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Home
Current Issue
Archive
Forum
Site Guide
Feedback
Subscribe
Search

Browse >>
Books & Critics
Fiction
Food
Foreign Affairs
Language
Poetry Pages
Politics & Society
Science & Technology
Travel & Pursuits

Send this page to a friend

Return to the Table of Contents.

(*The online version of this article appears in three parts. Click here to go to part one. Click here to go to part three.*)

A Retroactive Design

MANY of the basic intentions behind the Industrial Revolution were good ones, which most of us would probably like to see carried out today: to bring more goods and services to larger numbers of people, to raise standards of living, and to give people more choice and opportunity, among others. But there were crucial omissions. Perpetuating the diversity and vitality of forests, rivers, oceans, air, soil, and animals was not part of the agenda.

If someone were to present the Industrial Revolution as a retroactive design assignment, it might sound like this:

Design a system of production that

* puts billions of pounds of toxic

material into< the air, water, and soil every year

* measures prosperity by activity, not legacy

* requires thousands of complex regulations to keep people and natural systems from being poisoned too quickly

* produces materials so dangerous that they will require constant vigilance from future generations

* results in gigantic amounts of waste

* puts valuable materials in holes all over the planet, where they can never be retrieved

* erodes the diversity of biological species and cultural practices

Eco-efficiency instead

* releases *fewer* pounds of toxic material into the air, water, and soil every year

* measures prosperity by *less* activity

* *meets or exceeds* the stipulations of thousands of complex regulations that aim to keep people

and natural systems from being poisoned too quickly

* produces *fewer* dangerous materials that will require constant vigilance from future generations

* results in *smaller* amounts of waste

* puts *fewer* valuable materials in holes all over the planet, where they can never be retrieved

* standardizes and homogenizes biological species and cultural practices

Plainly put, eco-efficiency aspires to make the old, destructive system less so. But its goals, however admirable, are fatally limited.

Reduction, reuse, and recycling slow down the rates of contamination and depletion but do not stop these processes. Much recycling, for instance, is what we call "downcycling," because it reduces the quality of a material over time. When plastic other than that found in such products as soda and water bottles is recycled, it is often mixed with different plastics to produce a hybrid of lower quality, which is then molded into something amorphous and cheap, such as park benches or speed bumps. The original high-quality material is not retrieved, and it eventually ends up in landfills or incinerators.

The well-intended, creative use of recycled materials for new products can be misguided. For example, people may feel that they are making an ecologically sound choice by buying and wearing clothing made of fibers from recycled plastic bottles. But the fibers from plastic bottles were not specifically designed to be next to human skin. Blindly adopting superficial "environmental" approaches without fully understanding their effects can be no better than doing nothing.

Recycling is more expensive for communities than it needs to be, partly because traditional recycling tries to force materials into more lifetimes than they were designed for -- a complicated and messy conversion, and one that itself expends energy and resources. Very few objects of modern consumption were designed with recycling in mind. If the process is truly to save money and materials, products must be designed from the very beginning to be recycled or even "upcycled" -- a term we use to describe the return to industrial systems of materials with improved, rather than degraded, quality.

The reduction of potentially harmful emissions and wastes is another goal of eco-efficiency. But current studies are beginning to raise concern that even tiny amounts of dangerous emissions can have disastrous effects on biological systems over time. This is a particular concern in the case of endocrine disrupters -- industrial chemicals in a variety of modern plastics and consumer goods which appear to mimic hormones and connect with receptors in human beings and other organisms. Theo Colborn, Dianne Dumanoski, and John Peterson Myers, the authors of *Our Stolen Future* (1996), a groundbreaking study on certain synthetic chemicals and the environment, assert that "astoundingly small quantities of these hormonally active compounds can wreak all manner of biological havoc, particularly in those exposed in the womb."

On another front, new research on particulates -- microscopic particles released during incineration and combustion processes, such as those in power plants and automobiles -- shows that they can lodge in and damage the lungs, especially in children and the elderly. A 1995 Harvard study found that as many as 100,000 people die annually as a result of these tiny particles. Although regulations for smaller particles are in place, implementation does not have to begin until 2005. Real change would be not regulating the release of particles but attempting to eliminate dangerous emissions altogether -- by design.

Applying Nature's Cycles to Industry

PRODUCE more with less," "Minimize waste," "Reduce," and similar dictates advance the notion of a world of limits -- one whose carrying capacity is strained by burgeoning populations and exploding production and consumption. Eco-efficiency tells us to restrict industry and curtail growth -- to try to limit the creativity and productiveness of humankind. But the idea that the natural world is inevitably destroyed by human industry, or that excessive demand for goods and services causes environmental ills, is a simplification. Nature -- highly industrious, astonishingly productive and creative, even "wasteful" -- is not efficient but *effective*.

Consider the cherry tree. It makes thousands of blossoms just so that another tree might germinate, take root, and grow. Who would notice piles of cherry blossoms littering the ground in the spring and think, "How inefficient and wasteful"? The tree's abundance is useful and safe. After falling to the ground, the blossoms return to the soil and become nutrients for the surrounding environment. Every last particle contributes in some way to the health of a thriving ecosystem. "Waste equals food" -- the first principle of the

Next Industrial Revolution.

The cherry tree is just one example of nature's industry, which operates according to cycles of nutrients and metabolisms. This cyclical system is powered by the sun and constantly adapts to local circumstances. Waste that stays waste does not exist.

Human industry, on the other hand, is severely limited. It follows a one-way, linear, cradle-to-grave manufacturing line in which things are created and eventually discarded, usually in an incinerator or a landfill. Unlike the waste from nature's work, the waste from human industry is not "food" at all. In fact, it is often poison. Thus the two conflicting systems: a pile of cherry blossoms and a heap of toxic junk in a landfill.

But there is an alternative -- one that will allow both business and nature to be fecund and productive. This alternative is what we call "eco-effectiveness." Our concept of eco-effectiveness leads to human industry that is regenerative rather than depletive. It involves the design of things that celebrate interdependence with other living systems. From an industrial-design perspective, it means products that work within cradle-to-cradle life cycles rather than cradle-to-grave ones.

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Illustrations by Brian Cronin

The Atlantic Monthly*; October 1998; The NEXT Industrial Revolution; Volume 282, No. 4; pages 82 - 92.*

Home | Atlantic Unbound | The Atlantic Monthly | Post & Riposte | Atlantic Store | Search