Paradigmatic Resolution— The Debased Flower Images of Young & Ayata

LOUIS I. KAHN, Visiting Assistant Professor– Yale School of Architecture. Founding partner of the architectural design studio Young & Ayata



Architecture once had a technique for dealing with the problem of scaled mediation. The large buildingwas drawn to a proportionally smaller scale. The scale could be changed to allow more or less detail to be described. Key to these scale shifts was that the representations stayed at the same resolution. A site plan had the same amount of resolution as a construction detail, the only difference was that the lines described an increasing amount of design information. Most architectural projects could describe the building in its entirety with five differently scaled sets of orthographic drawings. As the architect worked within each scale there was an aesthetic and conceptual attention to what the resolution of the drawing at that scale could handle. The architectural project was considered fully thought through once this collection of different scaled fragments could be interrelated as a set.

This representational paradigm has been radically transformed with contemporary digital techniques. No longer is the architectural design drawn at a reduced scale, it is modeled at full scale. The representations generated from the digital model are rendered extractions. The model can be rendered as line-work and manipulated to meet the conventions of line drawings, it can also be rendered as photo-real and manipulated to fit the conventions of photography it can also be rendered as graphic and manipulated to fit the conventions of the graphic novel. All of these are rendered images used as visualizations from the data of a digital model.

The digital model alters architecture's representational concerns regarding scale. The problem can be simply stated as a tension between the "actual" resolution of a digital model, and the "imaged" resolution of the same set of information. All media, screen monitors, paper/film prints, and 3d fabrication operate at a resolution.

All digital models are built at a resolution. Often, both of these discrete fragmentations of continuity operate below our thresholds of perception. When our sensorial equipment (eyes, hands, ears, etc.) cannot identify the discrete fragments, we call these mediations Hi-Res or Hi-Fidelity. These are misnomers. They are not different in kind from what we call Low-Res. The only difference lies in how our perceptual systems register the distribution of sensible information. This is the concern of aesthetics. All digital objects are discrete, operating at various levels of discritization. This fragmentation modifies the aesthetic character of the digital image, object, or sound. The approximation of smoothness,

chunkiness, hairiness, shininess, transparency, abstraction, realism all bear on the quantity of pixels, voxels, polygons, or control points used to describe the object.

I used the term "paradigm" above. This transformation of the aesthetics and concepts of scale to those of resolution is a transformation of a distinct architectural representational paradigm. I am using this term in a specific manner that must now be explicated. As initially identified by Thomas Kuhn in The Structure of Scientific Revolutions (1962), and then further elaborated by Giorgio Agamben in the essay "What is a Paradigm?" (2008), there are two different usages of the concept "paradigm".

"Kuhn recognized that he had used the concept of "paradigm" in two different senses. The first meaning of "paradigm", ...designates the common possessions of the members of a certain scientific community, namely, the set of techniques, models, and values to which the group members more or less consciously adhere The second meaning refers to a single element within the set, such as Isaac Newton's Principia or Ptolemy's Almagast that serves as a common example and thus replaces explicit rules and permits the formulation of a specific and coherent tradition of inquiry." Giorgio Agamben from What is a Paradigm? (2008)1

It is this secondary sense of paradigm that both Kuhn and Agamben find the most novel. A paradigm is an example, a single case, not the general theory or the series of rules; but a redistribution of sensible information that presents the intelligibility of a concept "beside" it (para). When this is applied to the discipline of architecture, we find that we quite often use "paradigm" in this second sense, we structure pedagogy through examples that make ideas sensible, many of which are the basis for architectural discourse. The set of scaled drawings was exactly such a representational paradigm for the discipline of architecture from the Renaissance till the early 21st-century. It is crucial in this discussion of paradigmatic shifts to identify which aspects of the paradigmatic example are being changed. These differences allow us to avoid a slip into the first definition of paradigm referenced above, a slip that views a paradigm change as total. Instead by focusing on specific examples we can more clearly see what is at stake.

Scale is still operative in the digital model, but it has undergone a transformation. Scale as a distinct regulatory proportion for a set of representational conventions has been replaced by an apparent real-time updated rendering engine simulating the camera lens effect we call zoom. As

a designer zooms into a digitally modeled surface the movement is incremental and apparently continuous, but there will be a moment where the fragmentation of the surface becomes visually apparent. The closer to the model, the clearer the information, but also the "lower" the resolution level this information appears. The close view appears more fragmented, artificial, and abstract, the far view, smoother, more "detailed", more real.

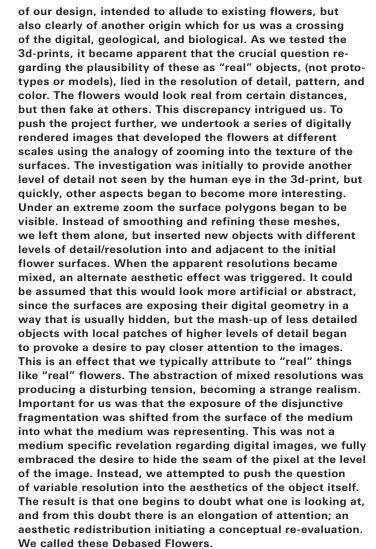
These are a completely different set of aesthetic effects than the question of scale within the previous paradigm.

What is opened here is a tension between abstraction and realism as an

aesthetic effect of resolution. This is further compound ed when considering the resolution of the media used to evaluate the design. The unit of the display comes into play the moment that the model is rendered. This can be a rendering of line-work, tone, texture, or materiality, but as soon as the design is "rendered" it is locked to a certain resolution of display. This is also not necessarily a conditiothat occurs at the end of a design, for modeling software is constantly updating the visualization as one moves, rotates, or zooms Once

locked, the zoom of scale quickly reveals the fragmentation of pixels. The outcome is that the collaged adjacency of discrete colored information becomes revealed as the universal medium of digital work. This is work on images, not drawings, not photographs, not graphics, but collages. The difference from historical collage is that the digital image typically conceals its seams below the threshold of percep-

In the winter of 2015, Young & Ayata developed a series of flower vases for an exhibition titled Base Flowers at the Volume Gallery in Chicago. Coinciding with the vases were a group of 3d-printed full-color flowers. The flowers were



Architecture's paradigms of representation are moving more and more into digital mediation. As this happens, it is tantamount that we understand that this is not the wholesale paradigm shift some have preached or feared, what seems more apt, is that some aspects are steady, others transform, and still others have entered into strange uncharted lands we are only beginning to understand aesthetically and conceptually.

1 Giorgio Agamben, "What is a Paradigm?," in *The Signature of All Things: On Method (*Brooklyn: Zone Book, 2008), 11.

Recent Exploits of Flon Mask

ANONYMOUS

Invented a space flight company that provides affordable rides to the moon and back for families. Descended from the cyclorama, SpaceY consists of a capsule in front of a screen with looped imagery of outer space cranked by hand by recent Stanford computer science graduates.

Actually built a real rocket with SpaceY but decided not to go to Mars. When asked to explain the decision, Mask replied, "I don't really see the point."

Decided to send the rocket to the center of the earth instead; it melted about 5 miles in.

Invented a new type of roof shingle that looks like solar panels, so you can proclaim that you're doing your part without actually having to spend all that money.

Invented a "driverless" car called the Ohm in which the windows have decals with a picture of the interior to make it look like nobody's driving.

Mask also tested an Ohm model nicknamed "seat suit" in which the driver would actually be camouflaged inside a driver's seat complete with armholes and a hole for the face.

Invented a hyperloop model where instead

of transporting humans, it transported liquids.

Mask named it "oil pipeline."

Mask is heavily inspired by the works of

Isaac Asimov, as can be seen in the subtle, poetic language of his tweets.

Decided to bore a tunnel from San Francisco

to the White House.

Developed a way to connect the human brain to computers. The setup consisted of two wires and a pickle; it managed to turn on a light bulb for 2 minutes and 24 seconds.

Invented a clone of PayPal where a fee on each transaction goes toward swaying elections and suing media companies out of existence.

Week 1 - On The Ground

MATT LIU, M. Arch '20

01/11

First year building project now in motion. Here's to hoping everything goes smoothly. No lotion.

Alan Organschi is quite charming. Not what we expected, truly alarming.

Lottery day, advanced studio leaders present their classes. Students await anxiously to hear which class they're in. To pass the time, some students dined, most drank.

Visiting Louis I Khan professors Róisín Heneghan and Shih-Fu Peng (hparc) initiate this semester's lecture series. Enhance thin lines!

01/12

Monday classes were held therefore most people had another dose of studio.

6-on-7 returns, conversations were mainly based upon what each other had done during the break.

01/13

Honestly, was anyone productive today?

Heard around the school

"YES! I saw on your instagram story, that looked so fun/ delicious/beautiful"

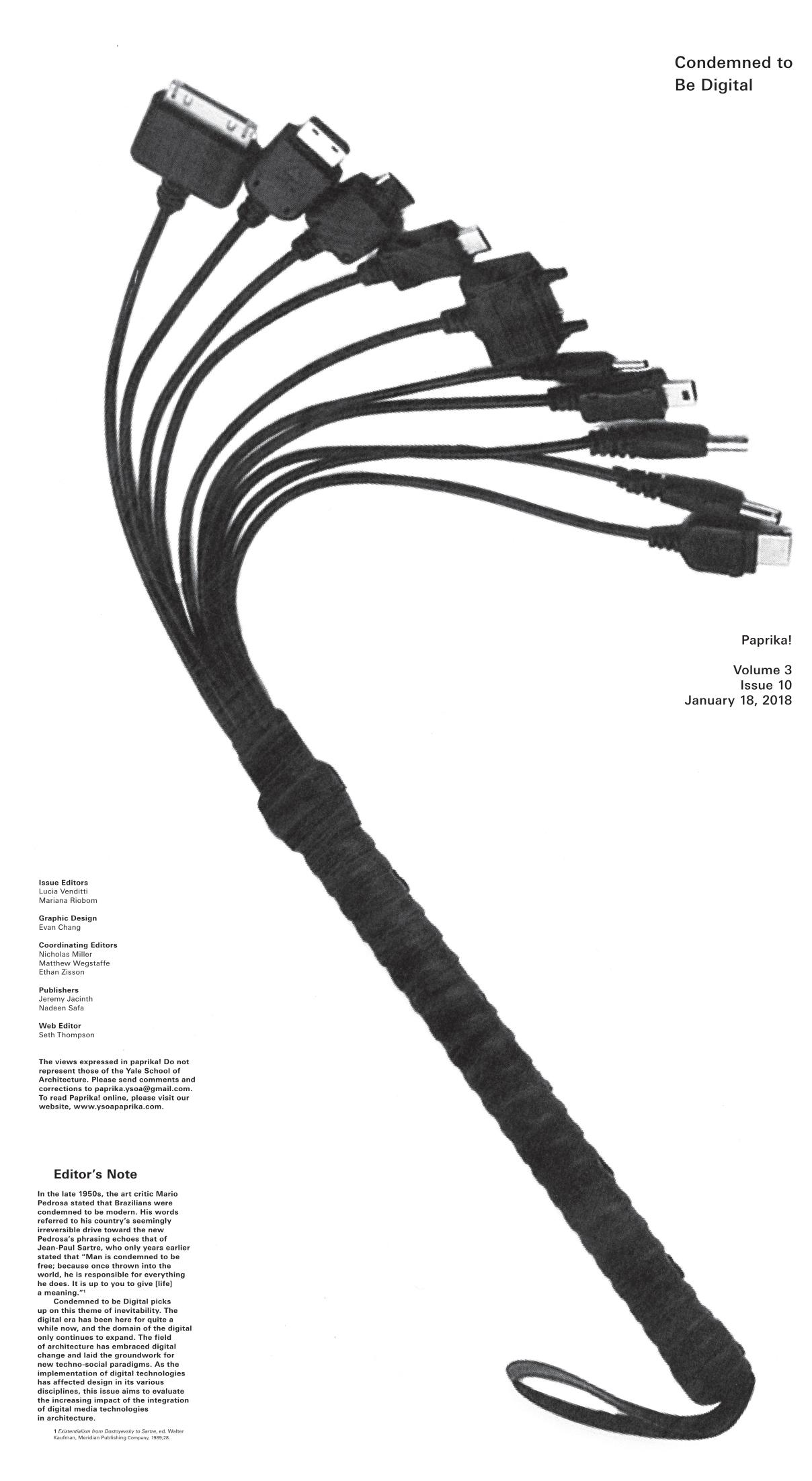
"...already looking forward to the next break"

"So where did you go?"
"Who is 'Shoes of YSOA'!?"

Lottery Musings

"This is so fucking stressful"
"People can be so toxic on lottery day"
"I don't know how I got my first preference, I didn't even have any points!"

have any points!"
"...this is a mission impossible project"





It's the End of the Digital as We Know It (And I Feel Fine)

MARK FOSTER GAGE, Assistant Dean and Associate Professor, Yale School of **Architecture Founding partner of Mark** Foster Gage Architects

Previously published in Postdigital Artisans: Craftsmanship With a New Aesthetic in Fashion. Art. Design and Architecture (Jonathan Openshaw, Frame, 2015)

There are equal quantities of irony and prescience in the fact that the term "digital" emerges from the Latin root "digitus" meaning finger, or toe. Fingers are, after all, the most analog of instruments-- surely nowhere near as interesting as the parametrically-coded world of singularly 3d printed buildings that architecture currently promises to a world of eager consumers of the future. In the hype of the 21st centuries' digitally progressive everything, fingers, as with most things analog, have, like sinners after some apocalyptic digital

It turns out, however, that fingers are pretty incredible things too, deserving at least a cursory obituary before we move our discussion back to the digital. The processes involved in moving your fingers to access this particular page, for instance, is a process so complex, and involving such vast quantities of information in the form of sensory feedback, textural processing, pressure and friction calculations, logistics of temperature, balance, and position in space, that it is impossible to accurately reproduce using all of the world's current digital prowess and robotic intelligence. In fact our current efforts a reproducing human muscle movement using digital and robotic technologies, however important and brilliant, usually result in stumbling, drunken machinations that can barely walk much less navigate the delicate page of a simple newspaper. That is to say, as far as complexity, efficiency, control, nuance of movement, and ability to actually do and make things, your finger can still give the digital...well...the finger. So why does the digital hold such allure to architects? And why does the promise of "digital fabrication" still continue, decades after its invention, to prompt wild speculations on what the future of the profession will bring?

There can be no doubt that architecture, as a profession, has had an explosive two decades of technological advances, and that these advances have opened up vast new possibilities for what can be produced by the profession, formally or otherwise. As such architecture can be partially forgiven for making the accompany ing sweeping promises of a future vastly reconfigured by these innovations. The problem with the continual onslaught of such promises is that the digital has spawned not only a wealth of new and fantastic toolsbut an entire new genre of architectural fortunetellers that seem content to merely make futuristic architectural claims on the digital's behalf-- as oppo sed to doing the actual, productive, research that might turn such a future into a real present. This is unfortunate, as it places architecture's successes just around the corner, leaving us with a rather unattended and unremarkable architectural present.

connectivity through Parametricism!" "Cities made of mushrooms are just around the corner!" At a certain point, however, it might be worth placing a finger on the pause button of speculative claims, for the sake of an increasingly desperate present, and take a sensationalism-free assessment of the digital and what it has, in fact, done, and what it can do for us, for humanity, now.

Architecture's shift from making to speculating-from builders to futurists, is leaving our actual architectural fabric, devastatingly undersigned. While it is exciting to see architectural speculators on TED stages and in sensational publications extolling how buildings will now be grown from beef, how genetically engineered skyscrapers will clean the air like giant oyster reefs, how cities will be assembled from parametri cally placed fungi, and how structures will be woven by silkworms, or extruded from spider-goat silk (all actual recent speculations), the truth is an emphasis on such narratives shift architecture from a discipline of the physical to a discipline of the verbal. As a profession, our speculations have become exciting enough to eclipse our current reality, and our tools have become so sophisticated at allowing us to visualize just about anything, that we are beginning to mistake storytelling bolstered by polished renderings or cheap lobby

As far as speculations on what digital technology will enable, the ugly truth is actually that the digital has been most influential not in the creative or design aspects of architecture, but its financial machinations -its tracking, cost estimating, product procurement and efficiencies of time-saving assembly. For all of the promise of 3d printing, robotic stacking, and CNC milling, parametric scripting and biological computation, it's been the excel spreadsheet and product-linked BIM model that are the actual legacy of the digital in contemporary practice. And so we see a split-the promise of digital dreams foretold by architectural futurists who produce effervescent words sprinkled with the occasional lobby installation or museum object, and the actual use of the digital, in the form vast spreadsheets that track the cost and placement of every brick, and BIM models that manage money, limit available geometries, and promise to transform architecture into the

is the only hope for their possible remarriage. Architecture is among the most complex and resource-intensive endeavors of humankind. It is complicated beyond the ability for any single person to understand its true extents as a discipline or as a singular endeavor. It involves far reaching calculations of material, access, weight, transportation, debt, engineering assembly, waste, regulation, insurance, expectations of profit, identity, longevity, safety, and maintenance all engaged in different capacities by individuals, families, communities, religions, unions, expediters, contractors, bankers, corporations, lawyers, politicians, speculators, inhabitants, governments and descendants. For any single technology, system of coding, biological innovation, or method of making to claim to replace the entirety of these complexities is unfathomably naïve. Architecture is, and always has been, the fusing together of countless materials, systems, and parts towards the production of seemingly monolithic wholeshistorically known as "buildings," despite the fashionable embarrassment the profession currently holds for that particular term. Instead of continually selling speculative digital and technological narratives, or

a wealth of new digital tools-more fingers if you will-- to our trade. Fortunetelling elitist academic speculators meet efficient boring BIM builders, meet elitist fortunetelling academic speculators- I am pleased to have had the opportunity to introduce you. The future of architecture, if not our entire environment as a species, depends on your offspring and your courtship depends on the recognition that what unites you is your common language of the digital. A rekindling of this romance is not a compromise, but will likely produce stranger, a more surprisingly weird and welcome world than we currently have or can possibly imagine. To aim for anything less, however, will all but guarantee that our influence in the world, and therefore our relevance, will continue to slip irretrievably through both

becoming product-pushing

service providers, now is the

time for architects to use the

towards more research-based,

school fingers, and have added

digital tools at our disposal

progressive, and achievable

ends. We still have our old-

We have all heard the claims: "All buildings will soon be 3d printed on site!" "Social and political inter-

installations for actual research and actual, physical, architecture.

act of arranging off-the-shelf products into big, dumb, LEED-certified boxes.

The future of the profession lies neither in saving even more money or making construction even more efficient, nor making even wilder claims about fleetingly distant futures. Architecture's actual future needs to be a fusion of these two trajectories into, again, a single profession neither digging its heels into the sand nor, like Icarus, flying too close to an unreachable sun. Digital technologies are not only the spur to both of these strains of practice-the efficient and the speculative, but as a common language it

An Image Is a Room Is an Image. HAYLIE CHAN, M.ARCH '19

This video explores how a museum

to room emulate the motions that one would perform with a swipe, scroll, or zoom into an image, revealing an implied space beyond the two-dimensional surface. However, as we scroll through the feeds of Instagram and design blogs, the seamless transition from image to image can only further a lack of scale and sense of place. This project then poses the question: How



are we able to locate ourselves within the digital realm? To view the full video, visit: www. https://vimeo.com/251087851

Left: Scenes 3, 4, 5, 6

could exist in a virtual setting, taking

cues from architectural imagery and

mensional interfaces. A unique web

gallery, where transitions from room

experience is resituated inside the

our daily interactions with two-di-



The Socialization of ISIS using "the Five-Photos"

SHUYI YIN, M.E.D. '18

On August 23, 2015, Reuters Damascus reported that Islamic State militants had blown up the Temple of Baalshamin. This destruction, wrote the news outlet, "would be the first time the insurgents, who control swathes of Syria and Iraq and captured Palmyra in May, damaged monumental Roman-era ruins." Maamoun Abdul Karim, Syria's antiquities chief, confirmed the demolition.¹ There were no images released on that day across media.

The following day, Syrian Ministry of **Culture Directorate-General of Antiquities and** Museums (DGAM) and news organizations including Al Jazeera, BBC and The Guardian, also covered the story.² At that time, most media outlets only showed images of the city of Palmyra and the structure of the Temple of Baalshamin before the destruction. The New York Times, however, released a photo showing the bombing scene, culled from the perpetrators themselves (figure 1).3 At the bottom of the photo, in Arabic, was the caption: "The moment of the explosion of the Temple of Baalshamin in the city of Tadmor" with the place of the incident, "Homs," next

to it.4 On August 25, NBC News and The Guardian published the same striking panoramic image together with a sequence of photos depicting two men transporting the explosives and positioning them in the temple (figure 2, figure 3, figure 4). Another photo showed the site of destruction after the bombing (figure 5).5

These five photos are exceptionally momentous due to their provenance and the intent of their release. Despite widespread media coverage, there are only five photos documenting this event, produced and disseminated by the Islamic State of Iraq and Syria (ISIS). The primary source of the photos, which circulated through traditional and new media platforms, was also both the subject and author of the documents in question. This transmission then has a "spatial-representational segregation." Paul Frosh, a scholar on photography and cultural production, points out that understanding these images requires us to "make inferences about the non-depictive techno-cultural conditions in which the image was made."6

The five photos showing the destruction of the Temple of Baalshamin could be understood as one entity, or as a continuing sequence. At first glance, the images demonstrate the practical act of staging and executing the destruction. The news media, act as a broadcasting platform and also as a space for politics and morality.⁷ This process becomes an invitation for a public spectatorship of witness mediated by digital remediations.8

The images function not only as representational devices; but also as forms of socialization and networking. According to Frosh, when the producer of an image and its referent are one and the same, the image "says not only 'see this, here, now,' but also 'see me showing you me.' It points to the performance of a communicative action rather than to an object, and is a trace of that performance."9 That is to say, the series of images entail an entire process of performance, including ISIS's "scene-setting" (the preparation itself) and the results of the

bombing. As the photos enter into the network of ISIS's official website and the global circuity of the news media, a feedback results giving ISIS a global voice: the first stage in a process of multiplying loops. The five-photo entity is thus an action as well as a coding process, where ISIS "types in" its input (images) with predictable results. From a cybernetics perspective, the following trace or algorithm is coded in the structure; that is, the rest of the process and reactions will continue automatically. As a result, these five images as an entity were able to create a remote witness.

The loops muddled the existing narrative of the photos as merely a representational tool. They became a socialization tool which allowed for feedback and interaction. Perceiving the socialization nature of the destruction activities and gestures is critical because terrorism destroys not only for the sake of destroying, it destroys for attention. In other words, the attention is more important than the act of destruction, or even the destroyed artifact itself. With this understanding in mind, it would be both indifferent and perilous not to inquire whose attention ISIS was trying to attract, who ISIS's socialization targets were, and most importantly, what algorithm helped ISIS finish the loop.

tion of Antiquities in

The New York Times.

1 Kinda Makeih, "Is-Jp Temple in the Ancient City of Palmyra." August 23, 2015. Reuters.http:// blow-up-temple-in-ancier city-of-palmyra-idUSKCN-0QS0WC20150823 2 DGAM. "Palmyra ISIS blown up Baal-Shamir emple." August 24, 2015. http://dgam.gov. sy/?d=314&id=1783 "ISIL 24, 2015. Al Jazeera. m/news/2015/08/ isil-destroys-anent-temple-syria-paltage-isis-baal-shamhtml "A Tragic Goodbye t Newsday. http://www. bbc.co.uk/programmes/ p030jz02 "ISIS Blows up Temple Dating Back to 17AD in Palmyra." Augi 24, 2015. The Guardian https://www.theguardiar com/world/2015/aug/23/ ing-back-to-17ad-in-unes co-listed-syrian-city

https://www.nvtimes tml This is the earliest in age showing the bombing e author could find. 4 "Tadmor" is both the uage is Arabic. emple," NBC News ng-baal-shamin-ter Carem Shaheen and

Arabic name and the mod Syria. The texts at the ottom of the image are nslated by the author's ale MED program fellov ina Taha who is from gypt and whose native 5 Matthew Grimso ISIS Images Purport edly Show Bombing of Palmyra's Baal Shamin ugust 25, 2015, https:/ ortedly-showing-bomb le-palmyra-n415496/ gencies in Beirut, "Islam Said to Show Destruct



Resolution

AMIR KARIMPOUR, Computation and Fabrication Critic Fall 2017'- Yale School of Architecture. Founding partner of Alden Studios and Founder of Walker Vail

Recently, in the fields of design and technology, the push for greater computing power has focused on increasing the resolution of our current digital tools. Power, in this context, is defined as the computer's ability to manage and display graphic information. This situation is very different from the early 2000s, when each year presented a significant leap in computing power focused on giving designers more freedom in their ability to design. Today, instead of new tools for designing, there are new means of perceiving the results of our digital designs, eg. virtual reality, augmented reality, extreme high resolution displays (or as Apple now brands them, "Super Retina" displays), and real time rendering engines.

The basic building block of the digital environment, the pixel, is now the main design problem. The pixel, akin to the atom, is our default unit in the pursuit for building truly immersive digital worlds. How do we free the pixel from its two dimensional state, make it so small, so dense per inch, per cubic inch, per virtual environment, that no matter how close we look, the resolution is infinite? This







Guardian. August 25, 2015,

com/world/2015/aug/25/

ple-baal-shamin-isis/

International Journal of

7 Lilie Chouliarak

of Migrants and Refugees in Digital News," Popular

15:2. 78-94.

9 Paul Frosh

cation 9 (2015)



Fig.5

Fig.1 A photo released by detonation in the Temple of Baalshamin in Syria's ancient city of Palmyra. Credit: Militant website

lia The New York Times

Fig.2 Images published

by ISIS showing two men Baalshamin, Credit: ISIS/ Via *The Guardian*.

Fig.3 Explosives seemingly vired to the outside of the

Fig.4 Explosives around the base of the foundations. Photograph: ISIS/V Fig.5 After the destruc ion. Photograph: ISIS/Via

question has provided a whole new market for the Architect: the digital built environment. No longer is it enough to design physical spaces; we are condemned to also operate in a digital parallel.

Working in between these two spaces, we are faced with questions of how to embed digital surfaces, digital environments, and digital experiences into our designs and physical environments. The implications of the digital parallel have been represented, not surpris ingly, by the film Blade Runner 2049. In this film, the dimensions of the digital and the physical are so interconnected that it is difficult for the viewer to distinguish between the "fake" and the "real". The resolution is inverted: the built environment of the city is always represented as foggy and blurry, while the digital representations are always crisp and sharp. The space of the digital is put in the forefront. The built environment acts as supportive tissue.

This reversal is contrary to the way in which we have been trained to use digital tools within architecture. We are accustomed to using the digital tool solely as a means for advancing the built environment. Architects use software developed for the design of spaceships, aircrafts, and boats to generate (what we believe are) complex facades and buildings systems. These and other uses, however fall short of the software's full potential. If this is the case, then we must come to an agreement that there is an uncharted territory that architects have not fully conquered. Blade Runner 2049 gives a glimpse of what this conquered future could potentially look like, but it does beg the question: will digital architecture become its own realm?



Blade Runner 2049 Alcon Entertainment

The Aesthetic of Biomimicry

LIWEI WANG, M. Arch I, '19

Today, several practitioners are working with the aesthetic of biomimicry (that is, designs that reference biological structures or functions). By and large, this aesthetic can be attributed to a somewhat simplified if/then argument: if buildings, skins or envelopes look organic, then they will function organically as well. Philip Beesley of Living Architecture Systems Group (amongst others, such as Neri Oxman, Claudia Pasquero and Marco Poletto of EcoLogicStudio) is a practitioner who makes such promises. On Living Architecture's website, he describes these organic designs as "advanced prototype envelopes that have achieved fully integrated self-renewing, intelligent, empathetic systems, capable of functioning within existing inhabited buildings."

1 However, **Interview with Trevor**

Williams

TREVOR WILLIAMS, Digital Media

Trevor started working for the Yale School

of 2011 and was officially hired by the uni-

versity in October of that year. He holds a

of Architecture as a contractor in August

Staff Yale School of Architecture

when one critically examines the nature of his work, it becomes obvious that the systems are far from intelligent. While they are beautiful, they are actually quite primitive in both their method of construction and their function.

Philip Beesley installed the first work of his Hylozoic series in 2007 at the Musée des Beaux Arts, Montreal. The work features thousands of intricate acrylic and mylar pieces that link together to form a textile. Sensors detect air movement caused by visitors, and the installation reacts by clumsily lifting a few mylar fronds up and down. The work conjures up images of primitive organisms, and aptly references hylozoism, the concept that all matter is in some sense alive.

While it is obvious from project videos that the installations are reacting to something, it is hard to discern the exact relationship between the stimulus (the visitors to the space) and the movement. This ambiguity may be intentional. However, it seems more likely that the lack of a clear connection is due to technological limitations, as a lag between the stimulus and response makes it hard to discern why the installation is reacting in a particular way.

The visual elegance of Beesley's installations is further undercut by the unwieldy labour involved in their fabrication and assembly, as evidenced by the project's technical documents. For his Seoul installation in 2013, the instructions dictate not only a highly meticulous assembly strategy, they also specify a packing and transport protocol for each individual component. The drawings reveal that, while individual parts may be mass-produced or even mass-customized, the construction, assembly and disassembly requires thousands of man-hours in the form of unpaid student labor.

Although Living Architecture has fallen short on their grand promises of responsive, self-renewing systems, they have produced a seductive aesthetic of biomimicry. This aesthetic has since been adopted by influencers of popular culture in fashion and music, who at times have directly collaborated with Beesley. Its proliferation can be seen as a way for humans to adapt to the state of the world today, where every aspect of our lives is increasingly infiltrated by algorithms and machine learning.

In 2012, the Dutch fashion designer Iris Van Herpen collaborated with Beesley on a collection titled Voltage. The collection featured dresses embellished with the jerking, twitching mylar fronds from the Hylozoic installations. This time though, the fronds moved and reacted without any lag; attached directly to the model's body, there was no need for a lengthy feedback through sensors. If we frame Beesley's installations as aesthetic manifestations of our collective cultural reaction to a new, smart environment, his collaboration with Van Herpen is then the convergence of this aesthetic language with our bodies. When Beesley's aesthetic became fashion, the gap between the stimulus and

the mylar fronds closed. While biomimicry-inspired fashion has yet to make an appearance at stores like H&M and the Gap, its cultural impact has not gone unnoticed. The formal language of Beesley and other living-architecture pioneers has been co-opted by Björk. On the cover of her 2011 album Biophilia, she wears a dress designed by Van Herpen, while on the cover of her 2015 album Vulnicura she is covered by appendages that look like they were plucked from one of Bees-

ley's installations. In 2016, Björk went even further, releasing Björk Digital, a virtual reality experience to compliment Vulnicura. By using virtual reality, Björk dictates a very specific way to consume her artistic output: a headset to augment our sight and accelerometers to augment our inner-ear equilibrium. This total imbrication of human with machine goes beyond ev Beesley's imaginings. While Beesley's installations promised a world in which our environment is made of appendages that sense our movements

and flutter at the lightest touch, its aesthetic lineage suggests a much more intimate relationship to our bodies. If Van Herpen's responsive outfits and Björk's virtual realities were ever widely adopted, they would represent a near total adaptation to our near-living environment of algorithms and machine learning.

Bachelors of Science in Architecture with a Minor in Physics, as well as a Masters of Architecture from Illinois Institute of Technology (IIT). As a resident support technician, Trevor's knowledge of "the back end"from his graduate research on parametrics and his time spent developing code for the Rhino BIM project —easily surpasses that of the student and faculty body. In a time when most architectural work is done via digital means, what is the significance of this knowledge gap between practitioner and programmer?

There is a massive gulf between coding and modeling-I mean modeling in the broadest sense that you can think of: working with the concepts of space. But I don't know if that gap really makes a difference. Ultimately, modeling is about adapting logic into form. Although it's great to be able to do that with the deep level of understanding that code can bring-coding allows you to automate the process, so you tend to be able to fix problems very early on-if you understand the logical flow that you want your diagrams to make, it is still possible to do that brute-force. People who come into architecture school with a coding background, even a minimal one, are going to work within that toolset and return to it to test ideas. Those who do not come in with that knowledge rarely acquire it because the amount of work and time necessary to gain proficiency does not translate into a semester-long project.

This fundamental time constraint—the semester-offers Trevor and the DM office the opportunity to rebuild student workstations multiple times each year, but it also provides another set of difficulties for those who spend their working hours within the shell.

Every year there is a new disk image built from the floor up: We put the hardware for the next year in place, run a clean install of Windows, and start adding software packages. Every time we add a software or driver package we have to check to make sure something else didn't break. It very often happens that one thing breaks other things. When that occurs we have fix each of things that broke. This involves tracking down specific libraries that might have been changed or moved, pieces of code that different pieces of software rely on, and registry entries that get tweaked by a piece of software and need to be adjusted or duplicated or figured out in one way, shape, or form. Then, if there's time, and there rarely is, we will start trying to improve user experience. But the semester-based schedule is a double-edged sword. It's great because it keeps things fresh and gives us the opportunity to go tabula rasa. At the same time, the school's schedule forces us to work so fast that we can't always do things correctly. Problems will get reported to us and tickets will have to close out because the semester has finished. The problem is no longer applicable, and because the problem is no longer applicable we no longer have to solve it. Problems often exist in the ether until they crop up a few years later.

Also in Trevor's purview are the digital fabrication tools found in the Sub-Basement, but perhaps the era of mass customization that has been heralded by so many of our predecessors may be less accessible than anticipated.

A lot of the stuff in the shop, especially the heavy-

end fabrication equipment, falls into the category of "dedicated operator machinery." Users are expected to put in four or five hundred hours of training before they are considered proficient. We might give you forty minutes and a document written by someone with maybe double that experience. The biggest hurdle that we consistently hit is with the Kuka Robot Arm. Figuring out how to make the machine do something specific requires days worth of machine-time to understand and anticipate how the machine will react. On top of that, the software packages that drive these things are every bit as complicated as the devices themselves. The ones we have are actually some of the better options available, and they are awful. That's the nature of the beast. There are what, 15,000 Kuka arms in the world? That's a pretty small user base. You can make the experience of using it awful and it won't matter. The people who need to fit that niche are going to do it. But the semester-based schedule does not allow for that to happen, unless someone wants to have class specifically devoted to trying to figure out how to use five-, six-, and seven-axis milling systems. And while that would be really cool in terms of professional, accredited development, it's a pretty niche operation. The knowledge gained would qualify you to work at one lab at SCI-Arc. And while I do think that someone should be working at that lab at SCI-Arc, it doesn't have to be an entire class' worth of people.

1. "About." Living Architecture Systems Group, livingarchitecturesystem

our digits and fingers.