



# The Nature of Fashion

Designing for True Circularity and  
Biological Systems

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May 20, 2020



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# Catch and Release

- Natural materials cycle endlessly. Nature cannot distinguish between good molecules and bad, nor can their movement be stopped.
- The essence of the second law of thermodynamics is that disorder increases over time. This means nature disperses.
- A global net helps nature capture valuable (dispersed) building blocks.
- Primary producers, consumers, and decomposers make the system possible
- Matter and energy are inextricably linked.

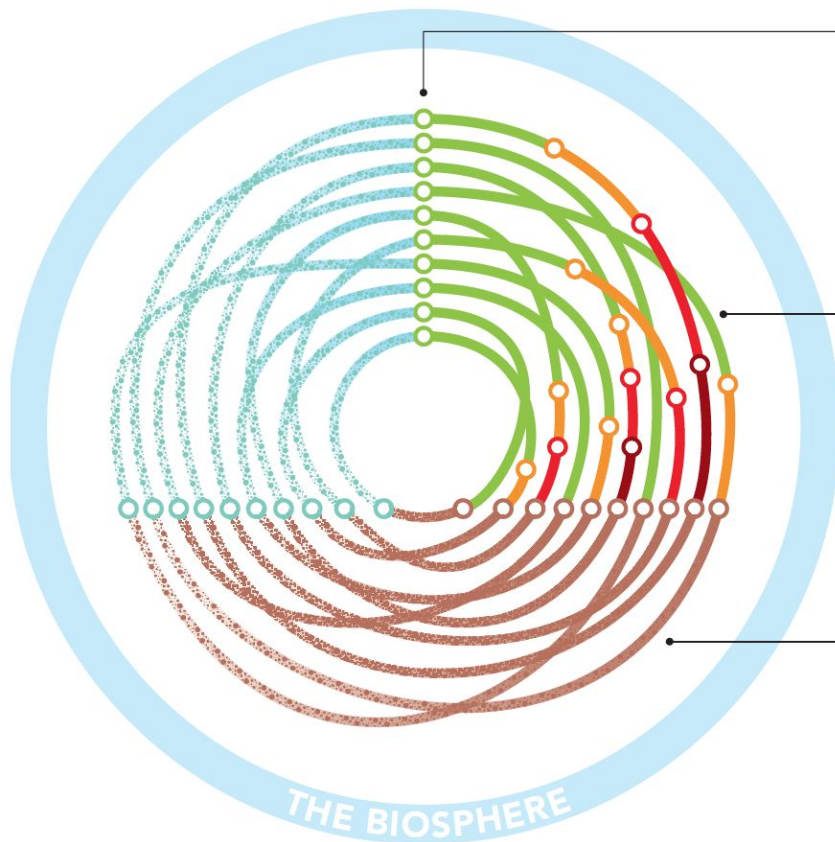
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The outermost loop is always the biosphere: air, water, and soil.



# Nature's Dynamic Equilibrium



Natural cycles have three main parts:

- **Primary Producers**

Photosynthetic plants and algae combine free solar energy with disordered material building blocks from soil, air and water to create highly ordered, energy-dense structures.

- ● ● **Consumers**

Includes all herbivores and carnivores, which break down energy-dense structures and use the stored energy and materials to construct their own tissues, creating physical waste and dissipating energy.

- **Decomposers**

Bacteria and fungi break down material to basic building blocks, using up remaining energy and making the physical building blocks available for use by primary producers.

# The Problem with Plastics

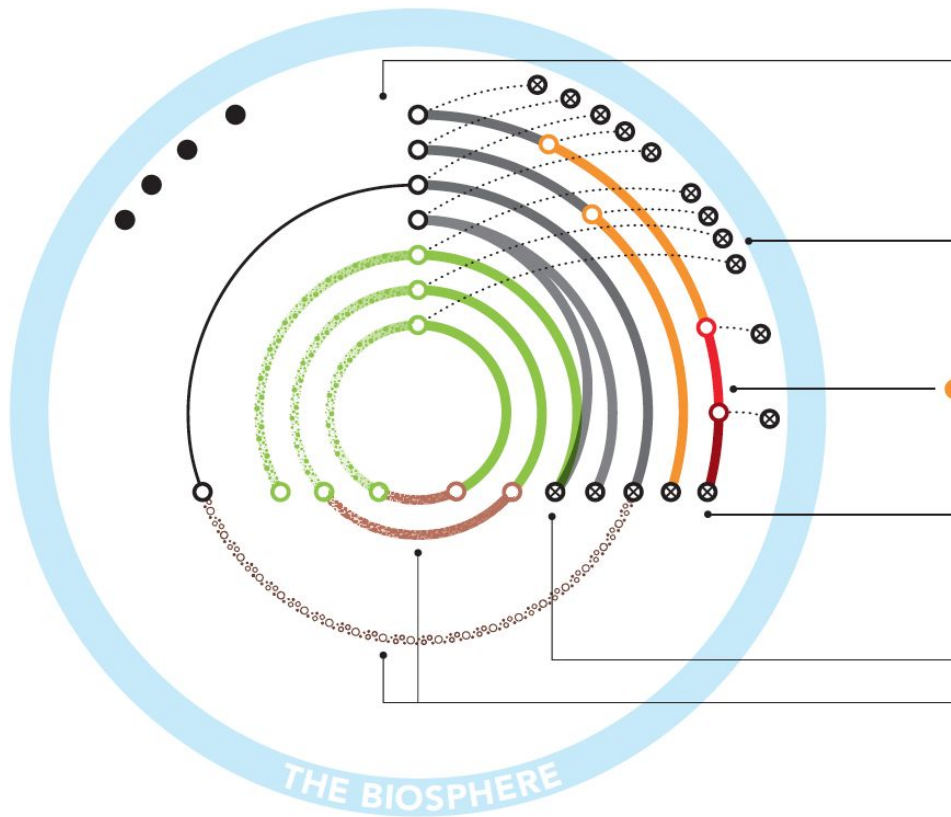
- Clothing made from recycled polyester terephthalate (rPET) still contains toxic chemicals not meant to go next to human skin.
- rPET is lower quality and degrades over time.
  - “Perpetual plastic” is a false narrative
- rPET is still plastic and shed microfibers pose a huge threat to marine ecosystems.
- Plastics/clothing collection at scale and mechanical sorting of textiles are both challenging

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Nature doesn't sort; it disperses.

# Current Fashion System



Fashion industry material flows lack equilibrium in several important ways:

## Raw Materials

60% of textile fibers are synthetics derived from petrochemicals. Processing is powered primarily by fossil fuels that release greenhouse gas pollution.

## Consumption

Includes the first use of clothing plus reuse, remanufacturing, and recycling. Synthetic fibers (virgin and recycled) become waste, which accumulates in soil, air, and water as pollution.

## Waste and Recovery

Decomposers are mostly absent in this system. Blended fibers prevent recovery. Composting and thermal energy recovery are rare exceptions that return materials to basic building blocks.

# Moving to a Regenerative System

1. Regenerative farm and fiber systems
2. Cellulosic feedstocks, including agricultural waste
3. Fermentation

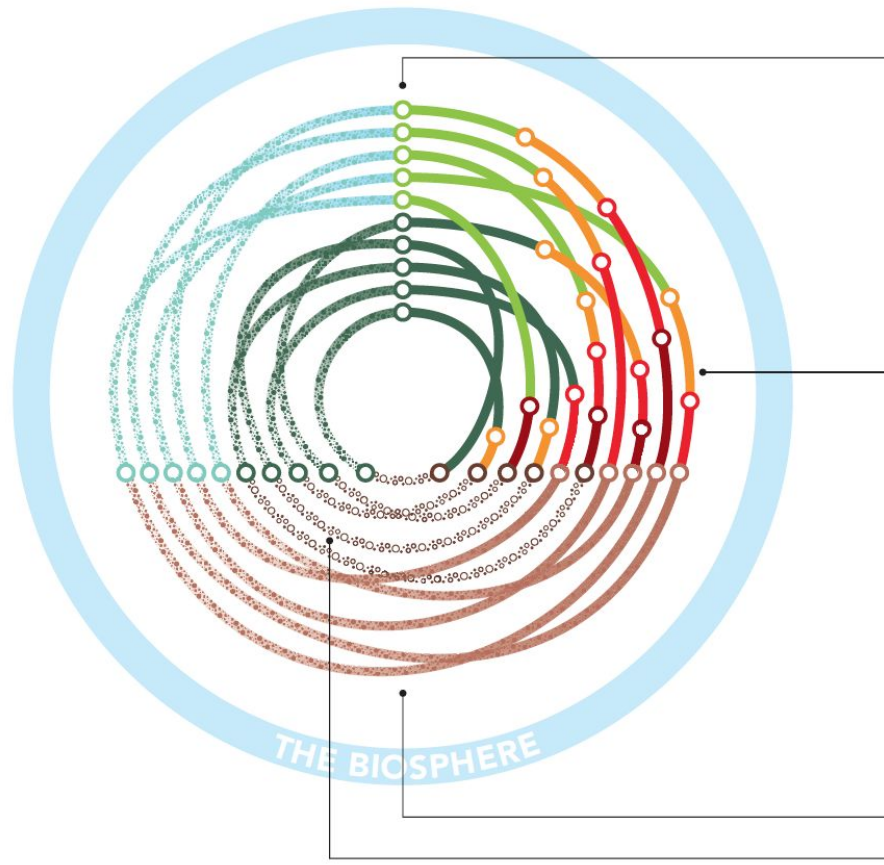
Cleaning up

4. Chemical recycling
5. Gasification + fermentation





# Biomimetic Fashion System



We can design a biomimetic flow of energy and materials through industry:

## Primary Production

Diverse feedstocks replace petroleum.

- Green dots: Fibercrops combine with biosynthetics made via fermentation, all powered by renewable energy.
- Yellow dots: energy.

## Consumption

Materials are bio-available and recyclable.

- Orange dots: Reuse, remanufacturing and recycling capture the full value of materials and slow the outflows to avoid overloading local recovery infrastructure. Processing is powered by renewable energy.
- Red dots: Reuse, remanufacturing and recycling capture the full value of materials and slow the outflows to avoid overloading local recovery infrastructure. Processing is powered by renewable energy.

## Decomposition

Recovery is distributed and scalable to match the global fashion economy, returning all textiles to their basic building blocks.

Robust compost systems are supported by chemical recycling and gasification.



# Levers for Change

## 1. Invest in local cycles

- Repair and upgrade equipment
- Catalog regional waste streams
- Create industrial symbioses
- Send the pattern, not the clothes
- Focus on the whole value chain

## 2. Build regenerative agricultural cycles

- Conservation pays
- Cluster fiber research and demand
- Fund new research
- Create new funding vehicles

## 3. Incentivize creation of new biomaterials

- Biomimetic biomaterials
- "ComPost Modern" design challenge
- Advance the knowledge commons

# Let's Talk

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