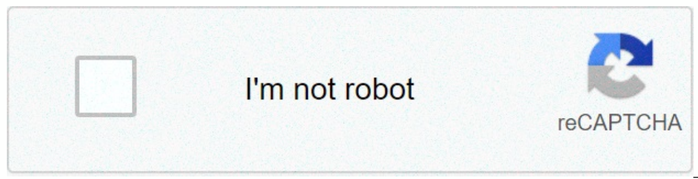

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Waste equals food system

What's the difference between a flower and a t-shirt? You might think that a flower grows in the ground, and a t-shirt is something you wear. Or that a flower is something that is planted, while a shirt is made in a factory. You're right, but there's another important difference between flowers and t-shirts: a flower is made of biological nutrients, while a t-shirt is created from technical nutrients. This week I read chapter five of Cradle to Cradle: Remaking the Way we Make Things by William McDonough and Michael Braungart. Titled Waste Equals Food, this chapter introduces the concepts of biological and technical nutrients and argues that a shift in industrial infrastructure and nutrient flows could eliminate the idea of waste from society. What is a biological nutrient? Biological nutrients are anything natural that biodegrades- think of a leaf, a tree or any compound material. This material contributes to the biosphere and is designed to return to the biological cycle. Biological nutrients consist of elements such as carbon, hydrogen, oxygen and nitrogen. What is a technical nutrient? Technical nutrients are the opposite of biological nutrients. They're not natural- rather, they're man-made. This material contributes to the technosphere, which are the systems of industrial processes. McDonough and Braungart distinguish between biological and technical nutrients because these materials are used and discarded differently. While biological nutrients can be reinstated in the environment and biodegraded, technical nutrients require processes that need to be reused. An intermediary between biological and technical nutrients are monstrous hybrids. Products made from both biological and technical nutrients are almost impossible to reuse or recycle. For example, a leather shoe contains many materials, from chrome to rubber. These materials, whether biological or technical, are lost when a leather shoe is discarded. A leather shoe is therefore a monstrous hybrid, because the combination of these materials prevents them from being recovered and reused. McDonough and Braungart see a world that distinguishes between biological and technical nutrients and uses both in product cycles. In this new economy, 'waste' in the form of garbage or used products would be 'food' for the production of new goods. This way, waste equals food, and materials flow through a continuous cycle. The diagram below shows what a society that maximizes both biological and technical nutrient flows can look like. On the left, biological nutrients are used and regenered, and on the right, technical nutrients are used, collected and reused. Graphic of the Ellen MacArthur Foundation McDonough and Braungart care several ways in order to eliminate the creation of waste and a society is wasting. First, industrial products need to be designed to maintain their quality to be used multiple times. For example, many valuable materials, such as copper, go into creating a car. If nutrient flow is considered in the design process of a car, these materials can be used again and their quality will be maintained for future uses. Next, McDonough and Braungart suggest that products conceive as a product of service. Rather than treating consumer goods as something to be bought, owned and discarded, these goods can be reconciled as a service. Consumers will buy a product to use for a defined period of time. When they're done using that good, the manufacturer will take back the good and rethink the materials for new products. These products will necessarily be designed to be disassembled and durable. Lastly, McDonough and Braungart consider the problem of unremarkable, products that don't fit into biological or technical nutrient flows because they are dangerous. Until this material can be degregated or no longer necessary, they can be stored in secure repositories or removed from the waste stream. What are your thoughts on biological and technical nutrients? Can equal food waste in our society? Do you have any zero waste questions? Let me know in the comments below! I am Alexa, the founder and editor of novel Hand. I graduated from Vanderbilt University with degrees in Political Science, Economics and Spanish. During college, I intern at nonprofits like International Justice Mission. Nothing is more important to me than Jesus and my family, although I love coffee. I run a lot (this summer I ran my first marathon). At Novel Hand, I am specifically interested in learning about topics related to justice and poverty, and how to create equitable, sustainable impact. You can reach me at novelhandco@gmail.com or connect with me on LinkedIn. I'm going to talk about design today because I'm a designer. And there's an old joke that when all you have is a hammer, everything starts to look like a nail. Well, if designer everything seems like a design problem to me, so today I want to talk about design and design problems. And I'd love to be a little assertive and maybe break some new ground here. I'd like to look at redesigning design myself. It's interesting that I come now from Charlottesville, Virginia, where I live in a home designed by Thomas Jefferson because we often get to think about Mr. Jefferson at the University, as we call it. I think that he saw himself as a designer, too. All you have to do is look at his tombstone, which he designed, and what three things noticed on it. That says Thomas Jefferson. Author of the Declaration of Independence. Author of the Statute of Religious Freedom for the state of Virginia. Which has matured into the Bill of Rights. And And And of the University of Virginia. Notice that he's just recording his legacy, not his activity. No mention of being president, secretary of state, governor of Virginia, minister of France twice. Simply recording legacy rather than activity. And as we see that from a design perspective, we realize that when the Exxon Valdez disaster occurred, the GNP meters from Prince William Sound went up because there were so many people there cleaning up. As long as our measuring system simply measures our activity and not our legacy, the instructions to our design, which I see as the First signal of human intence, are not necessarily the right signals. So I'd like us to consider a series of what I call Retrospective Design Commands because I'm going to position that all the people in this room are designers too, because you all have intentions, you all put them in the game. And I'd like to give us some retrosting design assignments. But the two I want to float before I go into the body of the talk are: How can you love all the children? Not just your kids, or from the kids, but all the kids when you make a design decision. And as an architect, I also have to ask this question, Why can't I design a building just like a tree? If Jefferson were a designer, what would be the design assignment of the Declaration of Independence? Can you author a document asking for life, freedom and the pursuit of happiness free of remote tyranny? That would be the retrosting design assignment of the Declaration of Independence. In Jefferson's time, remote tyranny would be represented by a person, George III, for example. Someone who didn't understand local conditions and made decisions that were untenable. Remote tyranny. I would posing that if [someone like] Thomas Jefferson came back today, she would come back and ask for statements of Interdependence. And the problem would be the same. How can we have life, freedom and the pursuit of happiness? Can you imagine our current Congress using the word happiness in a bill? Life, freedom and the pursuit of happiness free of what I call intergenerational remote tyranny. Because from a design perspective, I think we have a problem in the way we take, the way we make, and the way we use things. I think Jefferson understands this concept of intergenerational remote tyranny. In fact, I know he did, because in 1789 he wrote a letter to James Madison. In it, he said, The earth belongs to the living. No person by natural law may oblige the lands he owns or occupies to debt greater than those that may be paid during his own lifetime. For if he could, then the world would belong to the dead and not to the living. The world would belong to the dead. Oren Lyons, head of Onondaga people, told me that Benjamin Franklin had spoken Mohawk. Jefferson studied the Iroquois Confederacy, and the Iroquois Iroquois were brought together by their Great Peacemaker. And their Great Peacemaker instructed its chiefs that they should make all decisions on behalf of their seventh generation, even if it required them to have skin as thick as the bark of a pine. I think it's clear that Jefferson wrote the Declaration of Independence for his seventh generation, because it's interesting to note that the people sitting in this room are Thomas Jefferson's seventh generation. We're that. So it's our turn to write statements of interdependence for our seventh generation. The founding father, in all their wisdom and acuteity, would never have given an individual, a company or a government, the right to slowly poison the planet and kill children. When did we think we had a right to do so? It would never have been placed in the Bill of Rights because they would never have imagined that we would even think of doing something like that. Thomas Jefferson lived in a world that was solar powered. Oil has not yet been discovered. So, we need a retrosting design assignment, and we need to look at some new designs based on ethics based on ethical principles. It's all about doing good business. Because we need to separate the moral dimension, I think, from our fundamental engine of change, which is trade itself. But before I get into the relationship of commerce and design, I'd like you to think about a design assignment for me while I'm going into this. And I want you to consider whether it's an ethical assignment or not. Am I asking you to do something that is ethical? Can you design an industrial system for this country that produces billions of pounds of highly hazardous toxic materials and puts it in your soil, your air and your water every year? Can you design a system of production that measures productivity by how few people work? Does prosperity measure by how much of your natural capital you can cut down, dig, bury, burn and otherwise destroy? Measures progress through your number of smoke bags and, if you're particularly proud of them, put your name on them? Do thousands of complex regulations require you to stop each other from killing each other too quickly? And while you're at it, do a few items produce so highly toxic that they'll need thousands of generations to maintain constant vigilance while living in fear? Can you do it? Is this an ethical assignment? If design is a signal of human intence, who designed it? Do we intend to happen? I don't think so. I don't think that's the result of design. This is a result of thousands of, millions of small decisions based on fundamental self-interests that analysed in a retrospering design command that is obviously questionable from an ethical perspective. So, let's give ourselves a new set of design assignments. Wouldn't it be great if we could design things that weren't dangerous materials placed in our soil, our air and our water? Wouldn't it be great to measure productivity by how many people work? Prosperity by how much natural capital and solar income we can ad chance and be put into closed cycles of investment for future generations? To gauge our progress by how many buildings have no pipes? Wouldn't it be great if we didn't need regulations at all because we're not trying to kill each other? If we didn't yield anything leading to intergenerational remote tyranny?

Basically, we've seen capitalism, socialism and all the dialogue from where we're in between. And we saw that socialism certainly wasn't good for the environment. Russia's chief scientist has declared that 16 percent of russian land mass is uninhabitable. We see that pure capitalism is not good for the environment because its interest is too isolated. What was missing is what chemist Michael Braungart and I call ecologist. We didn't take into account the environment in that dialogue. We have three points to be accommodated: economics, equity and ecology. But an ideologue response would be just as dangerous as a purely capitalist or a purely socialist response. Any ism is dangerous. The Germans have an example of this. Watch an ideologue response from an industrial perspective as a design failure. Check out this slide. They set up a new recycling system for waste you probably heard: the takeback law in Germany. If you make something, you should be able to take it back. And they went to the Tetrapak Company, the people who make juice boxes, those small packages made of plastic, paper and aluminum. And they said, You have to recycle. Ecologism. You have to recycle. And so Tetrapak spent $2 billion building recycling plants to recycle those packages. It costs them three and a half times as much to reclaim one of them as it costs to make one. And what do we get from these recycled packages? We get flower pots, park benches and building materials. I don't want plastic and aluminum in my walls. Why do we take what we would call technical nutrients and bury them in our buildings? The problem is that the package was never designed to be recycled. It's too aggressive a response, to make people reclaim something that's never designed to be recycled. We must therefore be careful to balance these three issues of ecology, equity and economics without being extreme in any position. If we're going to need a new design assignment, we'd better figure out how to work within the natural world we inhabit. I was asked by the city of Hannover, Germany in 1991 to write the design principles for the World's Fair for the year 2000. They're called The Hannover Principles and we can get copies for you if you want them. In it, we explore the issue of relationship between humanity, nature and technology, the of the World's Fair. The first question is, What is nature? And as we go back into history, can we see Emerson effectively asking the question in 1836: If humans are natural, is therefore everything that is natural by humans? And his conclusion was that nature is all those things that are immutable, things that are too great for people to influence, in his words, the oceans, the mountains and the leaves. I think Thoreau understands, and we understand now, that we can indeed affect the oceans. Just ask Jacques Cousteau. Indeed, we can influence the mountains. Just look around. And we can indeed affect the leaves. Go to the Adirondacks. And so we realize we may have been given some kind of rule over nature. There was a debate about how sad it was that Genesis talks about God giving people dominion over the world. And people ask, Isn't it too bad that it wasn't stewardship? Well, I'll have to posit, isn't stewardship implicit within rule? Because how can you have dominance over something you killed? And ultimately, the question is perhaps the Native American question, which isn't really even stewardship because it's still anthropocentric. Perhaps the question is, how do we find ourselves in kinship with nature? How do we find ourselves as part of nature? How do we find a rightful, meaningful place within nature? What is designed? If design is the first signal of int intention, what is our intention? What designs do we have? Let's look again at Emerson in the 1830s. He went to Europe after his wife died, and he went over on a sailboat and returned in a steamer. Now let's abstract it for fun. He went over on his solar recyclable crafts operated by craftsmans practicing ancient arts in the open air. And he returned in a steel rust bucket, put oil on the water, smoke in the air, operated by people living in the darkness, pushing fossil fuels into the mouth of a kettle. These are designs. And guess what? We're still designing steam ships. We are currently in a steamer. The sun is shining out there and we're here, producing nuclear isotopes, carbon dioxide, chewing rivers. And we sit in the dark for all intences and purposes. So from a design perspective we're still in the dark, pushing fossil fuels into the mouth of a kettle. We need a new design. Who's going to do it? We. All of us. We're all designers here. Peter Senge at the Sloan School of Management at MIT has something called a learning lab where they study how organizations learn how to learn. And within that he has a leadership lab where they bring heads, chairs and so on, and his first question is to them, Who is the leader on a ship that crosses the sea? Everyone comes back with captain, navigator, helmetsman, chef. And he says, No. The leader on a ship is the designer of the ship. you can be the best in the world, but if the ship isn't designed to be seaworthy, and you get caught up in a storm, you go down. His point is for leaders to become designers. Designers need to become leaders. What I'm talking about here, I'm going to be a little aggressive. I'm not talking about eco-efficiency. The thing that separates me, I think, from all my colleagues is that I'm actually not that interested in eco-efficiency. I think eco-efficiency is great and it's very important, but ultimately I focus on the design assignment. And so I'll be a little strict about this. Looking at the development of species, we realize that nature is not effective. Everyone talks about how we should model ourselves on nature because it's so efficient. I'm even written up as a person who models his designs on the efficiency of natural systems. But nature is not efficient. Nature is effective. I took a walk this morning with Dave Crockett on your fairgrounds here and we walked through a cherry tree in full bloom. And I thought about it and I said, I'm going to talk about this tree this morning. I don't look at that tree and wait my finger and say, Son, are you ineffective. Look at all those cherry blossoms. You know, How much does it take? The thing that's nice about nature is that it's safe. We don't care if there are much more blossoms than necessary. Nature abounds. Nature celebrates itself. Nature is beautiful because it is effective, not efficient. But everything it makes is safe and it returns to the ground. It returns to natural cycles, so, we're not afraid of it. People try so hard to be efficient because the stuff we make is typically so dangerous, you have to be efficient about making it. Look at all the men in this room. A hundred million sperm in each of you, just in case a few of them get lucky. You're not very efficient. So I'd rather celebrate the world as a world of abundance, rather than a world full of limits. When I gave the closing address to EPA, for their 33/50 program on voluntary toxic reductions, I stood there with some of our customers. And they have awards for 90 percent reduction of toxins over five years, for example. And I said, The only problem with this from a design perspective is that we have Zeno's Paradox here. Zeno's Paradox is about the fact that an arrow heading for a target can always be seen as halfway there. You can always say, Stop. Freeze frame. The arrow could be halfway to its target at any given moment. So it never gets there. That's the paradox. Because it can always be seen as halfway at some point in time. In a way, eco-efficiency has a similarly built-in paradox. Because now that you have your reduction by 90 percent, guess what? You did new 100 percent. You're never going to reach your target. At the same time, we're starting to see EPA change regulations to start focusing on safe levels for children instead of adults because children are not small adults. They have different surface to volume ratios. They pick up by their mouths and not their noses. Things get directly to their lungs without being filtered, and so on. And suddenly we also realize that microscopic particles of man-made materials now cause questionable effects in our endocrine systems; that parts per billion, even parts per trillion can seemingly cause infinite amounts of these things serious problems. And so the question has to be, Why do we make these things in the first place? Can't we really redesign? I like to use Dave Crockett's managery analogy to lighten this point. When I leave Charlottesville, I can head north to Washington or I can go south to Lynchburg. If I find myself going 100 miles per hour toward Washington, but I'm supposed to go to Lynchburg, it's no help for me to slow down to 20 miles per hour. Because I'll still be going in the wrong direction. I have to turn around. What I would like to do is talk about that turning around. I also want to look at the issues of energy en masse. Remember Einstein's equation had two sides: E = mc2. I think we're going to solve the energy problem because we do have current solar income. I don't think we're going to solve the mass problem: the problem of losing genetic information and the problem of persistent toxication. There are 500 man-made chemicals that nature has never seen before that are in our fatty tissues and in the adipose tissue of animals across the planet, including Antarctica. It's something we won't be able to change, certainly not within thousands of lifestyles. It's persistent. It's pernicious. It's bioacumulating. And we're doing a mass experiment that we have no idea how to stop. If we were going to need design principles, what would be the retrospective design principle of the first industrial revolution? The only one I could find out is that, if brute force doesn't work, you don't use enough of it. That seems to be about it. In architecture, we design the same building in Reykjavik and Rangoon. We heat one up; we cool the other one. If you're not hot enough, add energy. If you're not cold enough, add energy. One size fits all. If brute force doesn't work, you don't use enough of it. We need some richer design principles. I use three in my work. And they are waste equal to food, use current solar income, and respect diversity. Waste equals food. I have this term and also use the term cradle-to-cradle to describe the way we design with the life cycle in mind. And the life cycle is not what Michael Braungart and I characterized as down cycling. It's real Right now, we're making park benches out of our plastic. That's good news for the homeless. That's bad news for the rest of us. We figured out currently makes about 83 park benches per capita. It's off cycling. It's not recycling. It takes valuable technical material and sends it to the landfill site as they stop as a park bench on their way there. We need to design for true recycling, so that waste equals food. Use current solar revenue. Nature does not mine the past; it doesn't borrow from the future. It uses current income. So should we. You'll see that all our buildings are daylit. Respect diversity. Look at the people in this room. No two people are the same. No two places in the world are the same. No two cultural flows, spiritual flows, materials flowing, energy flows are the same everywhere. Why do we design one size fits all? Why can't we design working with local conditions, working with local culture, and four natural energy and material flows? Well, if waste equals food, then there is no such thing as waste. If there is no such thing as waste, and everything is food, then food is nutrients and therefore they are nutrients from metabolisms. And so what are the metabolisms we work with? I mentioned I work with a chemist named Michael Braungart. We started a company called McDonough Braungart Design Chemistry, and we design processes and systems for industries. We currently operate with a whole raft of industries, with large corporations. It's not marginal. It's a big business. We say there are two fundamental metabolisms. There is the organic one, the one in which we physically inhabit and live, the world of nature. The other we call the technical metabolism. This is the metabolism of human industry. We need to design things to go in either the organic cycle or the technical cycle, and we shouldn't design anything else. Everything else we would call an imperceptible because it can't return to these cycles. See what happens when you start designing like this. I'll go through some projects to explain what's happening. There are two characteristics you need to know. One is that if you end up with what we call a product of consumption the thing truly consumes. That means it goes to an organic cycle. Let's look at this idea of consumers for a moment. I went to the United States from the Far East, and I spent my childhood summers in the Puget Sound. My dad is from Washington. But I always came here from Hong Kong, and I was always surprised that in America we stopped being people with lives at some point and we became consumers with lifestyles. When did this happen? Even on television, they talk about consumers doing it and consumers that. How do you consume a TV set? If I had a television set in this podium and I said, I have this amazing object, it provides an amazing service. But before I tell you what it does, let me tell you what it You tell me if you want it in your home. That's 4,360 chemicals. It has large amounts of quantities heavy metals. It has an explosive glass tube. And we think you ought to put it eye level with your kids and encourage them to play with it. Want it in your house? Why are we people selling hazardous waste? Future generations will look back and say, What have you done with all those valuable technical nutrients? The chrome, the antimony, the mercury, the lead? Why did you take all this material and then spread them in small holes across the planet so we'll never be able to get them back, while persistently covering the Earth's surface? What did you think? What was your design intent? And so we advise people to design things to safely go back to ground with no mutate, no carcinogens, no heavy metals, no persistent toxins, no bioacultulative substances, no endocrine disruptors. Otherwise, design things to be what we call Products of Service. Something designed to provide you with a service, like a television set. But when you finish it, you've effectively leased it from the manufacturer, and it goes back to them because it's now designed to become a TV again, forever. And so our customers include companies that make televisions, computers, cars, shoes, carpets, fabrics. And we design all these products so they'll go back to the industries from where they came, so that waste equals food. Whose food is this waste? It's the food of the electronics industry, in the case of a TV set. It's the food of an automotive industry in the case of a car. Amazing things start happening with the design as soon as you tackle this protocol. We also need to enrich our criteria. Typically, the design criteria we've all used are cost, performance, and aesthetics. Can I afford it? Does it work? Do I like it? Or in architecture school, we reverse it. We do aesthetics, performance and cost. But it doesn't matter. Still the same three. We need to enrich this by adding three new ones. Is it ecologically intelligent? Is it just? And is it fun? And now I want to show you some projects quickly. And we'll discuss them in terms of their ecological intelligence, their fairness and their fun. (Show slides.) It's a substance. We were asked by DesignTex, part of the Steelcase Corporation, the largest manufacturer of office furniture in America, to design a new fabric for furniture alongside Richard Meier, Aldo Rossi of Italy, Robert Venturi, Denise Scott Brown - some very famous architects, known for their design. We were honored to be in that company, but we said, We're not only going to have to design what it looks like, but also what it's like. And their director said, yes, we thought you'd say something like that and we're delighted with the prospect. So we've already figured it out for you to help move it along. And we're going to propose mixing cotton, which is natural, with PET out recycled. And that way we have naturally and recycled. We have all the buzzwords. It's cheap. It's durable. It works great. What do you think? What do you think? Is it a good product? Is this something we have to make? Based on our criteria, is it an organic nutrient? Is it safely going back to ground? Not with the PET. Is it going to go back to technical cycles? Not with the cotton. Isn't that interesting? A product that should not be made. How many times have you heard this? Can you imagine people sitting around the room going on, Oh, well, there's another one we shouldn't make? Wouldn't it be great if this kind of discussion was going on with genetic engineering? Some magicians sitting there saying, Gee, we could cross the animal kingdom with the plant kingdom. God never tried it. But maybe we could. Wouldn't it be nice if someone was sitting in the room saying, Somehow I don't think we should try that one. Because we don't know what that's going to mean. And they call this science? You do the experiment, release it into the world, then you watch what happens and talk about it. Remember PCBs and CFCs? Amazing! It's actually primitive science, a non-ecologically intelligent product design. Let's look at it from a deeper perspective. Cotton requires more than 20 percent of the world's pesticide use. This causes hydrical disasters. Goodbye Aral Sea. And it has never been associated with social fairness. PET is a petrochemical full of antioxidants, UV stabilizers, plasticizers, antimony remains of catalytic reactions. It is not designed to be next to human skin. Why would I want to put these two things together? So, for DesignTex, we decided to do an organic nutrient, a substance we did in Switzerland on the most advanced mill there. They try to be an eco-mill, do their eco-efficiency reductions, try to get their cadmium levels down to thresholds and so on and so forth. I spoke to the president and I said, Wouldn't it be great if waste equals food? The previous week, the trimmings of its bolts of cloth were declared by the Swiss government to be hazardous waste. They could not be buried or burned in Switzerland. He had to export them to Spain. Now we've hit the wall of the first industrial revolution when trimming your product is declared hazardous waste, but you can sell what's in the middle. You don't have to be Einstein to work out what it is you're selling. The most eco-efficient thing he could have done is sell the product unsatisfied. Because the customers are going to cut it up anyway. So he realized what his problem was. I said, Wouldn't it be great if trimming your bolts of cloth compost for the local 2006? So let's design it. And he did a magnificent job. Over the course of a year, we've developed a substance based on the idea that people should sit and be warm in winter, cool in summer. Our Our a substance using wool, which is an absorbing it absorbs 30 percent of its volume in water and ramie, which is a nettle family plant of the Philippines, grown organically. And the wool is of happy sheep in New Zealand. We designed it based on an interview with people in wheelchairs because we considered that the worst sitting, and it turned out that their biggest problem is moisture buildup. So we designed a fabric that absorbs moisture and then washs it away. It is a structural fiber stronger than steel in tension when wet. It absorbs the water and then evils it away. After we did, we had the process. But now we had to make it beautiful and make the colors and so on. And we said, the filters of the future, our design filters, we're not going to put them on the tips of pipes and chimneys. We're going to put filters in our heads. More intelligence. Fewer things. And the filter is this: no mutate, no carcinogenic, no heavy metals, no persistent toxins, no bioacumulatives, gene endocrine disputes. We went to 60 chemical companies in Europe and said, Who wants to put their products through our filter? Within three days, they locked us up. It was amazing how quickly they talked to each other. Everybody went around, Are you going to do it? No no. Are you going to do that? No no no. Three days. Sorry. No one would do that. So we went to Ciba Geigy in Basel, and we explained our idea. Michael Braungart and his team looked at 8,000 chemicals in the textile industry and with that filter had to eliminate 7,962. We were left with 38 chemicals out of 8,000. We have the whole fabric line with only those 38 chemicals. It won gold medals. It's in the market. It's a huge success. It exists, therefore it is possible. The ironic part was that we had every color we wanted except black. Remember Henry Ford's first industrial revolution, You can have any color you want as long as it's black? Now you can use any color you like as long as it's NOT black. (We've figured out black ever since.) But the part that's really exciting to me from a design perspective is that after the substance was in production, the factory's director called me and said, Listen. You need to know what happened when we ran your protocol. The Swiss inspectors have come to test the water if they are required to do legally every day. And they thought their equipment had broken. They checked the water coming into the plant and, sure enough, the equipment was fine. It was Swiss drinking water. It turns out that the materials are filtering the water. The water coming out of the factory was as clean as the water going in. The implications of this are astonishing when your effluent is as clean as your flu, which is Swiss drinking water. You can then use your effluent for process. And what happens then? You chop the pipe. That's what the mill is going to do now. Do. will be no effluent from this factory. There will be nothing to regulate. Nothing to measure. Why? Because they're not trying to kill anyone. This substance is what we consider to be the flag of what Michael and our friend and collaborator, Paul Hawken, call the Next Industrial Revolution. We now apply these concepts to carpeting with Interface Inc. The idea is that they will take back carpets forever. We also work with the Herman Miller company. We have a new factory for them in Zeeland, Michigan. It's right next to a site with sculpted lawns and some Canadian geese and some pines and then a large metal building. There is a large dam with a pompfontein. We looked at it and said, Do an inventory of biodiversity. Two species of flora: pine and fescue. One species of fauna: Canadian geese, unloved. The grass was recaptured while it attempted to go to the seeds. It was really quite an ironic message when you think about it. We pump grass full of fertilizer and then hack it back every time it tries to grow. Then we poison it to make sure that nothing else can enjoy its presence. On our site, the water travels through swales across the site, so it produces absolutely no stormwater problems. It's called the roly poly site. We now have big blue reie nests, egrets and songbirds. We decided to measure our success with how many songbirds return to the site. It is made with local materials as much as possible. It's a factory for recycling furniture, forever. We have all engaged in the factory in the design of the building from day one. It was designed and built within 18 months, one week off schedule early. And that was exactly on the budget at the cent. That was ten percent more than a normal building: $48 a square foot instead of a metal Butler building, which is $44 a square foot in Michigan. We used all local materials, which have multiplier effects in the local economy. But the part that's really interesting is that we've created an urban situation in a sub-urban location. The bottom of the plan is where the offices are and the factory is in the back. And where they meet is a street, so people spend their day bumping into each other along a street. If someone wants to get a cup of coffee or have meetings or whatever, meet them on a street. We actually brought daylight into the building with glamour. We celebrate glamour. Engineers are always worried about these things. They say, No. We need to neutralize everything. So you end up with buildings with no windows. And we said, No. Let the employees control the shade. So the people on the factory lines have clickers and they can take aim at a window as the sun in their eyes. They can click, aim at it, and the shade comes down for half an hour. Then it goes back. They control it themselves. They never need to lights during the full daylight hours. We have Battelle National Laboratories analyzing this for productivity for a year before they moved. And they've been in for over a year now. The result is what we expected and we're very excited about it. But listen to this. A lot of people told us at the beginning that they didn't expect productivity improvement because this company was so spider. They thought it was already 95 percent productive. Well, they monitored it for a year and they seem to have increased productivity by more than one percent. [Lately I've been told overall productivity is over 20% in the company. W.M.] One per cent may not look like much, but if you make $250 million worth of furniture every year, and you pick up a one per cent productivity increase we know it's out of the building, and we know it's the daylight because it comes from the first two shifts, it didn't come out of night shifting. That increase is worth $2.5 million a year with the same employee cost. Amortize the extra profit with the financing and you can fund the building improvements soon. Someone at Herman Miller told me that William McDonough & Partners gave them the building as a gift. So when people tell us, How do you talk your customers into spending ten percent more?, we're not talking about changing some bulbs. The cost of the building is negligent next to the value of people. For example, people can see what they're doing. The roof has these monitors, so there's daylight everywhere. They can see what their work looks like. They can look under their bank when they drop something, and they feel like they've been doing their day outdoors. This slide is a competition we won for a corporate campus in San Bruno, California. We're a small firm: they called us the kids. We competed against the two largest companies in America, CAGE and Gensler, and we won. It was a fun competition because commissioning the chairman of the company was not a specific program, it was to design a concept for a building. Don't design a building. We didn't have to worry about where the bathrooms were. We had to design a concept for a building. This is the last green site in San Bruno, California. We decided we'd design the building from the sky, so a bird would look down and say, It's nice. The roof is grass. The roof is the oak savannah of the original landscape. And we saved all the vibrant oaks that were on site, each one, and then designed the building around them with these giant meadows. And we won the competition and made the design real, broke it into two stages. It will open this fall [1997]. It has an unproted thatched roof and daylight everywhere. The metaphor here is that the roof from the sky is earth. As for birds, nothing happened. There are no stormwater problems as a result of this building because it still absorbs and makes oxygen. The roof absorbs water and makes oxygen. But inside it's it giant unprofesed curve because we were able to use elevated floors for air and for computer access. And no one wants to pay for it - it costs more for elevated floors. But our idea was to use the raised floor to move air through the floor all night to cool the slabs of the building. So we actually use the nighttime coolness from San Francisco to cool the building. We get free cooling. We were able to cut the mechanical equipment by more than half and the energy bills by more than half. It paid for the raised floor and left the ceiling clean. People feel like they've been seeing their day outdoors. The whole building is daylit, so we don't add heat and then have to air condition it, which is what typically happens in office buildings today. This slide is the new Environment Study Center for Oberlin College in Ohio, and the question here is the one I put earlier: Why can't a building be like a tree? Let me give you the retrostrosting design command of a tree. Can you design something for me that provides water pure, habitat for hundreds of species, builds land, avalanches solar income as fuel, provides food and micro-climates, fixes oxygen, fixes nitrogen and successors carbon? Can you do it for me? How many buildings do you know that produce oxygen? Wouldn't it be amazing if we could design a building like a tree? Compared to a tree, our buildings are incredibly rude. That's what we do at Oberlin. We gave ourselves a design challenge with David Orr, the head of Environmental Studies there, to design a building that is a net energy exporter. The idea is, the building will produce more energy than it needs to operate and it becomes fecund and it gives something back. Because if sustainability is simply maintenance, if it's just going to be that edge between destruction and recovery, then all we give our kids as a legacy is maintenance. Ultimately, it's an impoverished agenda because it's like eco-efficiency. When I look at eco-efficiency as a design command, what would it be? I'll have to say, I wake up in the morning and feel really bad. I spend my day trying to feel better by being less bad and my goal is zero. Is it fun? I'd rather look at it and say, What does 100 percent look like sustainable? I'd rather wake up in the morning and say, I'm only 21 percent sustainable today. Tomorrow, I'd love to be 22. Because that means I'll have to think what 100 per cent looks like. That means I have to rethink the world. That we don't accept it as it is and just try to be less bad about it. We're actually positioning what 100 percent would look good like and get on that track. This slide shows an experimental project to articulate the concept of a building like a tree. On the north side there are offices. It is a thatched roof that can of the building. The large wing of a roof is south-facing; it has collectors; it has photovoltaics that produce as much energy as necessary to run the building and then some. On the south side, in the lobby at the bottom of the drawing, is a living machine designed by John Todd, a marine biologist. It is a botanical garden that purifies all the water waste from the building to drinking water standards. So the building actually purifies its own water and avalanche solar. It is fully daylit, and it has natural ventilation systems. We're working with Amory Lovins and his teams to develop energy systems that I think will surprise you. If you want to get in detail, I'd be happy to talk to you about them. This is a project we do in Indiana, outside gary and Chesterton, d Indiana. It's a new community on a square mile of land, an expansion of a small town. But the reason I want to show you this is that the real estate developer who did golf course developments prompted one of the biggest real estate advisers in the world to tell him what the future looked like before the curve. We were brought in to look at it. We spend a day with them. And a year later, they called up and said, Okay, let's do it. This slide shows what we got when we arrived. These are four-lane highways leading to arterials leading to subdivisions with cul-de-sacs the original plan. We transformed it into a pedestrian-oriented community. These are all neighborhoods with gardens, with parks. We redesign retail itself. We use the concept of distribution inherent in a Wal-Mart to solve the problem created by a Wal-Mart, basically let them do personal distribution to Mom and Pop stores within each neighborhood. So everyone will be able to walk to one of those little red corner stores and get what they need. The homes will be south-facing rooftops and the utility will rent their space and the entire town will be photovoltaic. It will be his own utility. The solar collectors will be provided as Products of Service by utility. In other words, people are not going to have to be asked to buy ugly blue rectangles of heavy metal combinations. They will be asked to rent their south-facing surfaces for energy and then some. We have a global positioning transit system. The transit vehicles will know where you are and will be able to pick you up and take you anywhere you want to go. We've even drawn horse-drawn carriages that will move here though, because $8 a day worth of oats is a lot cheaper than running off to Saudi Arabia. There are only 600 brooding few Percherons left, which is unfortunate, so we'll bring some of them back. There is a transit loop that moves through it and makes it very convenient. And the point here is that if you look at a young family in America trying to get a home, the cheapest thing they can afford now is a on the nearest acre at the edge. This is what cancer cancer as under a microscope if you look at it from the sky. What we realized is, it's not just our subdivisions, it's actually this creeping requirement of our people to go to affordable housing because that's all we offer. We need to spend more time with our kids. Remember that question: How do you love all the kids? By design. We force people into remote circumstances. All of a sudden, if there are two parents and children, you have to have two cars because you can't leave people isolated. The average car in America costs $7,000 a year. So it's $14,000 a year going into cars for that family. Both of those parents have to work, and one of them works for the cars because after taxing $14,000 is a living wage. What we're saying is, wouldn't it be great if that family didn't need two cars because of a transit system, and they could only have one car? What would be the implication? Free up $7,000 a year and see what it's worth. It's worth $70,000 worth of mortgage. So instead of someone stuck with a $50,000 double-wide on the fringe costing amazing services from the country and causing sprawling, they can live in a $120,000 home financed by they don't have to have that car, or the other person doesn't have to work. They could stay with the kids if they wanted to. All of a sudden we realise that our families can go back to families and not be chauffeurs or consumers of tires, petrol, cars, and so on. We study the prairie of Indiana and it turns out it's the roots of prairie grasses; they are up to 16 feet deep. It turned out the prairie was a giant sponge. There was no such thing as run-off. The upper Mississippi reach was all fed by groundwater. Thus, the entire community is designed to absorb water everywhere. There are no geutes. There are no concrete curves. The roads are all brick. They are 22 feet wide instead of 44 feet wide. And all the surfaces are designed to absorb water. (In our office, we see asphalt as two words assigning blame.) If we ask, Why can't a building be like a tree? We find ourselves doing amazing things and rediscovering the creative joys of design. I'll give you one quick example. On the Oberlin Building, when we first did the runs, it turned out that it was only 43 percent solar power. Amory and I asked, Where is all the energy used? Much of it was in the pumps that managed the system, because the south side of the building was used to heat the north side. Two ground-deepening heat pumps are connected, so they actually use the heat built up on the south to heat the north, etc. We looked at the pumps and said, What if we changed the way we designed? Most engineers sit and do the pipe diagram. They are trying to save materials and so will they say, is a half-inch pipe, that's it and that, and they add it all up. They find out what frictional loss is and then puts in a five horsepower pump to run the water through the system. We said, What if we reverse the design? What if we designed it from the pump? In other words, what if we designed for zero friction? What if all the pipes got bigger, because the real work is the sweat of the joints, etc. This is not the cost of the pipe; whether it's this big or that big is almost irrelevant in terms of overall cost. So we designed it without friction. The pump sizes dropped by 95 percent. Because what you realize is we're going to pay for those pumps in energy consumption over and over again. In fact, we're going to spend as much on energy as the pump costs in one year. What if we could actually design the system so that it was frictionless? There's a nice metaphor here. Let's remove stress. Let's get rid of friction. Let's let our systems get slack. Let's make them fun and friendly. All of a sudden you realize that the building can easily power itself because we've taken the stress out of the system. It would never have occurred to us doing that until we realized we only had this limited energy budget. This has forced us to rethink the way our systems design. So the essential questions are, Why can't a building be like a tree? In other words, why are we here in this steamer? And How can we love our children, all the children? When you ask yourself that question, interesting things happen with design. I will close with a story from Curitiba, Brazil. Jaime Lerner, the former mayor and now the governor of the state of Parana, was recently at the university for winning the Thomas Jefferson Medal in Architecture, the highest prize in architecture in the world, which we worry anyway. When Curitiba had a visit from the former mayor of Jerusalem, he told the mayor, Rafael Greco, at the time, Where's your library? They realized Curitiba doesn't have a library. Here's a city trying to keep up with expanding growth. They have gone from 600,000 to nearly two million since 1970. And they didn't have a library. So the consensus was, Oh, we have to do a library. Instead of doing what San Francisco did, a $150 million mausoleum for books at the Civic Center, was the question, How do you build a library and love all the kids? They realized that a central library wasn't going to be good for most of the kids because they wouldn't be able to get there, they wouldn't have time, they wouldn't have had money even though the transit system there is spectacular. So, the question has become, How do you build a library and do you love all the kids? What they finally did was get small libraries, the size of small build with a lighthouse in front called a beacon of knowledge. Volunteers sit about ten metres into this glass room and read books: a firefighter, teacher, parent or forester. They make sure all the kids safe because it is built within 12 minutes of walking distance of each child in the city. When kids get to this library, find this friendly little building, they find all the reference books they need for school. If they can't afford to buy the books they want to take home for school, they can pick up garbage on their way there and trade them for books. Every little child, even the barefoot one who comes from the hinterlands arriving in the city, is loved by the city. Jaime's point is that if we don't love the kids, how will they love the city? Every child in Curitiba gets access to the World Wide Web. How do we do here by comparison? It's supposed to be a Third World country. How do we love all our children? How do we love our seventh generation? How do we design things in such a way that when they look back at us from seven generations there, they realize that what we were doing was signaling a new intention based on new information we now have about the acts of human artifice. They will realize that at this point in history we have begun to imagine what it might be like to find a meaningful, rightful and responsible place within nature to be in kin with nature and that we have accepted the challenge. 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