catatlogue of 100 adaptations – each concerned with the production and perception of heightened discrepancy - we developed a series of modules that are economically plausible and graphically singular.

03. ORNAMENTAL SKIN



Deploying computationally based design, the taxonomy of interlocking modules is infinitely variable. The preliminary series of 100 suggesting that unique units can be designed with each subsequent installation, insuring that the process produces economically-plausible, singular effects.

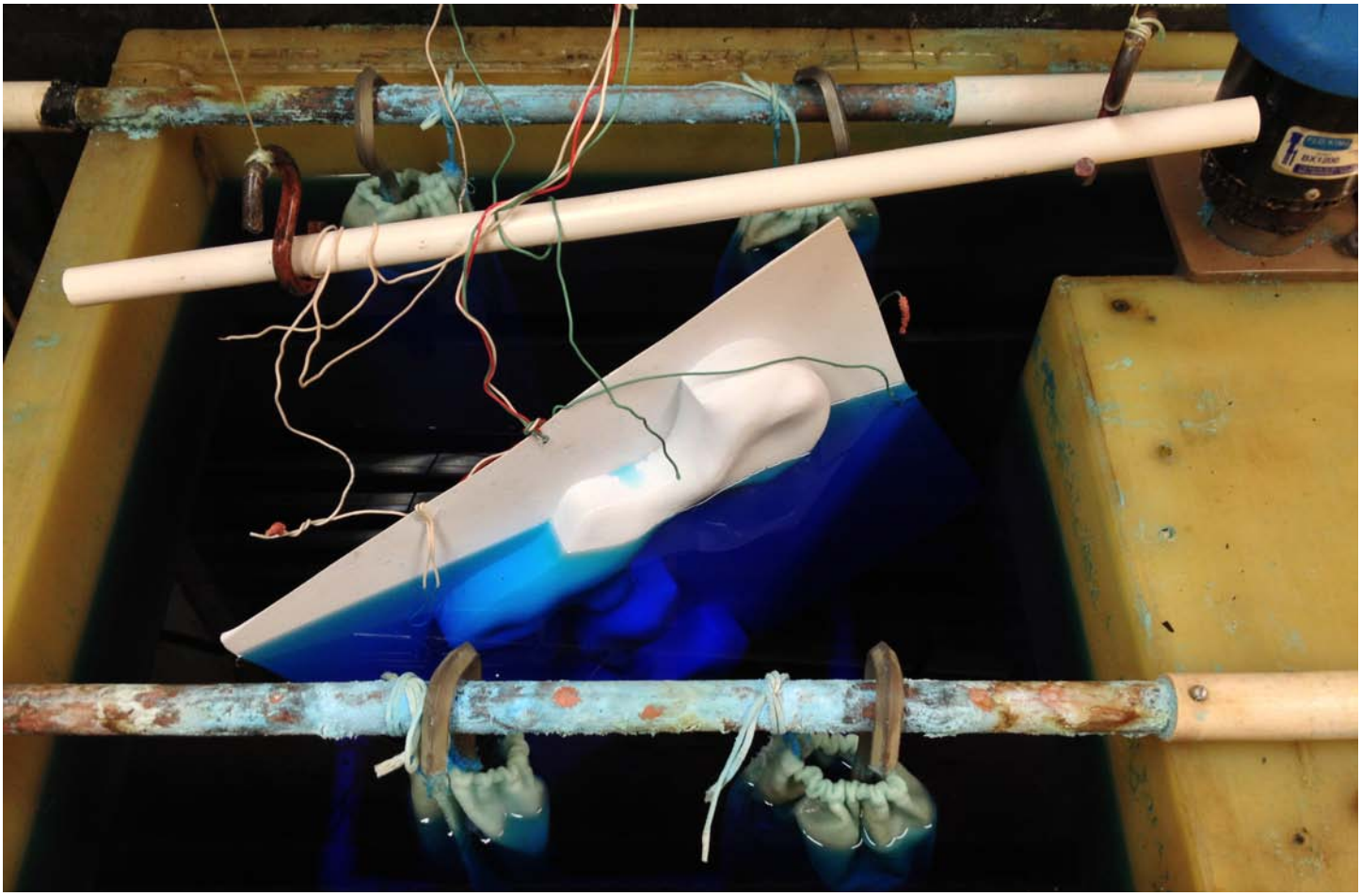
04. FINISH

Variation in the color palette is achieved by allowing copper to tarnish and discolor naturally. Once a desired patina is achieved, the oxidization process is arrested with a polyurethane veneer. Distinction in the aggregate field is thus a no cost process instigated by a ubiquitous resource - the atmosphere.

Tile 074, patina sample: 20 minutes of oxidization and polyurethane veneer.

05. TECHNIQUE

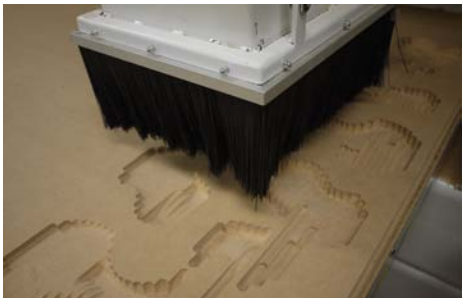
The metal can then be deposited on virtually any solid, synthetic material and the process can be deployed progressively, building up fine layers of multiple metal matrices in order to achieve a desired finish, tensile strength and complex form. Electroforming differs greatly from metalworking techniques such as punching and milling in that it produces virtually no waste other than the substrate material which, if strategically applied considered remains at the core of the finished product, enhancing the structural performance of the composite. Engaging contemporary digital design and fabrication techniques, our research tested a wide variety of materials and aggregate modeling methods

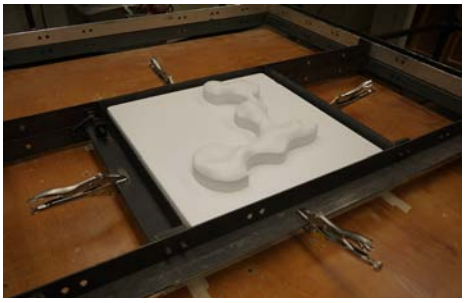


06. ECONOMY

Standard plating masters are expensive to fabricate and require large volumes of replication to offset the initial cost. Electroform(alism) shifts the economic onus away from quantity in the fabrication process. This is achieved by producing disposable, vacuum formed styrene masters, which can be manufactured for less than a dollar per unit.

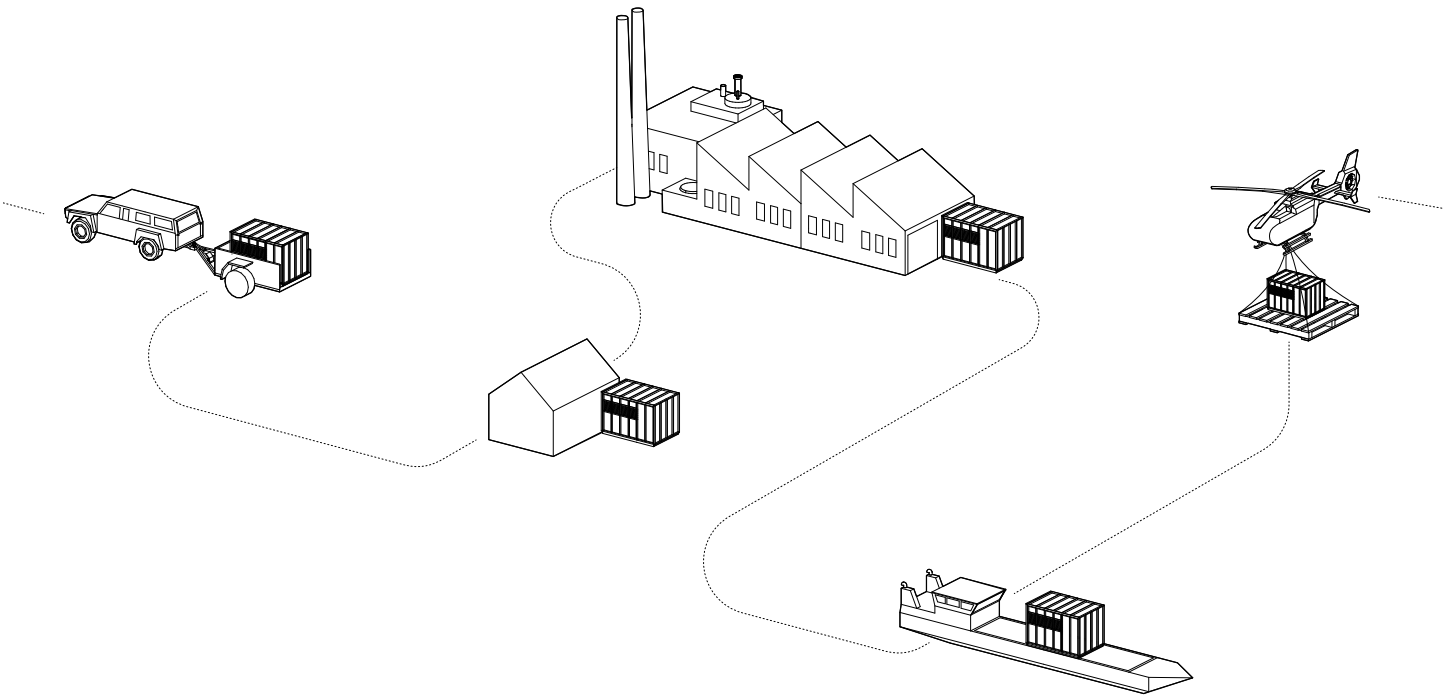
Additionally, what makes the time-intensive manufacturing process efficient—each electroform unit takes about 24 hours—is the use of a single interlocking component to create the appearance of endless variation. The developed series produces shapes that are ornate enough to disguise the repeating pattern, but curvy enough for even electroforming.






04. THE LAB

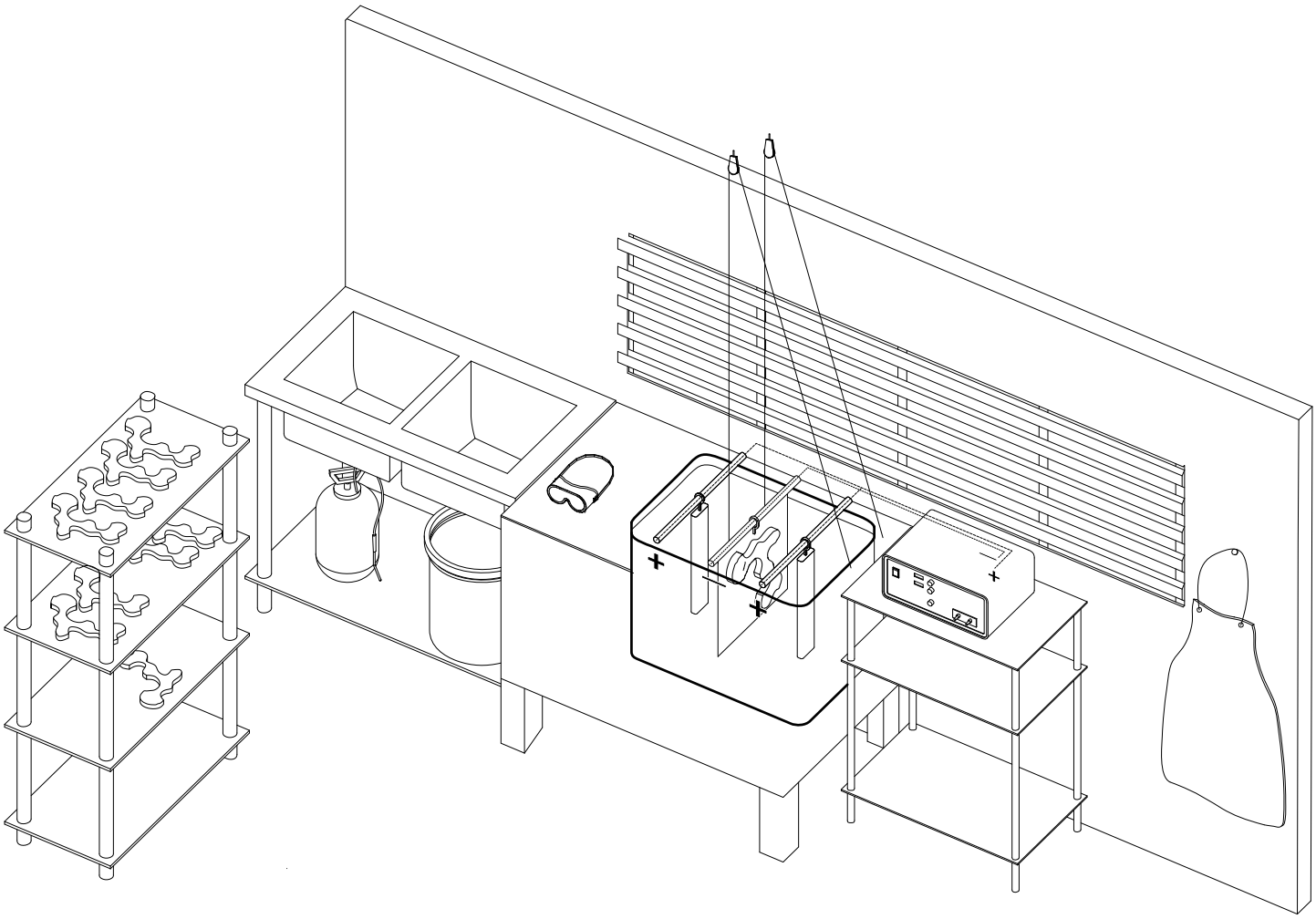


Electroforming facilities can be compact and mobile, as small and itinerant as the sum of their component parts. Depending on the desired output, the facility can be transported with relative ease. All you need is a source of current, a rectifier, a plastic garbage can and you're ready to plate. Collapsing the distance between the site of fabrication and installation allows for a certain level of demonstrative pageantry. Making (as) spectacle. We imagine deploying the nomadic fabrication facility in multiple scenarios: within industrial sites, adjacent to facades under construction, as pavilions in motion.

04. THE LAB

We constructed an adjustable lab - a mobile copper plating unit that can be broken down into an 8'x8' base module, with an 4'x8' additional expansion pocket.

04. THE LAB



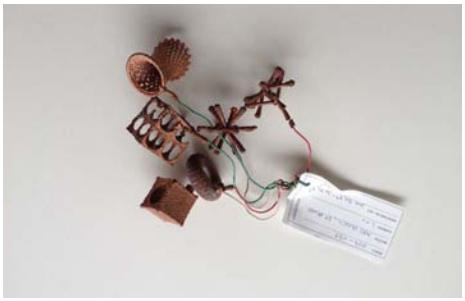
Ingredients required to assemble a micro-fabrication facility include: lined tank, rectifier, clamps, heavy gauge wire, light gauge copper wire, bus bars, anodes, electroconductive paint, containers, copper plating solution, rinsing bath, safety goggles, apron, replenishing brighteners, acid dip, small pump, shelves for base matrises; total cost 2,000 US.

04. THE LAB

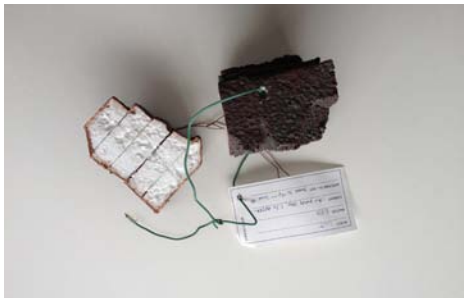
The lab allowed us to test a tremendous matrix of possible substrates in order to explore new material and fabrication possibilities.

Following page: lab technician with protective gear.



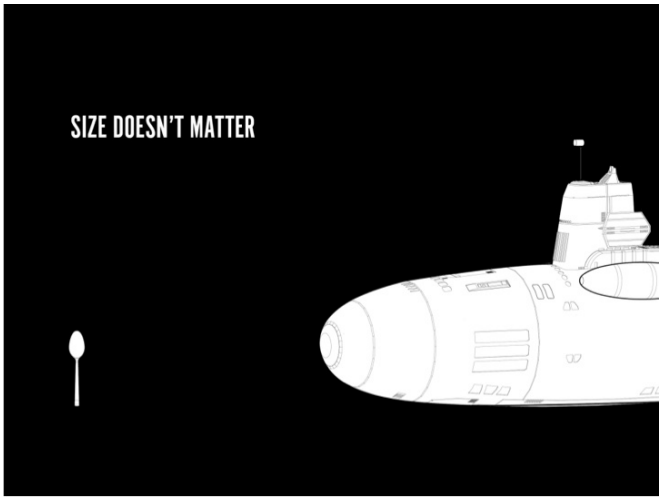





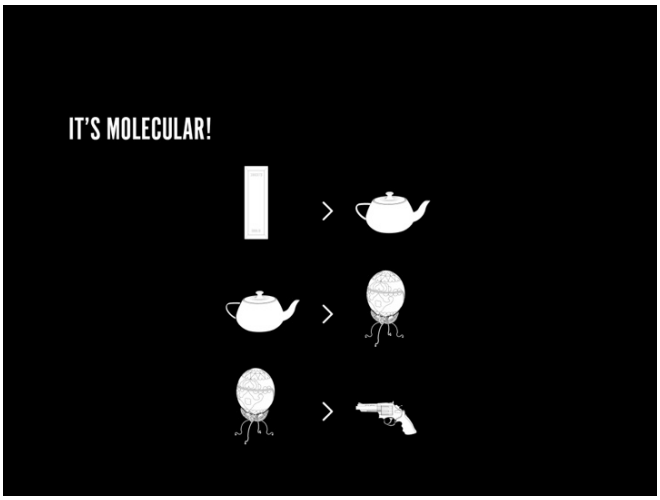




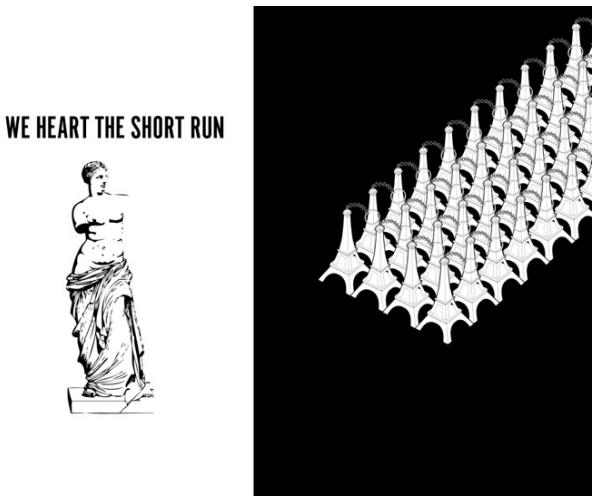
05. THE APPEAL



There are four critical reasons that we find electroplating so appealing as a mode of contemporary architectural production: First, SIZE DOESN'T MATTER. The process can be adapted to a variety of scales – from cufflink to submarine. Here scale is simply the consequence of a tank's capacity to hold solution.



IT'S MOLECULAR! The fabrication process imbeds the logics of reuse into production. Failed designs just go back into the tank as source material for further fabrication.

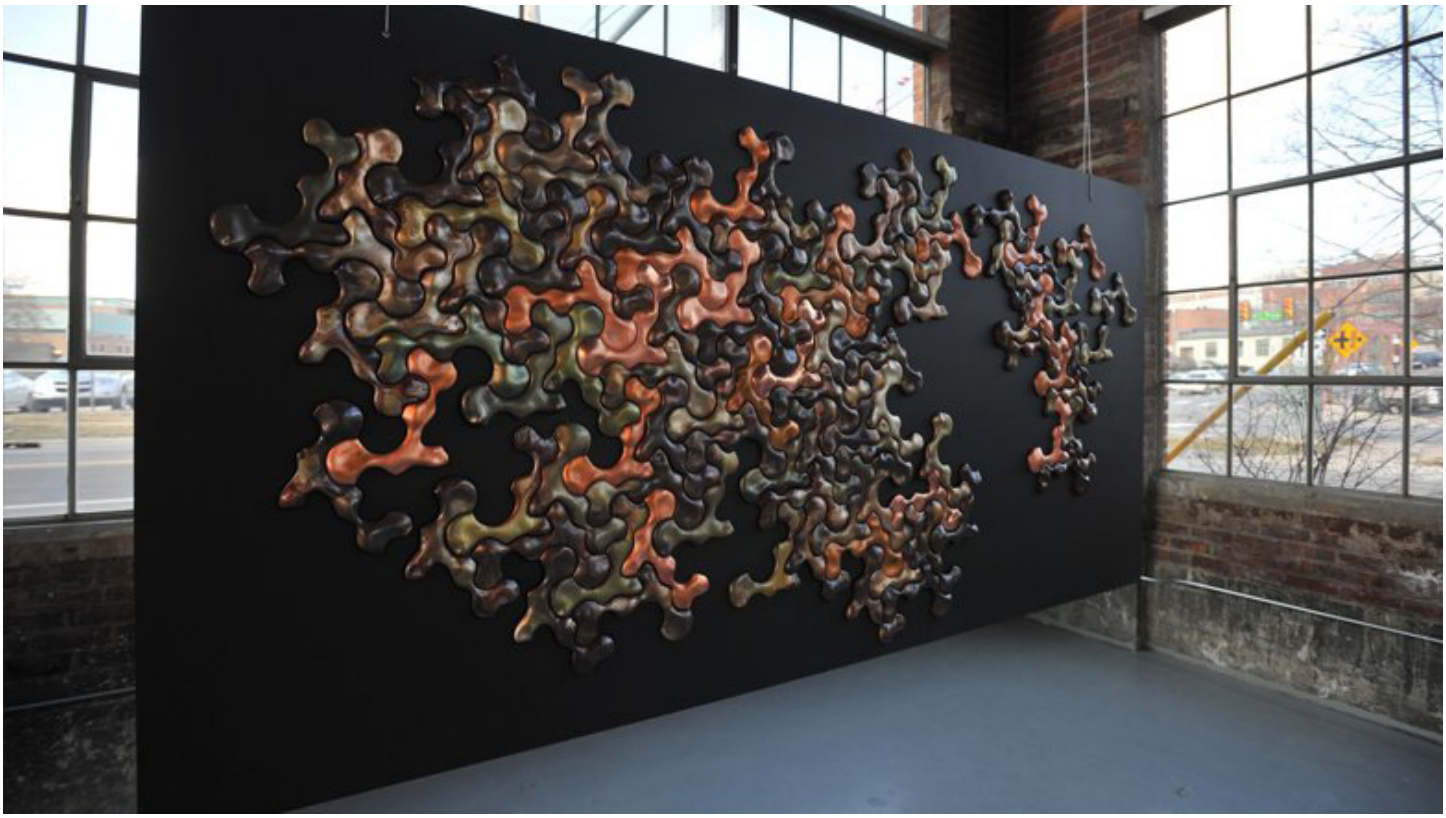


WE LOVE SHORT RUN PRODUCTIONS. Neither precious like the artisinal, nor imitable through large scale production, electroplating firmly sides with the logics of small batch making intrinsic to mass customization.

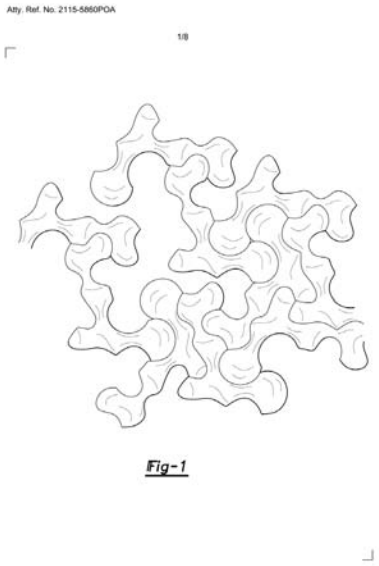
06. EXHIBITIONS

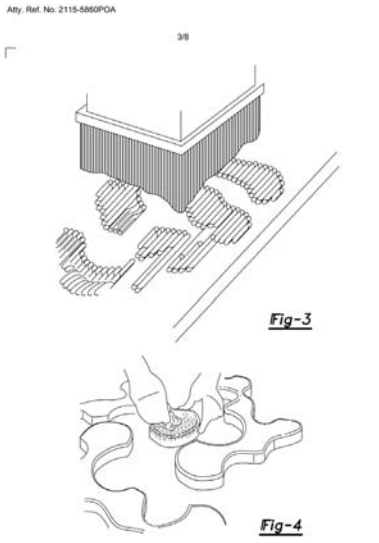
Electroform(alism) was featured in a solo exhibit titled "Come Again" at the La Placette Gallery in Lausanne, Switzerland. The exhibition and accompanying lecture contributed to the Jardin Lausanne 2014 international festival.

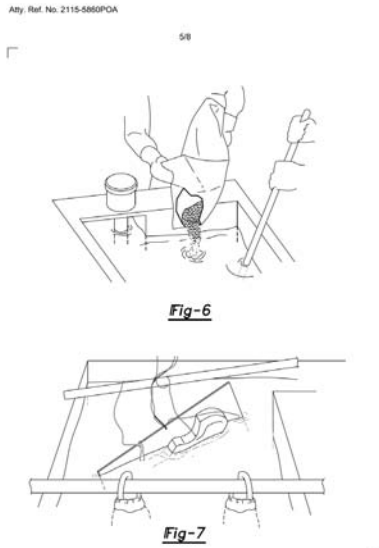
Electroform(alism) a featured project in the Detroit Design Festival 2013.

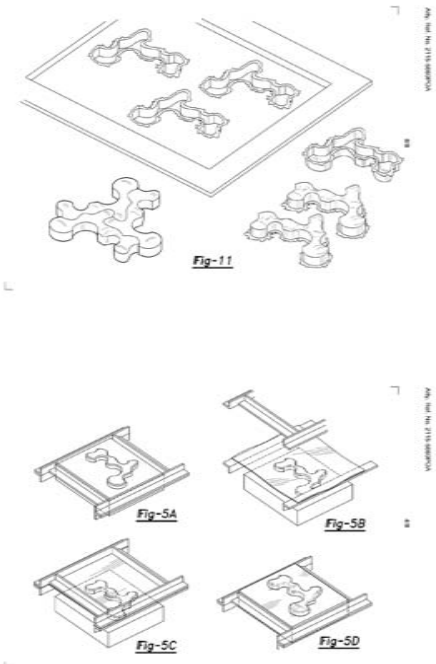


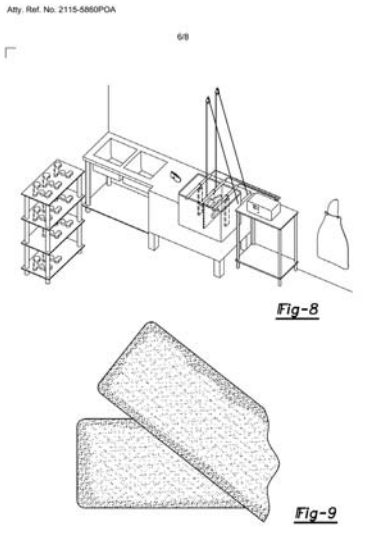
07. PATENT

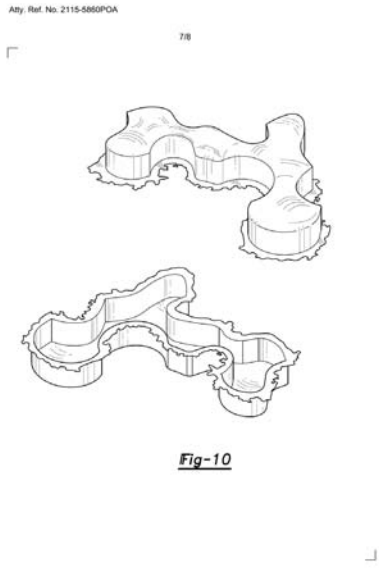












A United States and international patent was filed for the Electroform(alism) research project on September 2014 with final approval and registration anticipated in October 2015.

08. PUBLICATION

R+D Award 2013 featuring Electroform(alism) micro fabrication unit on cover.

09. CONTEXT

Electroform(alism) is conceptually inspired by Detroit's industrial landscape, which has served as the site of an inexorable scrap metal harvest since the onset of the city's well-documented economic collapse. Accelerations in growth and development across the globe have visibly precipitated the deconstruction of industrial building stock in the Motor City: driving metal prices up and motivated a covert and distressed workforce to take action. In light of this apparent flux of resources, the project speculates on ways that architecture can both materially and discursively interfere with predictable market flows by conceptualizing new models of fabrication. Small scale and intrepid, Electroform(alism) transforms Modernism perceived failures into a contemporary ornaments: beautiful and thoroughly useless.

Electroform(alism) is an ongoing collaborative research project made possible through from University of Michigan's Taubman College of Architecture + Urban Planning Research Through Making grant.

primary investigators: Anya Sirota (Taubman College of Architecture + Urban Planning), Jean Louis Farges (principal, Akoaki) and Patrick Beaucé (École nationale supérieure d'art et de design de Nancy)

research assistants: Nathan Doud and John Guinn

consultant: Alex Belykh