



Scrap Culture: Sustainable Design Practices in a World of Waste

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Welcome to Scrap Culture, where we will examine new sustainable design practices in a world consumed with waste. At Mohawk, we create carpet from waste. In fact, we are one of the largest recyclers of plastic bottles that get turned into residential and commercial PET carpet fiber. About 135 million square yards of carpet is produced each year for these markets, which diverts 6.5 billion bottles each year from hitting the landfill. It is in this spirit that we set out to explore what others are doing to help offset the waste stream around the world.

The Plastic Age

Our world is besieged with waste. It is so overwhelming we are literally killing the planet. Today we live in an era called the Anthropocene, a relatively new geological era defined by human effects on the earth. Carbon emissions, overpopulation, loss of natural resources, overabundance of pollution and debris, climate change, biological and chemical influencers have all affected the planet in devastating ways. Much of this has happened quickly in the history of the planet, all seen since the industrial revolution but more crucially since the advent of plastics in the mid-century.

We are all aware of the negative affect plastic trash and waste has had on our oceans and water streams, not to mention ecosystems and sea life. Over five trillion pieces of plastic currently litter the ocean. There are five parts of the world where trash has collected into large floating patches or islands, which is currently impossible to contain or clean up due to the sheer volume. And we know that plastics do not biodegrade, so that they become a hazard once they are put in a landfill or the ocean. What's worse is that they degrade from sunlight and smaller fragments break off, where they get ingested by fish and other sea life.

What happens with all the plastic waste? With these environmental challenges of the last sixty years, we are starting to see new materials take shape in the Anthropocene. "Plastiglomerate" is one such new material. This term was created by oceanographer Charles Moore, geologist Patricia Corcoran, and artist Kelly Jazvac to describe a stone that contains mixtures of natural debris that is held together

by fragmented plastic debris. This is seen as a marker for environmental change, where plastics are cohabitating with natural phenomena in a new form of pollution. This can happen through heat when plastics become molten, or through the natural buildup of debris in tide pools and the like. Jazvac collected these examples shown in Hawaii and considers these as natural history specimens, proof of human existence inflicted on nature.

Circular Economy

Realizing how plastics have overwhelmed the environment and are reshaping ecosystems, designers are starting to think about transforming trash. For a new generation of emerging designers, sustainability is becoming an ingrained part of their education and practice, including circularity. This means that everything is a resource for something else, as this is how nature works, and as humans we should be thinking in this biophilic way. It is related to the idea of the end of life of one material becomes food for another. But it also addresses how to create a closed loop system for manufacturing and allowing industrial waste to become a new valued resource. This is a model all about future possibilities, and more and more businesses are working towards this goal that can be restorative and regenerative, rather than about disposal.

The model we mainly operate in is the Linear Economy. This is where manufacturers take resources (Resource Extraction), make something new, distribute it around the world, consumers use it, and then it goes into landfill (Waste). What's wrong with this model is that it doesn't account at all for sustainability and contributes to the environmental problems we already have. The Circular Economy eliminates the Resource Extraction and Waste phases, and replaces them with Reuse-Repair-Recycle, and ultimately with a recycling stream that offers up new materials for the production phase. Upcycling is a goal because the new material needs to perform so it can have a useful life, and then be returned into raw materials when it reaches the end of its useful life. The challenge we have today with the Circular Economy is that not everyone is on board or equipped to participate. We need take-back systems in place so that these new materials intended to be recycled can indeed do so.



Fashioning New Yarns

The fashion industry is one of the most wasteful and polluting industries in the world. Fast fashion, the practice of factories cranking out cheap consumer goods at a fast pace to meet seasonal trends, has taken a toll. This practice has led to tremendous landfill waste. In 2018, according to the EPA, 17 million tons of textile waste was generated. Of this amount, 2.5 million tons were recycled, 3.2 million tons were combusted for energy recovery, and 11.3 million tons were sent to the landfill. The average American throws away approximately 80 pounds of used clothing per person. Synthetic clothing, like polyester and acrylics, take hundreds of years (if not 1000) to break down in a landfill.

The fashion industry is starting to take a proactive stance and using waste and scrap materials to create new design, as well as connecting with other social issues to find solutions in favor of sustainability. Brands such as Eileen Fisher, Adidas, Ecoalf, Rothy's, Patagonia, Everlane, and many others are fashioning new yarns from waste for their shoes and garments. For example, Eileen Fisher has a program called "Waste No More", where they give new life to old garments by taking back clothing and creating new textiles for clothing and interiors.

Adidas is tackling plastic waste through disruption. They are committed to not using virgin plastic in their supply chain, and in fact, they have declared that "Plastic is a design failure" as they want to reinvent the material. They also want to prevent any more plastic from entering the oceans. One of their first ventures in this area is their "Parley" sneaker, made from discarded fishing nets.

Many companies, like Mohawk, are making PET (polyethylene) fiber from recycled water bottles. Where Mohawk uses PET fiber for carpet, fashion brands are using PET fiber in lieu of virgin polyester or nylon. We see this with Rothy's shoes and Ecoalf clothing, where they promote their sustainable substitution.

Ecoalf does a nice job educating consumers with messaging embedded into their garments. One parka is made from 80 plastic bottles and has the words "Don't turn your back on the world, Natural resources are not endless" on the inside of the jacket. They also have a diagram showing how the plastic bottle becomes fabric. Ecoalf is also working with bio-based waste, such as reclaimed post-consumer coffee grounds, to add to PET to give it additional technical properties that are ideal for outdoor clothing.

Other companies and designers are experimenting with textile waste for new materials. Kvadrat, the Danish textile company, is working towards circularity by using selvedge waste from their own mill partners and converting this into new materials: solid textile board and acoustic felt, both for use by architects, interior designers, and product designers. British designer Sophie Rowley developed "Bahia Denim", which is a patterned textile made from denim production waste from the Diesel fashion brand. She compresses the textile scraps and adheres them with a bio-resin, and then carves away layers to create a marbled-like pattern. This new, intricate form of denim allows for endless pattern and color combinations, as each piece is hand-made and one of a kind. These are just two examples of textile waste becoming new materials, there are many more on the horizon.

New Materials

In addition to yarns and textiles, new materials are finding their way into the Anthropocene. StoneCycling is a Dutch startup founded by Tom van Soest to create Waste Based Bricks. Van Soest was concerned about all the construction waste he encountered (in Europe, that amounts to 1/3 of landfill waste). So, he started a company that uses local construction waste to make new bricks. Van Soest taps into the more artisanal side of brickmaking, crafting new recipes that utilize clay, glass, ceramics, and insulation and then bakes the discarded materials into new useful ones. All the experiments are done in his studio, but then can be made in a larger factory and scaled up for production.

In 2012, designers Marjan van Aubel and James Shaw created a new sustainable material in their studio by accident. Experimenting with sawdust and wood shavings from their own furniture designs, they introduced a bio resin to discover a new foaming reaction occurred. This foam can expand and harden into a new lightweight material to create furniture, such as their now iconic "Well Proven" chair. Realizing that there is a large percentage of waste in creating new wood furniture, these designers decided to use this new material to cut down on their wood use and put some of the waste back into the products. Their experiments also included coloring of the wood, and how to express the foam to show its natural beauty.

How ironic to turn paper back into wood, but this is exactly what Dutch designer Mieke Meijer did when she came up with Newspaper Wood. Newspaper, a ubiquitous resource even in



the digital age, is a typical material of the recycling bin. In 2003 when Meijer was a student at the Design Academy of

Eindhoven, she created her first prototype for this new material by stacking and gluing individual sheets of newspaper together. She then rolled the sheets into a cylinder and cut them in section, revealing a beautiful new material that showed variation just like a tree trunk does. The process is not all that different than creating engineered wood veneer, but this material could be cut into thicker dimensions, allowing for panels that can be used to create furniture and other design objects. Today Meijer has resurrected the Newspaper Wood, using a more sustainable adhesive and working with furniture collaborators in the Netherlands.

Related to newspaper are several designers working in the medium of paper pulp. Woo Jai Lee is one such designer who created PaperBricks in 2017 to then construct furniture. PaperBricks are made from newspaper pulp that has been mixed with glue and pressed into a mold. This material was created from recycled newspaper in hard and soft versions, as well as rough and smooth ones, so that there is tactility and a contrast in material for creating new forms and shapes. The paper bricks can be cut, drilled, and glued in the same manner as wood. The form of the brick was designed to minimize materiality while maximizing strength, as the primary goal was to give paper waste a new stronger life. Holes are included down the side of each block to allow them to join.

New Processes

In addition to new materials made from waste, we are also seeing new design processes. 3D printing has been on the rise, used by emerging designers who want to challenge traditional manufacturing methods. To create larger objects, such as chairs, some designers are hacking robotic arms and using them to extrude new recycled plastic waste. Dirk Vander Kooij has done exactly that with the design of the Chubby Chair, where he reclaims plastic interiors from discarded refrigerators, melts them down and extrudes the material into a new form. He developed his own extruder using a robotic arm so he could have more design control than typical 3D printing, imparting strength to the furniture where needed. The resulting aesthetic is much like toothpaste or paint being squeezed from a tube.

Another example of 3D printing furniture from plastic waste is a project called "Print Your City", which utilizes plastic waste to

engage local citizens to participate in recycling and contribute to beautifying public space. Started by a group called The New Raw, the project uses large scale 3D printing to make furniture for urban areas. The organizers see this is as much as a design solution for waste as much as participating in activism to rally all in the city to help close the plastic loop. The technology of 3D printing allows for closing the material loop of plastic with a short recycling path and a zero-waste production process. This design process can also be customized for each town, where all citizens can take part. It's also an example of co-design, teaching the public the value of new sustainable processes.

Dutch designer Jessica den Hartog explored new processes with her project "Recolored". She set out to research new materials and colors that could be made from plastic waste. Thinking about how recycled plastics don't have their own unique aesthetic, she wanted to give new attributes to this overlooked material. She learned that when plastics get recycled, they are not sorted by color, but instead all are assimilated together into one blended gray raw material. By focusing on color studies of plastic and collaborating with the recycling industry, she transforms all the colored bottles from a bale into new fragments of plastic that focus on color and aesthetics, and where surface materiality is valued. The colors are determined by the existing discarded plastic destined for recycling, but they get mixed into new colors through her work. Ultimately, her research reminds us that every material can be unique again and tells a story about its path in the world, and that it's a never-ending process.

New Artifacts

Now that we are living in the Anthropocene, it's inevitable that we will see new artifacts that will leave behind clues about how we have been living in the 21st century. Between plastoglomerate, new recycled materials, and sustainable interventions, future generations will see that we tried to correct the course of destruction from waste and pollution.

Lithoplast is another new material that is a sign of the Anthropocene, but also one that speculates how future generations could react to plastic. Created by Israeli designer Shahar Livne, Lithoplast is a clay-like material using plastic waste. With this project, Livne envisions Lithoplast as a valued material that could be mined in the future, especially if virgin plastic ceases production in the future. Our discarded waste from the present era would be seen as a rare and natural



resource in the future, as if this is what would be found in landfills of the future. To create the Lithoplast, Livne combines plastic waste collected from beaches and layers it with minestone and marble dust, both by-products of industrial waste. She then applies heat and pressure, mimicking the metamorphic process in geology that creates marble. The finished material is soft like clay and can be shaped into objects and then finished. Like plastiglomerate, Livne imagines a time in the future where this material will occur naturally.

Another concept for new artifacts is the reclamation of existing materials. There are so many existing materials right in front of us that have been abandoned and no longer used, such as deserted buildings and strip malls filled with fixtures, millwork, flooring, etc. We can utilize salvages materials, which is a good strategy for identifying materials that can be diverted from waste stream/landfill and find a new life in a new project. Examples include wood, scrap metal, doors, surfacing materials, and even core drills of concrete! A favorite is the furniture by Paul Cocksedge, who used concrete core drills to make new furniture. Anything can be repurposed with some creativity.

E-Waste, or waste from electronics and small appliances and gadgets, represent 2% of America's trash in landfills, but it equals 70% of overall toxic waste from heavy metals. Up to 50 million metric tons of e-waste are disposed of every year globally. Besides heavy metals, there are also precious metals inside our e-waste, like gold and silver. A new sustainability initiative has emerged called Urban Mining. This is the process of reclaiming elements and compounds from buildings, products, and their associated waste. Micro Urban Mining has also emerged, as a DIY movement to reclaim the materials inside of your own household consumer electronics and make something for yourself. Aluminum, copper, and other waste materials from your obsolete devices can be harvested and repurposed into new goods. This idea has been explored by designer Jorien Wiltenburg, who proposes that by mining your e-waste, you have the materials to make something new, but one would need to construct the methods to make these low-tech crafts, like having your own DIY foundry or forge.

Conclusion

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