

# A PLACE FOR PLASTICS

BioPlastics, Bacteria and Our Thoughtless Acts

by Megan Valanidas

*opposite: Stills from time lapse movie capturing the decomposition process of a textured bioplastic designed for accelerated breakdown in soil.*



*Slurpee Cup redesigned to maximize decomposition in Nature. Using patterns inspired from Nature but derived in mathematics, these patterns 1) Maximize surface area in order to accelerate the natural degradation process. 2) Inform the consumer that they are meant to be composted and not recycled or landfilled. (photo by: Rachael McArthur)*

Most plastics end up as landfill or litter, going to the “wrong place.” Instead of searching for ever more places, we can instead design plastics that “fit” anyplace they fall. Wherever that may be.

We live in the Plastic Age. Like the Bronze and Iron Ages that preceded it, the Plastic Age will be measured in centuries. Plastic is far more versatile than either of these materials. It is durable, easily formed and has millions of applications. We all benefit from plastics’ many advantages and we’re all acutely aware of it’s main problem: When we throw it away, it tends to stick around.

To mitigate this problem, they tell us to reduce, re-use and recycle.

The popular and longstanding rhetoric around plastic reduction is analogous to the promotion of abstinence-only sex education; though people may wish otherwise, teens are going to have sex and people are going to continue to use plastic. ‘Abstinence’ based campaigns to outright quit plastics have in no way significantly reduced the amount of plastic waste entering our ecosystem. Every year, one third of all plastics produced still end up in our planet’s ecosystem (*Hawken, The Drawdown*).

As designers we need to meet consumers and plastics where they are. We can employ existing substitute

materials with lifecycles more in balance with how plastics move in our world and design objects and systems that assist in this process.

Jane Fulton Suri, pioneer of IDEO’s Human-Centered Design strategy, observed people’s thoughtless acts in her book of the same name (2005); a pencil used as a hair tie or the way one might momentarily mark a place in a book with one folded finger. Her insight was that we must observe and design for real patterns in our world, saying, ‘Thoughtless acts are all those intuitive ways we adapt, exploit, and react to things in our environment; things we do without really thinking.’ Fulton Suri observed that some behaviors are informed by the designed environment while others may be spontaneous or even socially learned.

Littering exemplifies thoughtless acts; often an act without malice or intent. Everyone is positive that it wasn’t their frappuccino cup that made its way out to the Great Pacific Garbage Patch. Everyone is sure it wasn’t them that dropped a lighter or tube of chapstick without the wherewithal to hunt it down in the dark. Yet, somehow, plastics continue to flood the ecosystem.

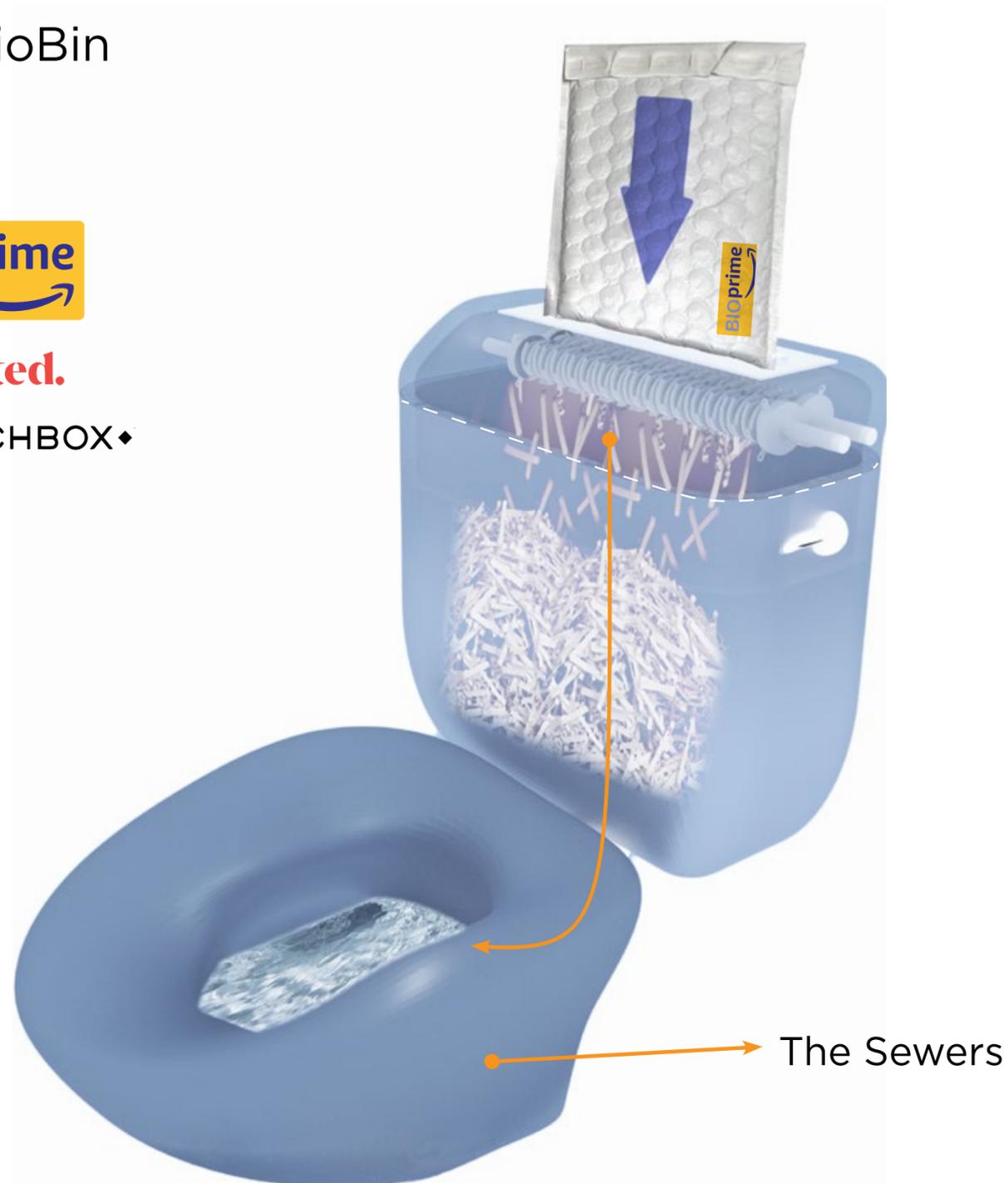
The bulk of these are single-use disposables; iced coffee cups, Big Gulps, airplane petite liquor bottles, shopping bags, tobacco wrappers, toys, straws, Nerf darts.

# The BioBin



Re-Plated.

BIOBIRCHBOX ♦



*CONCEPT VISUALIZATION: The BioBin offers consumers a way to utilize bacterial decomposition without having to litter or drive to distant (or in most cases, non-existent) municipal composting facilities. The BioBin is an attachment for existing home appliances, shown here atop a standard toilet tank. All biomaterials can be shredded and flushed. Subscription services (BioPrime, Re-Plated, BioBirchbox) in the Amazon model will provide bioplastic mailers and packaging that are flushable and intended to be digested by the environment. The existing bacteria in the waste water act to pretreat and degrade biopolymers before they clog waterways.*

Thoughtless acts : A cup placed thoughtfully under the car out of the way of the rain, forgotten and eventually run over as the driver moves on without their coffee / soda / tea / carton of nails.

The observable pattern is that plastics are ending their lives in water and soil. Soil makeup- generally discussed in terms of silt, sand, loam and organic materials- now includes plastic as part of its very composition.

By intentionally designing for thoughtless acts, the plastics that end up in the ecosystem would no longer be 'out of place' but instead be in just the right location. Plastics can be designed that are inherently beneficial to Nature. If we begin to utilize soil degradable plastics in all packaging and single-use goods, the act of leaving a cup behind at the park will become synonymous with forgetting to grab your banana peel to take to your home compost. It's still not a great idea, but it's not going to completely wreck the planet.

How might our thoughtless acts become the very way that we correctly dispose of a rather complicated and difficult to distinguish material? If we are already prone to creating pathways for plastics to enter the ecosystem, then shouldn't we be equipped with plastics that are meant to be there? And how do plastics arrive in Nature? What route do they take to

get to the open ocean? Are there opportunities for the breakdown of the product along its route as it makes its way through the city and into the big blue?

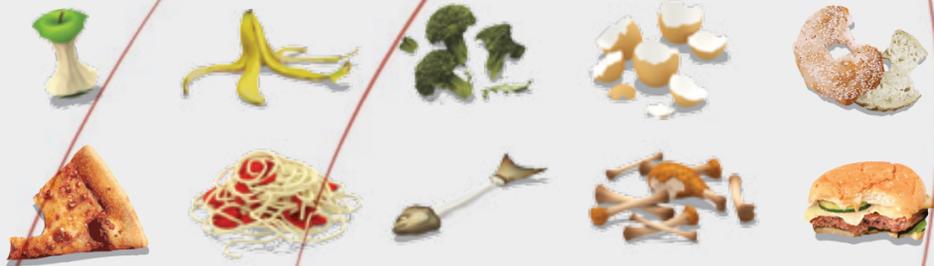
The term 'bioplastic' designates a plastic that is made without relying on fossil fuels. Bioplastics seem to suggest that they'd fit more naturally into the ecosystem. These plastics are often biobased (made mostly from plants or other renewable resources). It is reasonable to assume that these materials would degrade in harmony with the environment. Their shortcoming is that only rarely are they compostable in the way one might hope.

The designation 'Bioplastic' has no relation whatsoever to degradability or compostability. Furthermore, a bioplastic that is biodegradable may not be compostable and vice versa. For the thousands of types of plastics that are in the world, just as many different types of bioplastics exist to further confuse enthusiastic recyclers with more numbered labeling systems. Some are brittle, some are flexible, some are heat-resistant, others water-soluble and some are suited to do no more than carry food scraps from one bin to the next.

The Biodegradable Products Institute (BPI) is North America's certifying authority for compostable products and packaging. BPI executive director, Rhodes Yepsen, advises, 'There are many different

## Put items like these in your brown bin.

**Food Scraps** fruit, vegetables, meat, bones, dairy, prepared food



**Food-soiled Paper** napkins, tea bags, plates, coffee filters



**Leaf + Yard Waste** plants, trimmings, twigs, grass



**No** Metal, Glass, Plastic, Cartons, Clean Paper + Cardboard

**No** Trash  
Plastic bags, wrappers, pet waste, medical waste, diapers and hygiene products

Visit [nyc.gov/organics](https://www.nyc.gov/organics) for FAQs and videos.

*Courtesy of the New York City Department of Sanitation. 2017 composting brochure. In the written guidelines, rigid plastics are specifically prohibited from entering the system.*

*Bioplastics!*  
*too Risky*

biopolymers on the market and in development, and in their raw forms some can biodegrade in soil, the marine environment, and home composting. However, once those biopolymers are compounded and converted into finished goods, some of these properties are lost. So, it's nearly impossible to make generalizations. Things must be tested.'

It turns out that some biopolymers, like Novamont's soil degradable Mater-Bi product will break down as long as it is discarded in living soil. Likewise, this material is denser than water so it will sink and degrade on an ocean floor. Other biopolymers can take decades, if not hundreds, of years to biodegrade without the help of an industrial composting facility. That means that to the great outdoors, certain bioplastics are just as harmful as traditional plastics. These bioplastics need to be disposed of in a municipal, high heat composting facility which only exist in major metropolises such as San Francisco, Portland, Seattle and parts of New York. Even these lucky denizens who live in progressive towns can't compost just any bioplastic in these city-wide programs.

Take a look at what is allowed in an NYC composting bin (*opposite*). Nowhere does it list compostable forks, to-go containers or drinking cups. It definitely does not list biobased toys or accessories. A compostable fork looks identical to the standard

plastic fork. The same goes for compostable iced-coffee cups and green bioplastic bags. These biobased, non-toxic products are twinning with their traditional plastic brethren. It is asking too much of consumers to be able to distinguish these materials in the instant that it takes to toss a bit of waste in the proper bin. Often people are contaminating their recycling streams by 'wish-cycling': including items that are not recyclable in their municipal waste center. Recyclables end up in the compost and compostables end up mummified in landfills.

Combatting this will necessitate a three part plan. First, we aim for 100% tossable bioplastic. Gas stations, big box stores, subscription services will be the first to adopt this strategy, either through government mandate or simple economic advantage. As fossil fuels become more scarce and prices rise, we will no longer have the luxury of using traditional carbon-based plastics for things like packaging. Slurpees and Big Gulps will only be sold using packaging that is edible to microorganisms present in our soils.

Amazon and PeaPod packaging will be flushable and designed with the intent to break down in the local ecosystem.

Secondly, we need to make bioplastic conspicuously different. The industry aspires to create bioplastics



clockwise from top left: European standard label for bioplastics; Belgian standard distinguishing either biobased, compostable or biodegradable (not shown here); early Bioplastic Product Institute label (North American Standard); German certifier; Canadian standard bioplastic label.

that look like, perform like and cost the same as plastics but this sameness of appearance disavows bioplastics of their worth. New degradable plastics have the potential to perform like plastics, cost the same as plastics, yet breakdown like a banana peel. They can and *should* look completely different than any of the plastics we've known as well as being easily digestible by the environment.

Finally, we must develop and refine a new waste stream for compostable materials.

This will occur in phases. Possibly the next 50 years will include a slow transition toward full bioplastic integration. In the meantime, biobased plastics will coexist with traditional fossil fuel based plastics. The confluence of these materials mandates that they be easily kept separate in the waste stream. Consumers will need to be able to distinguish between the two materials in the time that it takes to set up a trash can 3-point shot.

When we do get this right, when our materials match the needs of consumers as well as those of the biosphere; we will witness a new dawn in the Age of Plastics.