Material Realities

"When you build a thing you cannot merely build that thing in isolation, but must also repair the world about it, and within it, and the thing which you make takes its place in the web of nature." — Christopher Alexander

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INTRODUCTION: A Look into the World of Waste

For thousands of years humans have experimented with various methods of waste disposal; From burning, to burying, to simply packing up and moving in search of an unscathed environment. The present global population expansion and the related increase in resource consumption poses a major threat to the future of our environment. According to the United States Environmental Protection Agency (EPA), Americans produced 254 million tons of trash in 2013. Approximately 87 million tons of this waste was recycled or composted.[01] The remaining 167 million tons of refuse ended up in America's 3,091[02] active landfills where the waste continues to pollute our environment today.

The production of waste is a dynamic cultural phenomenon that effects social, spatial and ecological orders. Habits of disposal are deeply ingrained in our daily lives; So casual and continual that we rarely ever stop to ponder the bigger picture. Disposed items may seem to be a trivial concern, but any single example of waste is connected to an ever-expanding set of local and global relationships. Challenges with trash disposal have grown critical in today's crowded world. *Re-thinking the ways in which we produce, collect and dispose of our waste, including innovative methods of design, are essential to ensure a more sustainable future*.

Material Realities posits that Architecture is contingent on the (waste) objects around us. The following paper explores waste problems and potentials on three scales: Small, Medium and Large. Within each scale study, a local (Milwaukee, Wisconsin) waste material will be identified, located and quantified. From there an architectural design proposal and relevant design precedents that are contingent upon available (waste) resources will be presented. *Material Realities* will demonstrate that design methods which embrace contingency are necessary to produce architecture that is socially, culturally, economically and environmentally sensitive.

SMALL-SCALE STUDIES: What Can We Do with All of This Urban Wood Waste?

Urban Wood Waste is everywhere. In cities throughout the country we find trees lining streets, filling yards and populating parks. Each year an astonishing number of these trees

are sent into our urban waste streams as a result of disease and infestation, natural disasters, infrastructure upgrades and urban development.

Estimates from the U.S. Forest Service show that there are nearly 4 billion urban trees in America, with another 70 billion growing in the outlying metropolitan regions. U.S. Forest Service researchers project that by the year 2050 America's urban land will nearly triple in size to an area larger than the state of Montana. In 2003 the USDA Forest Service estimated that in 2002, urban wood residues in the municipal solid waste stream totaled 14.8 million metric tons.[03] According the U.S. Forest Service, "wood from the country's urban areas, if processed, would produce about 3.8 billion board feet of lumber; Enough framing lumber to build roughly 237,000 houses."[04] Today, most of that wood is considered waste. Naturally, our urban forests will expand with our cities. So what can we do with all of this Urban Wood Waste?

Zooming in, closer to home, the city of Milwaukee Wisconsin manages an urban forest with roughly 200,000 trees. Each year, city foresters take down approximately 3,600 trees for various reasons. As an example, the Emerald Ash Borer threatens 5.2 million urban Ash Trees in Wisconsin—That's 20% of the state's urban forest! Other invasive species producing urban wood waste include Oak Wilts, Thousand Cankers Disease and Gypsy Moths.[04] The City of Milwaukee sends these fallen Norway, Maple, Sugar Maple, Elm and Ash trees 45 minutes northwest to the saw mill at Kettle Morain Hardwoods in Addison, Wisconsin.

This solution to urban wood waste is both sustainable and economical. Milwaukee's Forestry Services Manager, David Sivyer, says that processing the urban wood at a local saw mill "is about half the cost of what it would cost us to landfill the material. It saves us money and captures whatever value these urban logs may have."[05] As Bob Wesp, Vice President of Kettle Moraine Hardwoods puts it, "we look at this as a recycling program more than anything. You're taking whatever the log will give you."[05] This means embracing the unknown and accepting the imperfections of urban wood; The unique and unusual colors, grains, patterns and textures.

SMALL-SCALE STUDIES: From Urban Wood Waste to Honey Bee Habitats

As part of the ongoing *Material Reality* research *The BEEbrane* project proposes to convert fallen urban tree debris into new homes for urban flora and fauna, with a specific focus on the creation of honey bee habitats. This project takes inspiration from one of the oldest (and most natural) forms of bee keeping—A hollowed-out tree trunk cavity called a bee gum—for both its formal and conceptual framework. This form of habitat provides an environment that protects the hives from threatening weather conditions, like rain, wind, frost and snow. *The BEEbrane* reduces urban wood waste, enhances environmental biodiversity and invites people to experience the ever-changing processes within nature. This thrifty method of construction yields an unpredictable, ever-changing material and physical experience throughout the duration of the project life cycle.

The BEEbrane is an interdisciplinary project that operates in the space between Architecture, Art and Landscape to create productive placemaking strategies. The material research, design development and fabrication of *The BEEbrane* requires well-rounded, real-world architectural insight and understanding. The research and design process requires contact and communication with various local organizations to identify, locate, quantify and collect urban wood waste materials. This includes correspondence with a number of local groups, ranging from the city parks department, to non-profit urban wood organizations, to local lumber mill owners. Additionally, collaborations with area bee keepers and ecologists are an integral part of the design development process.

With this said, the design and realization of *The BEEbrane* is, as Stan Allen would say, "messy and inconsistent" where the design process is in constant "negotiation with reality."[06]

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Ultimately, the end result is completely contingent upon the availability of local urban wood waste resources, environmental conditions and the interdisciplinary relationships that are established within the community. *The BEEbrane* project demands that we work with what's at hand. These contingencies inform the materials that we work with, the economies that we engage and the environments that we create.

Working with these real-world contingencies requires designers to think critically and creatively while developing design ideas that are not self-involved, but instead are of interest to wide-ranging audiences, including architects, artists, industrial designers, landscape architects, ecologists, environmentalists, anthropologists and garbologists. *The BEEbrane* encourages responsible design and strives to positively impact the community through ecologically sensitive, community based design interventions that are accessible to all, both physically and intellectually.

SMALL-SCALE STUDIES: Additional Approaches to Issues Surrounding Urban Wood Waste

Throughout the design and development process of *The BEEbrane* project, several design precedents have provided inspiration and insight into the world of urban wood waste. Of particular interest is the work of the Seattle-based sculptor John Grade.

Grade has been called a "Connoisseur of Dissolution"[07] who's recent projects have been an exercise in time, performance and refined entropy. He often works with found natural materials, like wood, stone, leather, animal hydes and clay; Materials that react to environmental conditions, embrace the fluidity of time and accept the possibility of decay and renewal. Grade views his sculpture as a collaboration with nature where control blends with chance. He constructs his pieces with an image in mind, but ultimately lets go and leaves

Figure 1: Urban Wood Waste & BEEbrane
Model by Bob Allsop, Milwaukee, WI.

Mother Nature to decide the work's final fate. Often times his sculptures are situated in the landscape, exposed to the natural elements and inviting interaction with bugs, birds and bashing tides. He states that his work "will be a success when there is evidence of a compelling balance between what I have anticipated and the chance events that affect the work in unexpected ways."[07] In other words, his creations are, at a certain point, completely contingent upon external factors.

John Grade's *Wawona* (2009) exemplifies how these entropic ideas have come to influence his incredible creations. Salt-water seasoned, old growth planks and beams primarily from the ship's hull construct the 60-foot tall weathered wooden sculpture. This douglas fir lumber was salvaged from the San Francisco-built 1897 *Wawona* which was listed on the National Register of Historic Places in 1970. The schooner sat dormant in Seattle for years, awaiting a restoration that never came into fruition. John Grade and his team spent weeks dismantling the ship and cut the reclaimed lumber into smaller pieces for eventual reconfiguration.

In 2011 the Museum of History and Industry commissioned the *Wawona* for its new location in Seattle's historic Naval Armory building; A building that is also listed on the National Register of Historic Places.09 The 11,000 pound artwork punctures the floor and ceiling, exposing the sculpture's protruding portions to the natural elements. These parts of the Wawona, like the original ship, will decay over time, while the interior elements will remain preserved. The Wawona is a prime and poetic example of a contingent creation that uses urban wood waste to create wonder—Wonder that speaks to the specific culture and history of a place and its people. John Grade is "giving this old wood credit for time served. Chunks of art and history and biology and engineering, all held together by various inventive strands."[10]

MEDIUM-SCALE STUDIES: Knee Deep in C & D Debris

On top of urban wood waste, Americans are producing an astonishing amount of Construction & Demolition (C&D) debris annually. In 2010, an estimated 130 million tons of C&D debris were generated in the U.S., 36.4 million tons of which was wood waste. Demolition activities accounted for just over 80% of the wood debris with construction activities covering the balance.[11] Phil Araman and his research team at the USDA Forest Service have discovered that for an average 2000 square foot new residential construction, approximately 5,100 pounds of wood waste is generated. At an anticipated 1 million new home constructions per year in the U.S., this suggests that C&D wood waste from residential construction alone will be over 5 billion pounds annually.[12]

Again we zoom in, closer to home. C&D debris is a relatively untapped resource that represents approximately 30% of the municipal waste stream (MWS) that enters Wisconsin's landfills. How can architectural design that is contingent upon the objects around us address the unsettling issues that are tied to the overflowing C&D waste stream?

MEDIUM-SCALE STUDIES: From Waste to Wonder (Wall)

In the Spring of 2015, I taught an upper-level design studio in the School of Architecture & Urban Planning (SARUP) at the University of Wisconsin Milwaukee titled *From Waste to Wonder*. The research & design studio encouraged students to challenge their preconceived notions of waste. Students conducted in-depth research of various waste flows while simultaneously analyzing the work of a range of designers that are known for physically transforming bountiful by-products into works of wonder. These explorations served as inspiration for students to conserve resources, recycle, reuse and challenge their (design) imaginations. The results were thoughtful, inventive and oftentimes unlikely approaches to waste management.

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Undergraduate student Brandon Sather found himself wandering amongst the industrial ruins of Milwaukee's Inner Harbor. Just west of the Port of Milwaukee, the 100+ acres of brownfield waterfront was once home to an array of bustling industries. Today, this toxic landscape is the focus of various economic redevelopment and ecological restoration plans spearheaded by the City of Milwaukee and the newly formed Milwaukee Harbor District.

While wandering through the wastescape Brandon became fixated on the industrial ruins of the 46-acre Solvay Coke & Gas Plant. This former factory was in operation from 1866 to 1983, at which point Wisconsin Wrecking began a scrap and salvage operation on the site. In 2003 the majority of the Coke & Gas manufacturing buildings were demolished as part of an EPA hazardous waste removal project. For a brief material exploration project Brandon literally picked up the pieces of the industrial ruin to fabricate his Wonder Wall. He scavenged the site over the course of several visits, scouring the landscape for any rubble he could find; From Creme City Bricks, to concrete blocks to 16 foot tall walls of wood waste. Brandon's Wonder Wall mock-up honors the past, confronts the present and contemplates the future of Milwaukee's industrial economies and inner harbor.

MEDIUM-SCALE STUDIES: Part-to-Whole Preservation

Brandon Sather's *Wonder Wall* makes it clear that building materials are not fixed in space and time, but rather they are part of a continually evolving enterprise. His *From Waste to Wonder* Studio experiments were heavily influenced by the Art of El Anatsui, the installations of Catie Newell and the architecture of Wang Shu.

Nigerian-born El Anatsui is a renowned Artist who works with "materials that have been subjected to considerable human use: mortars, trays, graters, tins and...liquor bottle tops."[13] Anatsui works in a variety of mediums, from sculptures to paintings and prints to drawings, with each containing personal and global (his)stories. He is best known for his "simultaneously diminutive and monumental, delicate and violent, whimsical and serious"[14] sparkling sculptures made from liquor bottle tops; The used materials that are found in his immediate surroundings. Anatsui's design process relies on the acute investigation of his immediate

Figure 2: Solvay Coke & Gas Plant
The Inner Harbor, Milwaukee, WI.

environments. He believes that “he can free the creative process by turning to the humble everyday materials around us.”[14]

Michigan-based architectural designer and educator, Catie Newell, upholds a similar set of design values. Newell’s “creative practice has been widely recognized for exploring design construction and materiality in relation to location and geography, as well as cultural contingencies.”[15] Her 2010 Detroit Michigan project, *Salvaged Landscape*, transformed a post-arson condition into an inhabitable environment. The project began when Newell was approached by a Detroit resident who had two houses that were slated for demolition as a result of arson. She saw this all too familiar Detroit condition as an opportunity for material exploration and social commentary. In an interview with *Scapegoat* she stated, “for me the material potential of the space was in the charred wood. I knew I couldn’t make materials like this—You can’t machine something to look this charred. Also, the wood is not burnt entirely through, a raw state remains in the center of the material. On the exterior of each piece, the bulbous quality of the wood, as a result of the fire, creates impure geometries. Not to mention the material was native to the house.”[15]

First Newell deconstructed the scorched space, breaking the structure into fragmented parts. Next she began to reconfigure these pieces to construct edited volumes in the residential ruin. “I make familiar spaces, domestic or not, unfamiliar; I’m agitating architecture,” Newell stated. “There is something in that instinct that is stronger than making things that are entirely new. There is something in the translations and transpositions that can take on more.”[15] The end product was a *Salvaged Landscape* that enabled visitors to experience new textures, spaces and atmospheres while contemplating the past and present social, cultural and economical issues that are imbedded in The Motor City.

On a larger scale, and in a different context, Chinese architect Wang Shu is working with similar issues. Shu, along with his design partner Lu Wenyu of Amateur Architecture Studio demonstrated an insightful understanding of the shifting material flows in China’s ever-changing constructed environment through their historically sensitive *Ningbo Historic Museum* (2008).

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Figure 3: Wonder Wall

By Brandon Sather, Milwaukee, WI.

Shu and Wenyu turned to China's past to design a museum for the future. The *Ningbo Historic Museum* is built using the wa pan construction technique. This process, based on the re-use of existing materials, was developed years ago by the region's farmers as a solution to coping with the destruction caused by natural disasters. Much of the museum's envelope is composed of found building fragments that are rich with history. In an interview with Domus, Wang Shu "pointed to a grey brick about 20 centimeters wide. 'This one was produced over 40 years ago—That's the Ming Dynasty. That is a very standard size. This one is from the Qing Dynasty. Some people have found older ones. The oldest one is from the Tang Dynasty—That's 1,500 years ago.'"[16]

The *Ningbo Historic Museum* is a refreshing sight in Ningbo, a 5,000 year old city that, unfortunately, looks like it was built yesterday. Seeing piles of brick and tile rubble left over from hastily razed structures is an all-too-common sight in Modern-Day China. This rapid and careless destruction is erasing the country's cultural and architectural heritage. "We must not demolish history in order to develop,"[17] says Shu. The *Ningbo Historic Museum* is not just a piece of Architecture. With its highly textured cladding, dissimilar blocks and randomly placed apertures, it revives local cultural conditions, educates its inhabitants and proves that working with what remains can be an intellectual, imaginative and innovative endeavor.

LARGE-SCALE STUDIES: Finding Potential in the Foreclosure Crisis

The aforementioned waste stream of Construction & Demolition debris is directly linked to issues of abandoned architecture. It's been nearly eight years since the beginning of America's foreclosure crisis. Since 2008, nearly 5 million homes have been lost. The severity of the crisis runs deep. The catastrophe has ravaged communities and shattered economies across America. In 2010, at the peak of the foreclosure crisis, "2.9 million homes suffered foreclosure filings. In 2013, the number was 1.4 million."[18] Clearly, we're not out of the woods.

Today, problems tied to the Foreclosure Crisis run rampant in Milwaukee. "Before the housing bubble burst, The City owned fewer than 100 foreclosed residential properties at any given time."[19] By the end of 2014, Milwaukee held title to nearly 1,600 tax-foreclosed properties. In addition, there were 1,400 bank-foreclosed properties blanketing the city. Since 2008, Milwaukee has lost approximately $4 billion in value as a result of the foreclosure crisis.[20] In response to the emergency, Milwaukee's Mayor Tom Barrett and his team devised a Strong Neighborhoods Plan which allocated $11.7 million in the 2014 city budget for foreclosure-related issues. In 2015, The City will spend $10.3 million on home loan programs and local organizations like the Northwest Side Community Development Corporation (NWSDC) will use $4 million of grant money to purchase, rescue and rehabilitate vacant and foreclosed properties. How might we view these unfortunate urban conditions not as abject, but as opportunity? This seems like a perfect storm with a ton of contingent design potential.

LARGE-SCALE STUDIES: The Frankenstein Fix to Foreclosure

For his final research & design project in the *From Waste to Wonder* studio, graduate student Brad Pokrzewinski took on Milwaukee's foreclosure crisis. His proposal, *Franken Houses*, was an insightful analysis and innovative approach to addressing the devastating realities that resulted from the burst of the housing bubble.

Franken Houses proposed to record and recompose the materials, artifacts and events found in the vacant homes surrounding Milwaukee's ARTery, a defunct railroad line that serviced the City's formerly bustling beer industry. *Franken Houses* aimed to rejuvenate this region of the city and weave together the broken pieces of the *Harambee* neighborhood, which suitably means "all for one" in Kiswahili.

Through several site visits and research routes, Brad quantified and documented the foreclosures, vacant homes and demolished properties in the area. With this given material, Brad produced contingent design proposals at the scale of The Human, The House and The (neighbor)Hood. *Franken Houses* honored Milwaukee's historical housing typologies by recomposing these forms, figures and materials to create welcoming micro-communities that worked together to revive the larger neighborhood. Visitors would experience the layers of history and be reminded of the memories, both good and bad, that were tied to the people of this place called *Harambee*.

LARGE-SCALE STUDIES: "If Anything Emerges to Cut Up I'll Go Anywhere, Anytime" (G.M/C)

The *Franken Houses* project is a theoretical proposal that is very much rooted in reality. It's reminiscent of the successful realized works by Artists, Activists and Urbanists like Gordon Matta-Clark, Rick Lowe and Theaster Gates. A closer look at the built visions of these Imagineers demonstrates that contingency in Architecture and Urban Design is not only possible, but is an imperative modus operandi to produce socially, culturally, economically and environmentally sensitive design.

Gordon Matta-Clark envisioned a world that was founded on the constant recycling of its ingredients. His entire body of work was contingent upon the objects he found in his immediate environment; From his earlier installations like *Garbage Wall* (1970) to his defunct bodega restaurant *Food* (1971) to his architectural adventures like *Thresholds* (1973) and *Splitting* (1974). "As a sculptor," he wrote, "I have based my outlook and my work on those given things in the environment which have passed over into a neglected state. Specifically I am speaking of the city's abandoned structures."[21] As an urban archeologist, Matta-Clark discovered sites of meaningful disjunctions and operated on them to reveal their layers of historical significance, structures of daily living, economic networks and circulation systems.

Matta-Clark's empathy and hunt for harmony led him to connect with local communities throughout the duration of his abbreviated career. His creative endeavors challenged the traditions of many cultural, social and political beliefs. "The work was rooted in urbanism and the displacement or transformation of space, in what Miwon Kwon calls a spatial politics, 'a resuscitation of a sense of place, a sense that ostensibly once was, but now is lost.'" [21]

In a draft proposal for a Guggenheim Fellowship in 1976, Gordon Matta-Clark wrote, "One of the greatest influences on me in terms of new attitudes was a recent experience in Milan. When searching for a factory to 'cut up,' I found an expansive, long-abandoned factory complex that was being exuberantly occupied by a large group of radical Communist youths...Their program was to resist the intervention of 'laissez-faire' real estate developers from exploiting the property. Their proposal was that the area be used for a much needed community services center. My exposure to this confrontation was my first awakening to doing my work, not in artistic isolation, but through an active exchange with peoples' concern for their own neighborhood." [21]

Unfortunately, Matta-Clark passed on just two years later, leaving us only to imagine the impact that this influential experience would have had on his future work. But we can see Gordon Matta-Clark's legacy live on in the contemporary projects of activists like Rick Lowe and his Project Rowe Houses in Houston, Texas or Theaster Gates and his Dorchester Project in the south side of Chicago. The work of these Imagineers has taught us how contingent design strategies can reveal the positive potential in urban neglect and abandonment.

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CONCLUSION

Every design profession needs to incorporate time and space for self-reflection and creative contemplation. When we stop and take a long, hard look at the world around us it becomes clear that given today's pressing social, cultural, economical and environmental conditions forward-thinking, contingent design strategies are necessary.

Let's face reality.

The Waste research, contingent design proposals and long list of successful, realized design precedents that are laid out in Material Realities clearly demonstrate that working with what remains can be imaginative, innovative and intellectually stimulating. Did I mention inspiring? As designers, it's our role to take on these issues; To question our preconceived notions of Waste; To conserve resources; To challenge our (design) imagination. If we don't do it, who will?

Working with real-world contingencies requires designers to think critically and creatively while developing design ideas that are not self-referential, but instead engage a wide-range of audiences, including Architects, Artists, Industrial Designers, Landscape Architects, Ecologists, Environmentalists, Anthropologists and Garbologists. *Material Realities* encourages responsible design that is rooted in reality but reaches for the radical. Let's use the City as a living laboratory and explore its numerous repositories where opportunities for architectural exploration, social engagement and cultural education are rich and plentiful.

Figure 4: ICAN 2 Lab & The ARTery

By Beintween, Milwaukee, WI.

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Figure 5: The Dorchester Projects

By Theaster Gates, Chicago, IL.