“We may think of cars and factories as the most obvious enemies of the environment, but buildings consume more than half the energy used worldwide.”
Buildings have a greater impact on global warming than any other sector.

Why green?

WORLDWIDE, BUILDINGS ACCOUNT FOR...

- 17% fresh water withdrawals
- 25% wood harvest
- 33% CO$_2$ emissions
- 40% material and energy use
- 45% in China
Why green?

- 8-9% decrease in operating costs
- 7.5% increase in building values
- 6.6% improvement in ROI
- 3.5% increase in occupancy
- 3% rent increase

Why green?

- Increased productivity
- 20% better test performance
- 2½ day earlier discharge
- Increased sales per square foot
- Increased production
- 2-16% productivity increase
• Seventy-six percent of all electricity generated by U.S. power plants goes to supply the ‘Building Sector’

• People in the US use eight times more energy on a per capita basis than do people in Asia

• If the current population of China used as much energy as Americans, they would use more energy than is being consumed by the entire planet today.
Architecture 2030 Challenge

- Proper planning
- Siting
- Building form (form follows performance)
- Glass properties and location
- Material selection
- Incorporating natural heating, cooling, ventilation, and daylighting strategies

Sustainable:
the concept of meeting the needs of the present without compromising the ability of future generations to meet their needs.
Designers must become leaders, and leaders must become designers

What we seek is a delightfully diverse, safe, healthy, and just world, with clean water, air, soil, and power, that is economically, equitably, ecologically, and elegantly enjoyed.

Sustainability

KEY CONCEPTS:
Industrial production should take its cues from nature to create healthy and abundant cycles that continually and effectively reuse our finite resources.

Sustainable products should be made from either biological nutrients, which can decompose naturally without poisoning our habitats, or technical nutrients, which must be recaptured at the end of the products’ useful lives so that they can be remade into the same products or ones of equal value.

“Cradle to Cradle is a celebration of a world of abundance, not a world of limits. That’s the big message.”

Sustainability
**Cradle to Grave**

Product → Consumer → Landfill

**Why less bad is no good**

Less Product → Consumer → Inferior Product → Landfill

**Cradle to Cradle**

Product → Consumer → Equally Viable Product

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**BIOLOGICAL VS. TECHNICAL METABOLISM**

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Sustainability
ECO-EFFECTIVE PRODUCTS

The coated-yarn fabric for Steelcase's Think chair is made entirely of recycled PET (polystyrene terephthalate) and can be reground and melted down, then be reconfigured into yarn and recolored, thereby starting the cycle all over again.

Sustainability
U.S. Pension Building
(now National Building Museum)
Montgomery C. Meigs
1887

Project Ventiform
Foster and Partners
2001 (Unbuilt)

BUILDINGS, THAT LIKE TREES
PRODUCE MORE ENERGY
 THAN THEY CONSUME
Pearl River Tower
Skidmore Owings and Merril
Guangzhou, China
2009
the first zero-energy supertall building in the world
Sustainability

The tower will harvest wind, humidity, and solar power from the environment and use it to maximum efficiency through myriad interwoven systems.
Underfloor Ventilation with Radiant Cooling

High-Performance Facade
Fuel Cell Technology

San Francisco Federal Building
Federal Office Building
Thom Mayne (Morphosis)
under construction
Sustainability

Minoan & Mycenaean Architecture

Sustainability
70% OF BUILDING COOLED BY NATURAL VENTILATION (no AC)

90% OF WORKSTATIONS HAVE ACCESS TO NATURAL LIGHT, NATURAL VENTILATION, AND VIEWS OF THE CITY
San Francisco Federal Building

THIS BUILDING WILL SAVE $9 MILLION DOLLARS IN ENERGY COSTS IN 20 YEARS
researchers analyzing the “GreenHouse” have found “strong evidence that enhanced habitability is associated with increases in psychological and social well being.”
Sustainability

Minoan & Mycenaean Architecture

Largest “living” roof in the world (10 acres)
Provides Habitat
Decrease Energy Costs
Protects the roof membrane
Retain half of the annual rainfall

Ford Rouge Truck Plant
Dearborn, Michigan
William McDonough and Partners

Charles Sheeler Photograph
Ford Model U

Offices for GAP Inc.
San Bruno, California
William McDonough and Partners
“How could I not be involved in a place that’s going to build new housing for 400 million in 12 years?”

Guantang Chuangye Sustainable Demonstration Project
Liuzhou, Guangxi Zhuang, China

Solar Umbrella House
Pugh + Scarpa
Venice California
2005
Conversion of 650sf Bungalow into a 1900 sf residence

Inspired by Paul Rudolph’s 1953 Umbrella House in Sarasota, Florida, which originally featured a wooden trellis to shield the structure from scorching rays.

A translucent canopy of 89 grid-connected solar panels—the “solar umbrella”—wraps the addition’s roof and west elevation.

Generates 95% of the electricity needed for the building
Sustainability

Minoan & Mycenaean Architecture

Solar Umbrella House

Solar Energy that Falls on Each Square Foot in a Year by Surface

The average energy consumption in the US per square foot of floor area in a year:
Single-Family Residential: 42.7 Kbtu / SF / YR
Commercial/Institutional: 85 Kbtu / SF / YR

Sustainability
“You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete”

R. Buckminster Fuller
Sustainability

Minoan & Mycenaean Architecture
In lower temperatures, the external flaps slow down the chimney effect. Fresh air is then drawn through an underground funnel and up the thermal core of the building, keeping moderate temperatures and allowing fresh and recirculated air to mix and be cooled by the core. According to BREEAM, for 80 percent of the year, the library is ventilated by simply opening panels or using controlled fresh air intake from below. The library consumes 35 percent less energy than a comparable sized building.
Sustainability

Minoan & Mycenaean Architecture
“Next time we’ll do it with just air and gases moving, and no space frame.”
CHICAGO CITY HALL

20,000 PLANTS (100 SPECIES)
ROOF RETAINS 75% OF A 1” RAIN
70 DEGREE TEMPERATURE DIFFERENCE ON HOTTEST DAYS
90 / 90 / 160
GREEN ROOFS CAN LAST MORE THAN TWICE AS LONG AS A CONVENTIONAL ROOF

$40,000-$50,000 IN ENERGY SAVINGS EACH YEAR
$3,600 ENERGY SAVINGS EACH YEAR (ARCH RECORD 12.05)

Sustainability
The first and only municipal building in the United States to be awarded LEED Platinum status by the U.S. Green Building Council.
Sustainability

Minoan & Mycenaean Architecture

CCGT

Sustainability
“Despite the challenges involved, we've found that every time we've elected to do the right thing, even when it costs twice as much, it's turned out to be more profitable.”

“Back in the mid-nineties, to cite just one instance, we changed the packaging of our thermal underwear. We were using a thick, wraparound cardboard header inside a heavy Ziploc plastic bag. Instead, we decided to hang up the heavier long underwear like regular clothing and simply bundle our lighter underwear with a rubber band. The first year after the change, we saved 12 tons of material from winding up in a landfill, saved $150,000 in packaging, and boosted sales by 25 percent—largely because the product wasn’t hidden in a wrapper and people could feel the material and appreciate its quality.”
BEYOND ARCHITECTURE

- Leather (a renewable resource) pieces are stitched in an overlapping fashion so as to produce smooth internal seams, obviating the need for comfort liners and reducing the shoes's material mass.
- All leather pieces are tanned using a vegetable-based process.
- Again, to save material mass, metal eyelets aren’t used.
- The two-piece outsole is designed to snap together, eliminating harmful adhesives and simplifying recyclability.
- No use of PVC.
- Where possible, materials are sourced locally to reduce transportation energy use.

The result? **Considered** shoes generate 63% less waste in manufacturing than a typical Nike design. The use of solvents has been cut by 80%. And a stunning 37% less energy is required to create a pair of shoes.