

Brownell, Blaine; *Transmaterial*; 2005

## ULTRAPERFORMING

Materials which are stronger, lighter, and more durable than their conventional counterparts.

### Beams/ Columns

#### Liquid Metal

In the same way that the inventions of steel in the 1800s and plastic in the 1900s sparked revolutions for industry, a new class of amorphous alloys is poised to redefine materials science as we know it in the 21st century. Welcome to the 3rd Revolution, otherwise known as the era of Liquidmetal alloys, where metals behave similar to plastics but possess more than twice the strength of high-performance titanium. Liquidmetal alloys were conceived in 1992, as a result of a project funded by the California Institute of Technology (CalTech), NASA, and the U.S. Department of Energy, to study the fundamentals of metallic alloys in an undercooled liquid state, for the development of new aerospace materials. Arguably the first major breakthrough in materials technology since the development of thermoplastics, Liquidmetal alloys offer superior mechanical properties compared to other highly engineered materials. Compared to crystalline metallic alloys, Liquidmetal is much more resistant to permanent deformation from impact, and 3 times more elastic or resilient.

[www.nasa.gov/vision/earth/technologies/liquidmetal.html](http://www.nasa.gov/vision/earth/technologies/liquidmetal.html)

#### Smart Beams

SMI Steel products is an innovative steel manufacturer specializing in the smartbeam, which is suited for long-span composite floor construction or long-span roof applications for architecturally exposed steel. Produced with castellated, hexagonal web openings or cellular, circular web openings, smartbeams operate most efficiently between 30 and 80-foot spans. Smartbeams allow a more flexible, column-free, long-span floor space at the same cost as traditional short-span construction. The most common building types for smartbeams are office buildings, mezzanines, parking garages, or any application utilizing a suspended composite floor. Smartbeams' superior vibration characteristics and ability to accommodate mechanical services make them ideal for any composite floor application.

[www.smisteelproducts.com](http://www.smisteelproducts.com)

### Doors/ Windows

#### Ultra-Slim Doors

Tre Più is a leading company in the design and manufacture of top quality doors, supported by the continuous creative and innovative contribution of renowned names in architecture and industrial design. The Tre Più door is known for its highly architectural quality and formal ability to re-design a space. The Tre Più door has been conceived and designed to become an object whose distinctive and original qualities enhance interior design. The Convex door was designed by F.A. Porsche, the Milano door by Luca Scacchetti, and the Rever door by Cini Boeri, Laura Griziotti and Guido Nardi.

[www.trep-trepiu.com/porteeng/porte/index.htm](http://www.trep-trepiu.com/porteeng/porte/index.htm)

### Glazing

#### Aerogel

Aerogel or "Airglass" is a transparent material that looks like glass, insulates better than mineral wool and is more heat resistant than aluminum. The material has many interesting properties and possible applications such as insulation in windows and solar collectors, windows in firewalls, a component in air-conditioning equipment, etc. Aerogel has outstanding properties, especially regarding heat transfer. The material transmits about 88% of the integrated solar

spectrum (thickness about 10 mm, or 3/8 inch). Aerogel is molded, giving the possibility of getting different shapes: cylinders, cubes, plates of varying thickness etc. Chemically, Aerogel is composed of quartz and a great deal of air, making it fragile. The grains of quartz are small compared to the wavelength of light, giving Aerogel good transparency properties. At around 750°C (1380°F), it starts to shrink and slowly collapses to a piece of ordinary quartz. Aerogel can be cut with a band saw and holes can be drilled with a metal drill. It should be noted that Aerogel is non-flammable and non-toxic.

[www.airglass.se](http://www.airglass.se)

#### Cast Glass

Shanghai Kang Yu Jie Sen's Cast Glass Façades exhibit superior clarity, the highest refractive index of any architectural glass, and are suitable for use in interior or exterior applications. Cast Glass Façades are superior to stone in terms of weather resistance, staining, and background radiation. The product can be worked similar to float glass by bending, tempering, and laminating. The glass can be cast to achieve sharp lines as well as soft organic shapes, and the thickness allows for sophisticated multidimensional effects as well as a variety of color possibilities.

[www.eastasiaportal.com/luxury](http://www.eastasiaportal.com/luxury)

## Lighting

#### LED-FLEX

The LED substitute for neon lighting has arrived. After two years of research and development, Mule Lighting has developed a product that looks like traditional neon but is more versatile. Uniform and super-bright light output is achieved through a proprietary optical maximization technique which is completely sealed and impervious to shock and vibration. LED-FLEX is suitable for wet locations and can withstand extreme temperatures. The product uses very little energy, requires little maintenance, and is available in a variety of bright colors.

[www.mulelighting.com/led-flex](http://www.mulelighting.com/led-flex)

#### Linelight

Developed by the innovative Tokyo-based company Material House, Linelight maximizes the illumination potential of artificial lighting by channeling the illumination of a single light source along a line. Linelight is comprised by a highly-reflective mirror housing fronted by an acrylic lens designed for even dispersion, which is contained within an aluminum frame. Linelight accepts lamps from 35 to 150 Watts in power, and will carry bright light 30 feet using only a single lamp. Not only are fewer fixtures required compared with conventional point-source installations, but maintenance is also simplified, as only a single fixture must be changed.

[www.materialhouse.co.jp](http://www.materialhouse.co.jp)

#### Powermoon

Powermoon is a balloon-based lighting system suitable for road & railway infrastructure, outdoor events, entertainment, military, and search & rescue applications. Powermoon is packaged in a small, portable unit which may be quickly assembled on-site. Powermoon HQI lamps produce five times more light than traditional tungsten halogen lamps for the same power rating, and last from two to fifteen times as long (depending on the model). Powermoon lamps also produce less glare, softer shadows, and a whiter light compared with traditional light sources. Powermoon comes with a collapsible balloon and stand, a generator, an IP 67 control gear box, and a carrying case. Powermoon does not require an inflation fan and is therefore noise-free and lower in cost compared with other balloon-based lighting systems.

[www.antidazzlelighting.co.uk](http://www.antidazzlelighting.co.uk)

## Mechanisms/ Substances

#### Metamaterials

The idea of invisibility has fascinated people for millennia and has been an inspiration or ingredient of myths, novels and films, from the Greek legend of Perseus versus Medusa to H.G. Well's Invisible Man. Dr. Ulf Leonhardt at Scotland's St. Andrews University has recently published two papers concerning the potential realization of invisibility using modern MetaMaterials. DARPA states that "MetaMaterials are a new class of ordered nanocomposites that exhibit exceptional properties not readily observed in nature. These properties arise from qualitatively new response functions that are: (1) not observed in the constituent materials and (2) result from the inclusion of artificially fabricated, extrinsic, low dimensional inhomogeneities." According to Dr. Leonhardt, the key to achieving invisibility lies in creating transparent materials capable of bending light around objects hidden behind them. While seemingly far-fetched, light-bending phenomena such as hot

road mirages or water refractions occur naturally. Leonhardt claims that these phenomena are possible “because light will always take the shortest route, which is not always a straight line. All you need is a transparent material that bends light around an object like water moving around a stone.” Theoretically, MetaMaterials created using nanotechnology, which is a necessary tool due to the small scale of light waves, will soon channel waves of specific frequencies. Leonhardt claims that “there will be advances on both the technological and theoretical sides which will make invisibility happen in the not too distant future. This is not completely beyond the range of present technology and theoretical ideas.”

[www.cnn.com/2006/TECH/science/08/09/feature.invisibility](http://www.cnn.com/2006/TECH/science/08/09/feature.invisibility)

#### Novec 1230

3M's Novec 1230 fire protection fluid looks exactly like water, but does not cause the type of damage associated with water when putting out a fire. It can be used to protect rare exhibits, electronic equipment and other delicate items without causing any harm. In fact, items can even be immersed in the agent. The fire protection fluid will quickly evaporate, safeguarding these items – and leaving them unaffected. Novec 1230 is a fluoroketone which serves as an advanced halon replacement. The fluid has zero ozone depletion potential and the lowest atmospheric lifetime for halocarbon alternatives: 5 days. (The closest alternative is 33 years.) It also has a Global Warming potential of 1, 99.9% lower than any halocarbon agent acceptable for use in occupied spaces. Extinguishing via its cooling effect, Novec 1230 fluid works as a gas, yet it is a liquid at room temperature. Because it is not stored or shipped from the factory in pressurized cylinders, Novec 1230 fluid is easy to handle and charge. Novec 1230 fluid systems allow for more efficient use of space, requiring about the same number of cylinders as conventional halocarbon agents. Novec 1230 fluid also has the greatest margin of safety for use in occupied spaces.

<http://cms.3m.com/cms/US/en/2-68/iclcrFR/view.jhtml>

#### Quiet Revolution

London-based XCO2 has developed an elegant vertical-axis wind turbine which is virtually silent and vibration free, and therefore ideally suited to both urban sites and exposed locations. The simple and robust design (patent pending) has just one moving part, maximizing reliability and minimizing maintenance requirements. Unlike other renewable energy sources, quietrevolution is also available in a unique model capable of creating a striking visual display that is part illuminated billboard, part artwork, part renewable energy device. Light Emitting Diodes (LEDs) embedded in each of its three S-shaped blades fire in sequence as the blades rotate, painting a video screen that appears to hang in the air. This full color and motion image is clearly visible day and night.

[www.quietrevolution.co.uk](http://www.quietrevolution.co.uk)

## Surfaces

#### Accoya

Accoya is a high performance solid wood that is modified by a proprietary process called acetylation. This technique increases the amount of acetyl molecules, which are naturally present in all species of wood, throughout the material (not just at the surface). Acetylation delivers exceptional performance attributes, including Class 1 durability, reduced swelling and shrinkage, mold and insect resistance, UV-degradation resistance, and reduced thermal conductivity. Because of these factors, Accoya is appropriate for use in more rigorous conditions, such as heavy-traffic road bridges. The product is also sourced from sustainable forests, is 100 percent recyclable, and is nontoxic.

[www.accoya.info](http://www.accoya.info)

#### Accura Bluestone

3D Systems's stereolithography process creates three-dimensional objects using a laser to cure sequential layers of material to form shapes that have been modeled in digital environments. Accura Bluestone is an engineered nanocomposite designed specifically for this process. Accura Bluestone is an exceptionally rigid, thermally resistant material, making it suitable for scaled automotive and aerospace wind-tunnel applications. Bluestone has also been used in the design verification of lighting components, as well as the production of jigs and fixtures for complex assembly operations.

[www.3dsystems.com](http://www.3dsystems.com)

#### Advantic

Advantic is a syntactic foam made by mixing or combining hollow glass microspheres with an epoxy resin. This high-strength composite solves many of the problems associated with other common tooling materials. Cornerstone Research Group (CRG) Industries's proprietary mixing process minimizes the number of microspheres that break during mixing, a common problem in manufacturing syntactic materials. This process enables Advantic to maintain low density with high uniformity and minimum void content. Because Advantic is lightweight, it reduces wear and tear on machining equipment. It also has low thermal conductivity and specific heat, so it requires little warm-up time and virtually eliminates plug sticking during thermoforming. Advantic is dimensionally stable and will keep its shape over a wide range of temperatures. The material can also be machined using standard carbide-tipped tools in sheet-fed, rotary, or in-line machines for a variety of applications. Advantic is available in small or large lots of customized material with custom properties. CRG Industries can customize properties such as compressive strength, flexure strength, material density, operational temperature, chemical resistance, electrical properties, thermoconductivity, water absorption, and surface finish.

[www.crgindustries.com](http://www.crgindustries.com)

#### Airitecture

Building with air, the most natural of all materials, is a special challenge, since air-inflated components are used in place of the usual loadbearing components. The idea behind Airitecture is based on mechanically pre-tensioned membrane constructions that have been used for several interesting buildings, e.g. the German Pavillon at the EXPO 1992 in Seville, Spain or the International Airport of Denver, Colorado. The most important innovation of Airitecture is that the membranes are not pre-tensioned mechanically, but by means of air pressure and in such a way that they are able to bear loads. The classical air-supported buildings were the prototypes that the German Pneumatic experts Festo intended to develop further. In contrast to such buildings, however, Airitecture works with a much higher air pressure and also has atmospheric pressure in the inside.

[www.application-forum.de/INetDomino/coorp\\_sites/en/d948c8ea6f89ec2ac1256b3b004f8f18.htm](http://www.application-forum.de/INetDomino/coorp_sites/en/d948c8ea6f89ec2ac1256b3b004f8f18.htm)

#### Autoclaved Aerated Concrete

It was discovered in 1914 in Sweden that adding aluminum powder to cement, lime, water, and finely ground sand caused the mixture to expand dramatically. The Swedes allowed this "foamed" concrete to harden in a mold, and then they cured it in a pressurized steam chamber-- an autoclave. Autoclaved aerated concrete (AAC, also called autoclaved cellular concrete--ACC) is produced by about 200 plants in 35 countries and is used extensively in residential, commercial, and industrial buildings. At a density of roughly one-fifth that of conventional concrete and a compressive strength of about one-tenth, AAC is used in load-bearing walls only in low-rise buildings. In high-rises, AAC is used in partition and curtain walls. The material is also fairly friable and must be protected from weather with stucco or siding. On the positive side, it insulates much better than concrete and has very good sound absorbing characteristics. After a history of aborted efforts to introduce AAC to the U.S., two large European conglomerates have both decided to take the plunge. The German Hebel Group, through Hebel USA, has just completed the first full-scale AAC plant in the U.S. Once the plant is fully operational, licensee Hebel Southeast will control production.

[www.safecrete.com](http://www.safecrete.com)

#### Backlight

Backlight is a demonstration of electroless metal plating by Tony Wurman of New York-based Wunderwurks. In contrast to conventional electrolytic processes, electroless plating uses a nongalvanic chemical plating method involving multiple reactions in an aqueous solution without external electrical power. Electroless plating can provide decorative and protective finishes for many materials, including metal, wood, glass, plastic, stone, fiberglass, ceramics, and even fabrics. Wurman's gold-plated light sculpture of a human spine cast in urethane resin demonstrates that the electroless process is highly cost effective compared to conventional electroplating and vacuum metallizing and is not limited to the item's size, design, or surface characteristics. Moreover, the electroless-plated object's finished surface will accept conventional paints to enable striping, accenting with graphics, or airbrushing.

[wunderwurks.com/Merchant2/merchant.mvc?Screen=CTGY&Store\\_Code=WD&Category\\_Code=J](http://wunderwurks.com/Merchant2/merchant.mvc?Screen=CTGY&Store_Code=WD&Category_Code=J)

### Bannerworks

Koryn Rolstad is a Seattle-based industrial artist who leads an integrated team of industrial designers, graphic designers, project managers and production staff in creating large-scale aerial sculptures and public art installations around the world. Known as "Bannerworks," her pieces dexterously cross the boundaries between sculpture and signage, art and engineering. Her project list includes interior environments for Starbucks, Novell, AT&T, REI, Mishima Hospital, Oacis Healthcare Systems, and various schools.

<http://krstudios.com/home.html>

### Bendable concrete

University of Michigan has developed a new type of fiber-reinforced bendable concrete which looks like regular concrete, but is 500 times more resistant to cracking and 40 percent lighter in weight. Tiny fibers that comprise about 2% of the mixture's volume partly account for its performance (under excessive strain, the specially coated network of fibers veining the cement is allowed to slide within the cement). The ingredients in this concrete also make it more flexible (this concrete does not contain coarse aggregate).

[www.umich.edu/news/?Releases/2005/May05/r050405](http://www.umich.edu/news/?Releases/2005/May05/r050405)

### BioSteel

Spider silk has long fascinated man for its elegant evolutionary solution – a unique combination of enormous tensile strength and elasticity with an ultra-lightweight fiber. Spiders produce a number of different silks with different mechanical properties for use in spinning webs or forming cocoons. Of these silks the "dragline" or "frame" silk has been the object of desire for materials engineers because of its extreme performance mechanical properties, particularly strength. In fact, spider dragline silk is widely recognized as the strongest material known. Despite its superior mechanical properties, spider silk is not used commercially because of an absolute constraint on supply. Recently, however, the modern tools of biotechnology have offered the possibility of mass producing man-made spider dragline silk for the first time– in goat's milk. Nexia's proprietary silk production system is an innovative approach, proven successful in producing the most authentic, man-made spider silk to date. The result is "BioSteel", a family of spider silk proteins. Nexia's technology relies on the anatomical similarities between the spider silk gland and goat mammary glands. In both cases, epithelial cells manufacture and secrete water soluble, complex proteins in large amounts. BioSteel may be used in a wide variety of medical and industrial products, from wound closure systems to ballistic protection fabrics.

[www.eurekalert.org/pub\\_releases/2002-01/nbi-nau011102.php](http://www.eurekalert.org/pub_releases/2002-01/nbi-nau011102.php)

### Bubbledeck

BubbleDeck is a two-way hollow deck which utilizes plastic balls to reduce the use of concrete that has no carrying effect. By adapting the geometry of the ball and the mesh width, one may obtain optimized concrete construction, with the simultaneous maximum utility of both moment and shear zones. The reinforcing mesh used in BubbleDeck catches, distributes and locks the balls in exact position. Meanwhile, the balls shape the air volume, control the level of the reinforcing meshes, and at the same time stabilize the spatial lattice. Obvious advantages over conventional decks include reduced weight, increased strength, longer span (20 to 50 times the deck height; cantilevers approximately 10 times the deck height), fewer columns, and no beams or ribs under the ceiling.

[www.bubbledeck.com](http://www.bubbledeck.com)

### Carboncast

CarbonCast is a precast-concrete technology that uses a carbon-fiber grid for secondary reinforcing or shear transfer, depending on the application. Because carbon-fiber reinforcing resists corrosion, CarbonCast precast products require less concrete cover, resulting in added durability, lighter weight, and improved sustainability over traditional precast concrete. In addition, the reduction of concrete enables the integration of insulation, which can increase R-values of wall panels. CarbonCast architectural cladding panels can weigh up to 66 percent less than conventional precast panels. This weight reduction permits engineers to reduce substructure or specify smaller cranes for lifting the panels into place. When used in the flanges of CarbonCast pretopped double tees, the carbon-fiber grid can reduce weight by 12 percent and eliminate the need for sealers and sacrificial barrier coatings. When used as a shear connector in CarbonCast high performance insulated wall panels, the carbon-fiber grid improves thermal performance, given its relatively low thermal conductivity.

[www.altusprecast.com](http://www.altusprecast.com)

#### Carbon Fiber Surfacing

Constructed entirely of carbon fiber, the Z5 chair weighs only 14 pounds but will withstand loads in excess of 1200 pounds. The technology used to construct this chair was originally developed for military applications and is a primary component in all advanced fighter aircraft. By exploiting the characteristics of this exotic material, Giovanni Pagnotta has created what appears to be an updated version of Gerrit Rietveld's 1934 Zig-Zag stool which is "not only visually disarming but also extraordinarily comfortable." Z5 is available as shown in naked carbon, red, yellow, blue, or dressed in black leather.

#### Concrete Canvas Shelter

The Concrete Canvas Shelter is a rapidly deployable hardened shelter that requires only water and air for erection. It can be deployed by two people without any training in approximately thirty minutes and is ready to use in twelve hours. The shelter consists of a cement-impregnated fabric (Concrete Cloth) bonded to the outer surface of an inflatable plastic inner structure. Prior to construction, the shelter is delivered folded in a sealed plastic sack. Once the sack is positioned and filled with water, the fiber matrix wicks water into the cement, naturally controlling the water-to-cement ratio. The sack is cut open after hydration, and a battery-driven fan inflates the inner plastic lining, causing the structure to lift. After a duration of twelve hours, the concrete will have set sufficiently for use. The fibers of the Concrete Canvas fabric form a coherent matrix within the concrete, providing tensile reinforcement and helping prevent crack propagation. If desired, the shelter can be buried with over 0.5 meters of sand on the roof in order to provide increased insulation and protection.

[www.concretecanvas.co.uk](http://www.concretecanvas.co.uk)

#### Creative-Weave Metal Mesh

Metal meshes have been known as decorative and functional design elements in architecture for only a few years. The French National Library in Paris was the first architectural project where GKD, in cooperation with French architect Dominique Perrault, succeeded in systematically implementing metal meshes in a building in various ways and applications. Since then, this development has continued worldwide. For decades, GKD has manufactured metal meshes for industrial applications in filtration and separation technologies and the process belt sector. At first, it was their visual attractiveness that made metal meshes suitable for the architecture and design sector. During the continuous product development it became clear that metal meshes also have considerable technical advantages which are extremely relevant in the field of architecture. Today, the architect has a wide range of mesh samples at hand, with weaving widths up to eight meters, which allow for great design flexibility. Woven metallic meshes used as partition elements convey a new dimension to any space. They can be used as projection screens, and, taking into account their acoustic characteristics, are suitable for the use in public buildings, opera houses and concert halls.

[www.gkd.de/englisch](http://www.gkd.de/englisch)

#### Floating Concrete

By replacing sand and gravel with tiny polymeric spheres, University of Washington materials scientists have created a concrete stronger than traditional concrete but so light it floats in water. The team won a regional American Society of Civil Engineers Concrete Canoe Competition.

<http://students.washington.edu/asce/canoe.shtml>

#### Foamed Aluminum

"Light-as-air, stronger-than-steel materials are just beginning to shape our world. Foamed aluminum first emerged from the lab in the frame of a 1998 Karmann concept car. Ten times stronger than traditional aluminum at just one tenth the weight, the material allows a more fuel-efficient vehicle. Its isotropic cellular structure helps the frame absorb shock and serves as an insulating firewall between the engine and the rest of the car. The foaming process can also be applied to steel, lead, tin, and zinc." [Jessie Scanlon, Wired] CYMAT's Aluminum Foam Division is an innovator in the use of closed cell aluminum foam for a wide variety of applications. Initially developed by Alcan International, this material won the National Research Council (Canada) Award for Product of The Year in 1993. The product is a high strength, extremely light weight material that possesses high durability, excellent finish and lasting value. The foam comes in an assortment of densities and sizes up to five feet wide and up to fifty feet long. It has numerous applications including architectural, automotive, marine, military, aviation, transportation, electronics, appliances, signage and many more.

[www.cymat.com/Cymat\\_Foam\\_products0.htm](http://www.cymat.com/Cymat_Foam_products0.htm)

### Fusion Stone

The Fusionstone proprietary process involves ultra-clear glass permanently fused to exotic stone slabs to achieve superior surface protection while retaining and showcasing the beauty of natural stone. It eliminates adhesion lines, and the material appears entirely translucent from edge to edge. As a result, natural stone can be used in applications where it was once prohibited because intrusion of natural and chemical substances into porous marbles, sandstones, and limestones is completely prevented. LED lighting can also be integrated into Fusionstone for additional aesthetic enhancement.

[www.archsystems.com](http://www.archsystems.com)

### High-Performance Concrete

Imagine a footbridge as long as a football field with a platform as thick as your hand. Or a 6' x 10' sheet just 1 inch thick that bends as it continues to support a 2,000 lb car. Working in collaboration with Rhodia and Bouygues, Lafarge has developed a whole new family of concretes called Ductal. These concretes have high compressive and flexural strength, and their special characteristics enable the achievement of outstanding architectural feats. Ductal concrete incorporates strengthening fibers and opens the horizon to ultra-high performance due to its special composition which provides it with outstanding strength, six to eight times greater than traditional concrete (under compression). "Fiber-reinforced" means that it contains metal fibers which make it a ductile material. Highly resistant to bending, its great flexural strength means it can withstand significant transformations without breaking. Ductal also comes with organic fibers for applications with less load and for architectonic applications.

<http://64.227.188.244/imagineductal/home.asp>

### Laminated Thermoplastic Panels

Blizzard Composite GmbH manufactures high-tech plastic composites for the architectural field as well as the trucking industry. Their core expanding machinery heats up and vertically expands solid thermoplastic sheets, which are then processed into sandwich panels by lamination equipment. Due to the unique geometry of the PepCore, the panels are of low weight and provide an excellent combination of high stiffness and compressive strength.

[www.blizzard-composite.com/en/architektur\\_und\\_design](http://www.blizzard-composite.com/en/architektur_und_design)

### Lightblocks

Initially developed for use in public art installations, Lightblocks are high-strength, integral-color acrylic and polycarbonate panels which can be used in interior and exterior applications. Lightblocks have been shown to withstand impacts approximately three times greater than laminated safety glass and have six times greater impact resistance than ordinary glass. Moreover, Lightblocks are 50% lighter than glass. Lightblocks are available in unlimited translucent or opaque colors, and have been proven to withstand weather and sun exposure for long periods without any detectable deterioration. Available in thicknesses ranging from 1/16" to 4", the material can be molded, curved, slumped, cut, drilled, and carved, and surfaces can be smooth, textured, glossy or matte.

[www.lightblocks.com](http://www.lightblocks.com)

### Light-Transmitting Concrete

The days of dull, grey concrete could be about to end. A Hungarian architect has combined the world's most popular building material with optical fiber from Schott to create a new type of concrete that transmits light. A wall made of "LitraCon" allegedly has the strength of traditional concrete but thanks to an embedded array of glass fibers can display a view of the outside world, such as the silhouette of a tree, for example. "Thousands of optical glass fibers form a matrix and run parallel to each other between the two main surfaces of every block," explained its inventor Áron Losoncz. "Shadows on the lighter side will appear with sharp outlines on the darker one. Even the colours remain the same. This special effect creates the general impression that the thickness and weight of a concrete wall will disappear." The hope is that the new material will transform the interior appearance of concrete buildings by making them feel light and airy rather than dark and heavy.

[www.litracon.com](http://www.litracon.com)

### Lumicor

Lumicor panels are made from thermally-laminated translucent resin, with options for integrating textile materials or graphics between polymer layers. Lumicor panels are superior to glass in terms of their stronger break resistance, lighter weight, and lower cost. They can be thermoformed,

crowned, beveled, polished, water jet cut, bent, etc. The typical panel size is 4' x 8', but custom sizes can be made up to 5' x 10'. Panel thickness ranges between .030" and 1".

[www.lumicor.com/index.asp](http://www.lumicor.com/index.asp)

#### PepCore (CoreTough)

PepCore is a honeycombed truss-wing-formed composite wall sandwiched between a seamless, one-piece, thick outer facing and a thinner inner facing with no rivets required. The PepCore power structure starts with plastic sheet material like polyethylene, ABS, Surlyn, Polystyrene, or Polycarbonate. The core material is then formed with Phelps Engineered Plastics proprietary PepCore process which, through heat and convection, the core sheet is expanded to the desired honeycomb thickness and geometry. When mated with the specified facing, it becomes a material with a high degree of rigidity. PepCore is "pound for pound, lighter than aluminum and stronger than steel," and solves the four problems traditionally experienced with traditional aluminum sheet and post body construction: leakage, rust and corrosion, dents and dings, and weight management. The lampshade shown above at the far right was designed by Jun Takagi and manufactured with PepCore material.

[www.tss-llc.com/coretoughALpanel.asp](http://www.tss-llc.com/coretoughALpanel.asp)

#### Pervious Concrete

Pervious pavement is a cement-based concrete product that has a porous structure which allows rainwater to pass directly through the pavement and into the soil naturally. This porosity is achieved without compromising the strength, durability, or integrity of the concrete structure itself. The pavement is comprised of a special blend of Portland Cement, coarse aggregate rock, and water. Once dried, the pavement has a porous texture that allows water to drain through it at the rate of 8 to 12 gallons per minute per square foot. For reference, tests conclude that a square foot of bahia sod drains at the rate of 2 1/2 to 3 gallons per minute. According to the manufacturer, this rapid flow-through ratio inspired the phrase "the pavement that drinks water."

[www.centralconcrete.com/pervious\\_concrete.html](http://www.centralconcrete.com/pervious_concrete.html)

#### Self-Structured Sliding Doors

Traditional Japanese shoji are sliding doors made of washi paper supported by wood crosspieces. The paper offers privacy and protection from wind but requires the lattice structure for support. For the Takeo Corporation's Haptic exhibition, Japanese architect and materials researcher Hiroshi Ota set out to rethink the traditional Japanese architectural feature. After researching the Japanese papermaking technique called kami-suki (paper-scooping), Ota hypothesized that it would be possible to make self-supporting paper screens. Ota formed a stainless-steel screen with a dimensional basket weave-type pattern using a rolling press. He molded two sheets of paper with this screen and attached them together after allowing them to dry. Once paired in this way, the paper sheets formed a truss capable of supporting its own weight and functioning as furniture. Although Japanese washi is typically appreciated for its lightness and delicacy, here Ota has used the paper to create stability and strength in a new sliding door.

<http://csur.t.u-tokyo.ac.jp>

#### Super-black

British scientists have invented the darkest material on Earth. The super-black coating was developed by researchers at the National Physical Laboratory in London. It could revolutionize optical instruments because it reflects 10 to 20 times less light than the black paint currently used to reduce unwanted reflections. The key to the nickel and phosphorous coating's blackness is that its surface is pitted with microscopic craters. "Super-black" is especially effective at absorbing light which hits it at an angle. With the light source at right angles, the coating reflects less than 0.35%. Black paint reflects about 2.5% - seven times more. One of the early applications might be on startrackers, navigational aids which help spacecraft stay on course by fixing on pinpricks of light in the heavens. The material could also be used in works of art. NPL says several artists have shown an interest. Nigel Fox, who heads the optics group at NPL, said: "When you look at the black, it is an incredibly beautiful surface. It's like black velvet."

[www.npl.co.uk/optical\\_radiation/superblack.html](http://www.npl.co.uk/optical_radiation/superblack.html)

#### Topo Table

TOPO is a series of Corian tables with built-in reconfigurable landscapes. Plastic inserts drop into the table to create functional topographies. TOPO uses rapid-prototyping technology in a way that enables each table to be different, and customers color in the areas where they want

inserts placed in the finished product. These inserts sit in the holes and can be swapped out and rearranged. The little hills and valleys are made of plastic that is formed over real rocks. When not in use, these functional land forms invert to become sculptural mountains. According to designer Scott Franklin, "We spend a lot of time sitting at tables, so it's nice to have some basil planted nearby."

[www.nondesigns.com](http://www.nondesigns.com)

#### Transformit Tension Fabric

Transformit's provocative tension fabric structures are appropriate for use in entertainment venues, special events, exhibits & trade shows, or anywhere that fabric architecture is appropriate. Made of nylon spandex, the structures offer a viable surface for any type of projection or lighting display, including front and rear-projected video. It is also possible to print on the fabric via silk-screening or dye sublimation digital printing.

[www.transformitdesign.com](http://www.transformitdesign.com)

#### Translucent Concrete

An idea hatched in the research department of OMA promises to transform the nature of buildings. Inventor Bill Price conjures up the ultimate material: translucent concrete. "My ultimate goal was to create a material to change concrete – but still keep the construction technique intact," Price says, switching to a slide of a poured block of translucent concrete made from a crushed-glass aggregate and a plastic binder. Lit from underneath, it seems to breathe light like the sun breaking through winter ice. He reaches behind him onto the bookshelf, takes a small cylinder made from the same material, and places it and two other samples onto his desk. They look like high-design paperweights: crushed glass, plastic tubes, and crushed opaque gravel frozen in translucent plastic. It's easy to imagine a tabletop made of this material – or an entire wall of a house, theater, or museum... Translucent concrete will need to be further researched, perfected, and tested before widespread applications are possible. The analyses conducted thus far – tests done in the laboratory at Virginia Tech on small columns and cylindrical sections of translucent concrete with the crushed-glass aggregate and plastic binder – have shown the new material to be superior to traditional concrete in compression and flexure. But large-scale applications of his new material are still months – if not years – away.

#### Tree Tents

Dre Wapenaar, a Dutch artist who is practically unknown in the United States, believes that a properly designed tent can alter human behavior. It can do so, he says, by making people feel secure, calm and friendly. Administrators in a Dutch high school in Helden-Panningen, a town 90 miles southeast of Rotterdam, last year asked Mr. Wapenaar to solve a perennial problem. The school's 400 students needed a place for a little privacy. Remembering the hangouts of his own youth ("always a difficult location, somewhere behind the school," he said), Mr. Wapenaar, 39, devised a 33-foot-long pavilion with seating for 70 students under a canopy of overlapping translucent polyester. For Mr. Wapenaar, who titled the work "Hang Kiss Smoke," this was one of his few permanent creations. His tents, which have been exhibited in the Netherlands, Italy, England, Japan and France (and for three days recently in Aspen, Colo.), have become contemplations on what makes a home and how people interact. "There is a universal language of tents," Mr. Wapenaar said on a recent visit to New York. The tent, he added, is "an object for meeting people."

[www.nytimes.com/2001/07/05/living/05DRE.html?ex=1123905600&en=0879bc7c6f561739&ei=5070&pagew](http://www.nytimes.com/2001/07/05/living/05DRE.html?ex=1123905600&en=0879bc7c6f561739&ei=5070&pagew)

#### Underlit Flooring

Underlit Flooring is a polished concrete-and-glass flooring system suitable for interior applications, such as kitchens and bathrooms, and various external applications, including gardens and terraces. Available by the square meter and in custom sizes and colors, the concrete tiles can be laid directly onto an existing floor. The glass lenses are lit by fiber optics laid directly under the tiles and powered by a single bulb that will effectively illuminate areas up to 1,076 square feet (100 square meters). The color of the light can be altered at the touch of a button or left to change automatically over a period of time, creating a subtly shifting ambiance. Underlit Flooring may also be installed as a wall cladding system.

[www.concrete-blond.com](http://www.concrete-blond.com)

#### Vacuum Insulation Panels

Cars and homes have at least one thing in common: they consume energy in the form of oil or

gas. Energy-efficient vehicles typically make use of lightweight materials and improved engine technologies, and soon home builders will also need to pay greater attention to environmental concerns in their designs. Apart from modern and efficient heating systems, thermal insulation makes the biggest difference. Vacuum insulation panels (VIP) could well be the material of the future. Until now, such panels have been used primarily in cooling and refrigeration units. Now they are finding more widespread application as insulators for flat roofs. VIP's work on the same principle as the thermos flask: when air is evacuated from the cavity of the double-walled container, heat conduction and convection decrease sharply. A metal layer on the surface further reduces the heat transfer by IR radiation. A VIP consists of a filler material such as compressed silica which is vacuumencapsulated in a plastic barrier foil. "The real advantage is the amount of space that can be saved", explains Dr. Klaus Noller of the Fraunhofer Institute for Process Engineering and Packaging IVV. "Panels with a thickness of two centimeters insulate just as effectively as 20 centimeters of mineral fibers."

[www.fraunhofer.de/fhg/EN](http://www.fraunhofer.de/fhg/EN)

#### Woven Stainless Steel

K5 New York is now offering woven stainless steel in 18 different weaves, produced in Switzerland by G. Bopp. This product has been used in projects as diverse as railing systems and furniture components. Custom weaves and patterns are also possible.

[www.sloanm.com/fabric/k5.html](http://www.sloanm.com/fabric/k5.html)

## MULTIDIMENSIONAL

Materials which exploit depth in their manufacture for enhanced stability, texture, and richness.

### Beams/ Columns

#### Flexible Framing Track

Flex-Ability Concepts manufactures the Flex-C Trac system, which is a construction product used to build curved metal or wood structures. It can be used to frame curved walls, barrel ceilings, wavy ceilings, s-curves and columns. Architects like Flex-C Trac because the strength, quality and uniformity of the finished curves are superior. It can be hand shaped on site to make curves of varying radii, or to easily match existing curves. Contractors claim it saves 60 to 80% of the time required to build a curved structure compared to conventional methods and results in a better-finished product.

[www.flexc.com/1.html](http://www.flexc.com/1.html)

#### Make/Shift

Make/Shift is a flexible shelving system that can be arranged to fill spaces of varying sizes and between walls or even pillars. The interlocking wedge shape of the units allows them to "expand" or "contract" within a space: a single pair may be used for small gaps, or multiple modules may be linked together to make larger units. Conceived by Peter Marigold, Make/Shift was designed for frequent movers who often encounter difficulties adapting their existing furniture to new settings. The shelves easily conform to any space larger than 19 7/32 inches (the width of a single module). Make/Shift units may also be assembled into freestanding units using the clips provided. Make/Shift is fabricated in black, white, and pink Arpro expanded polypropylene (EPP), which is a lightweight, steam-cleanable foam that is stronger and more resilient than expanded polystyrene (EPS). Arpro also recycles the CO2 emitted in the manufacture of the material, which may also be recycled at the end of its life. Make/Shift is available from Movisi.

[www.petermarigold.com/make\\_shift.htm](http://www.petermarigold.com/make_shift.htm)

## Glazing

#### Corrugated Glass

Like structural glass channels, corrugated glass experienced its first widespread use in industrial buildings in Europe due to its structural integrity and relative economy, and was later adopted by the international design community for aesthetic reasons. Until recently, however, it has been difficult to find a producer of corrugated glass in North America. Joel Berman Glass Studios in Vancouver, BC now produces 53" x 118" corrugated glass panels of varying depths, profiles, and colors. The panels may be tempered or laminated, and the corrugations can run in a horizontal, vertical, or diagonal direction. The sides of the panels are flanged to accommodate a variety of framing systems.

[www.jbermanglass.com](http://www.jbermanglass.com)

## Surfaces

### 3d Carpet

With the Clodagh Collection, Lees proves that it can be competitive in the high-design carpet arena. Created in partnership with the innovative designer Clodagh, “these luxurious designs, inspired by Clodagh’s native home of Ireland and her intuitive sense of design, fashion and aesthetics, are translated into highly-styled products with Lees long-standing commitment to performance.” The Clodagh Collection comprises one running line and three custom broadloom products named Buncrana, Glanmire, Kildare and Lisadell. These three-dimensional, textured offerings, which employ Lees’ next-generation TriAx tufting technology, are constructed of DuPont Antron Legacy nylon, and are 5/64-inch gauge, 40 oz. face weight products. TriAx allows yarn to be manipulated to a three-dimensional level of precision by accurately placing and controlling design and textural elements in unlimited pile heights. This creates intriguing surface textures and color interest through highlighting and refraction, giving depth and loft to plain colors in an unprecedented way; solids look like they are constructed of more than one color.

[www.leescarpet.com](http://www.leescarpet.com)

### 3d Fabric

Spacer is a high-tech upholstery fabric with a 3-dimensional look. Visually, it appears to be three separate fabrics that have been connected. This look is achieved by a complex knitting process allowing all layers to be knitted at once which makes it incredibly strong. This structure makes the fabric thick without being too dense. Consequently, Spacer is a very comfortable fabric to sit on. This fabric is available in 5 bright colors. The bright colors are achieved by digitally printing the color onto the fabric. This also enhances the 3-dimensional look because the color is sprayed through the top surface. Spraying, as opposed to piece dyeing, allows the middle layer to remain white.

[www.jhanebarnestextiles.com/index2.php](http://www.jhanebarnestextiles.com/index2.php)

### 3d Molded Plywood

Reholz GmbH develops, produces and sells veneers that can be three-dimensionally deformed to a very high degree for the manufacture of three-dimensional plywood mouldings, for the facing of both profiled and curved edges, and for the coating of three-dimensional surfaces. In this new technology, traditional veneers of different woods in thicknesses from 0.6– 1.5mm are processed mechanically such that they become distortable. This is the basis of three-dimensional deformation, analogous to the deep drawing of metal sheets in which initially plane blanks are deformed to container-like hollow parts. As opposed to metal sheets, 3D-veneers are stable only if several plies are bonded together, preferably with alternating grains. These 3D-veneers can also be bonded to a substrate.

[www.reholz.de](http://www.reholz.de)

### 3d Wallpaper

Designed by Jaime Salm and Esther Chung, Tangent is 3D wallpaper that is reconfigurable and made from 100% waste paper. Tiles allow for customization, both acoustically and aesthetically, and are easily recycled. They can also be painted with water-based paints for an additional flair.

[www.mioculture.com](http://www.mioculture.com)

### Aero Formed Aluminum

Aero consists of tightly corrugated anodized aluminum sheets that are flexible and formable. Variations in thickness, depth and rounded or square return edges produce five unique designs, some of which include precision-engineered perforations. Aero comes in a matte silver anodized finish with UV protection. Aero is ideal for a breadth of interior applications, whether the visual impact desired is an emphasis on geometric compositions or fluid curves. The lightweight material is sturdy enough to be used for wall and ceiling panels yet is malleable enough to be rolled like a carpet.

[www.forms-surfaces.com/products/surfaces/aero.htm](http://www.forms-surfaces.com/products/surfaces/aero.htm)

### Algues Organic Structures

Ronan and Erwan Bouroullec’s Algues (French for algae) is whatever you want it to be – a curtain, divider, faux hedge, and more. Each finely branched, 12-in. by 8-in. by 2-in. plastic module has 19 ring-like eyes that can be easily joined to other modules with plastic pegs.

[www.bouroullec.com/index.php?p=62](http://www.bouroullec.com/index.php?p=62)

#### Braille Tiles

Dennis Lin designed these Braille tiles when he was looking for a way to express a message in a literal, but subtle, way: "If the writing ain't on the wall already, these tiles provide the perfect way to get it up there." Each 6" x 12" cast polymer tile represents a character of the Braille alphabet, and costs \$50. Custom 'tactile messages' may be ordered directly from Totem Design.

[www.totemdesign.com/index2.html](http://www.totemdesign.com/index2.html)

#### Bump

Andrea Valentini's Bump material is a sculptural textile made from various fabrics bound to closed cellular foam. The foam is extremely lightweight and durable, imparting sophisticated Bump-clad bags and furnishings with a notable resilience. Bump is also flame retardant and resistant to ultraviolet light, making it even more durable.

[www.andreavalentini.com](http://www.andreavalentini.com)

#### Continua

Erwin Hauer Continua is a series of designs for perforated and light-diffusing architectural surfaces. Originally developed in 1950, Continua screens were made of masonry materials painstakingly cast in complex molds. With the advent of current digital fabrication technologies, Continua screens are now easier to fabricate and mass produce, and Erwin Hauer's sensual, multidimensional shapes may now be realized in a variety of materials. Developed in cooperation with Enrique Rosado, Continua screens are available in CNC-cut medium-density fiberboard (MDF) and stone, as well as precast concrete and high-strength gypsum cement. Panels may be shop-fabricated up to 4 x 8 feet (1.2 x 2.4 meters), and larger sizes must be assembled on site.

[www.erwinhauer.com](http://www.erwinhauer.com)

#### Circulation

Designed by Monika Piatkowski, the circulation rug and wall surface is comprised by circular wool felt pellets set within a honeycomb structure. This simple configuration allows the surface to be smooth and resilient while simultaneously soft and comfortable. Circulation is edged with Hessian webbing, but other materials can be commissioned. The rug and pellet size may also be commissioned to custom dimensions.

[www.hivespace.com](http://www.hivespace.com)

#### FlexiComb

Imagine a mix between a beehive and a slinky: Flexicomb is a light-hearted new material that combines the properties of both. In contrast to conventional rigid honeycombs, Flexicomb is flexible, bouncy, and fun. This porous, translucent material transmits light effectively, and it can be bent, sprung, and compressed to form sculptural installations, lamps, desktop accessories and furniture prototypes. PadLab makes Flexicomb by fusing thousands of closely packed polypropylene tubes on one end to form a flexible honeycomb. The production of Flexicomb begins with a set of tightly compressed cylinders. When the ends of the closely packed tubes are heated, they fuse into a matrix of hexagons.

[www.padlab.com](http://www.padlab.com)

#### Iconic Panels

The development of sophisticated digital fabrication technologies has led to the increased dimensionalization of patterns in architecture. Wallpaper, for example, has been utilized for over a millenium as a flat medium; yet recent tools give it dimensional relief. B&N Industries now offers Iconic panels, which are created using the latest CNC technology and a process which forms laminate material over a carved wood core. Iconic panels are offered in a variety of abstract line patterns which are depicted solely via surface relief. The durable panels may be sawn, nailed, screwed, glued, or simply mounted on walls.

[www.bnind.com](http://www.bnind.com)

#### Geoweb

Presto's perforated Geoweb cellular confinement system features an engineered pattern of perforations in the cell wall. This hole pattern provides increased frictional interlock with coarse aggregates, crushed rock and concrete. In vegetated systems, the perforations increase root lock-up, creating a more stable vegetated mass and overall healthier soil environment. The perforations allow lateral drainage through the system, thereby enhancing performance of the system in saturated soil conditions. The Geoweb system enhances system performance in

slope and channel protection, earth retention and load support applications. The multi-layered earth retention system is used for a wide range of design requirements and site conditions. The system's flexibility allows it to withstand large differential settlements and conform to a contoured landscape while typically using on-site infill materials. The system's outer cells, when filled with topsoil, provide an ideal environment to support vegetation.

[www.alcoa.com/alcoa\\_consumer\\_products/prestogeo/en/home.asp](http://www.alcoa.com/alcoa_consumer_products/prestogeo/en/home.asp)

#### Kerrigan Architectural Tile

Kerrigan ceramic architectural tiles are the result of Chicago-based designer Bryan Kerrigan's methodical exploration of dimensionality and texture of the ceramic tile. Designed and manufactured using high-temperature-fired stoneware clay, the tiles are very durable for both interior and exterior applications in all climates. Beginning his work with ceramics in the early nineties, Kerrigan developed pottery and sculpture with fluid, organic shapes. His experiments in ceramic art led to the development of hand-sculpted tiles for architectural applications. Noting the extent to which the subtlest alterations of plan and edge affected the dimension of the forms, Kerrigan embarked upon several years of thorough ceramics research in order to produce his current collection.

[www.kerriganart.com](http://www.kerriganart.com)

#### Les Tuiles

The textile brick designed by Erwan e Ronan Bouroullec for Kvadrat is the latest step in their process of deconstructing space. That process is now eroding the delimitation of space by such restraints as walls, doors and passageways – all hitherto regarded as closed and permanently fixed entities – which can instead be transformed into free configurations. The soft brick is in fact self-organized in a continuous surface. This determines its growth in space according to the context. The brick's basic module has no clearly perceptible form as such. Rather, its design springs from the scope for connection offered by its actual geometry. Once aggregated into a settled combination, the basic module tends to lose its separate identity and merge into a continuous flow. Each unit is a "fabric sandwich" containing a soft and highly deadening layer of cellular foam. In this way, areas enclosed by the flexible textile brick surfaces acquire a special sound quality that tends to create a muffled, protected, inward and warm sensation of that space.

[www.kvadrat.dk](http://www.kvadrat.dk)

#### Mind the Gap

Textile designer Ane Lykke has developed a three-dimensional wallpaper which explores the visual parallax created by two multicolored layers of hexagonal boxes. Currently on display at the Danish Design Centre, her so-called "Mind the Gap" wall decoration inspires interaction with the observer. "The exhibition explores a very common phenomenon, which we have all experienced, for example when passing two parallel grid fences. As we move we see new wave forms or patterns arising. This is the principle that I have used in the exhibition. I want to find new ways of affecting the perception of a space, demonstrating that the spectator plays a crucial part," says Ane Lykke, who adds that in physics this phenomenon is referred to as interference patterns. Mind the Gap consists of a two-layered wall where the layers are separated by a 14 cm-space. The layers are made of hexagonal plastics boxes with stripes made of red lines in varying density and directions. The two layers turn into large pattern areas that change with the light and the spectator's movements. As Ane Lykke puts it, the wall is "passively waiting" and is only activated when the spectator moves within the space. Then variations of the patterns follow along as a film, forming a living, vibrating surface. In this way, the spectator alters the wall.

[www.ddc.dk/events/DDCudstillinger/mindthegap\\_event](http://www.ddc.dk/events/DDCudstillinger/mindthegap_event)

#### Noodle-Block Cube

Lauren Moriarty's Noodle Block Cubes represent intriguing experiments in digitally fabricated three-dimensional cellular structures that may be compressed and return to their original form. Moriarty designs the pieces in a digital environment, and they are then laser cut and hand finished. The cubes may be used as decorative seats, cushions, sculpture, or playthings.

[www.laurenmoriarty.co.uk](http://www.laurenmoriarty.co.uk)

#### POP PANELS

POP is a 3d form-pressed interior panel made of plywood, intended for covering walls and partitions. POP was designed by Jaana Ylitalo for use in lobbies, office interiors, cafeterias, restaurants, hotels, stores, etc. Material options include natural birch and warm-tone cherry.

Elements can also be mixed together with flat plywood. POP is available in 20 x 20 cm and 40 x 40 cm panels, with a thickness of 6 mm.

[www.brainwood.net](http://www.brainwood.net)

#### Sculptural Gypsum Panels

modulararts is the result of over two decades of experience in designing and building custom artwork for commercial and residential interiors. With a combination of experienced modelmaking, casting, and state-of-the-art technologies, modulararts can provide the beauty and subtlety of relief sculpture in modular panels which match up to create seamless, continuous surfaces of any size. Gypsum, the primary material in modulararts panels, has been favored by architects and designers around the world for its superior fire properties, its similarity to sheetrock in regard to installation, and its relative light weight. Because modulararts panels are entirely mineral they will not burn. The nature of gypsum acts like a thermal regulator when exposed to flame, also protecting the materials behind it from the heat of the flame for up to two hours. Moreover, modulararts sculptural panels are comprised entirely of nontoxic mineral and are not subject to hazardous polymerization (they do not off-gas like plastics or wood composites).

[www.modulararts.com](http://www.modulararts.com)

#### Soft Shelf

Typical shelving systems retain the same configuration when fully utilized or when empty. Developed by Lateral Architecture, Soft Shelf adapts and changes with its contents and can be expanded or compressed to fit a variety of spaces. The basic shelf unit is composed of two strips of industrial grade felt, segmented vertically and stitched at intervals to create pockets. Units connect to each other by Velcro, and shelf segments can be added as desired. Segments have aluminum eyelets at the top and are hung from a stainless-steel rod like a curtain. Soft Shelf can be hung against a wall or from the ceiling to act as a screen.

[www.lateralarch.com](http://www.lateralarch.com)

#### Tackable Acoustic Panels

Robin Reigi produces tackable acoustic panels made of porous expanded polypropylene bead foam. The panels are lightweight, fully tackable, non-fibrous, structurally rigid, and have a non-abrasive surface. They are also Class A fire retardant. The panels may be used for acoustical purposes, in commercial, educational and retail areas, and in environmentally sensitive areas. Acoustic capabilities vary with the thickness of the panel. The panels start at \$5.00/SF for low volume, and are available in 2' x 4' sheets, 1" and 2" thick. The panels require a 2-3 week ordering lead time. Available colors are charcoal and white.

[www.robin-reigi.com/main.html](http://www.robin-reigi.com/main.html)

#### Tactile Ceramics

Ikuko Iwamoto's work is influenced by the microscopic world, and she is infatuated with cells, spores, and pollens. Iwamoto's Tactile Ceramics are simultaneously ordinary and extraordinary in nature. They are vehicles to make visible an invisible, microscopic realm. According to the artist, her art conveys a world "of intricacy and detail, of mathematical pattern and organic chaos, of beauty and repulsion." Although her previous conception of porcelain was cool and sharp, she found that porcelain could be rendered to have a smooth and warm quality in order to convey these influences in her sculpture.

<http://homepage2.nifty.com/ikuko-iwamoto>

#### Textured Porcelain Tile

Italy's Gruppo Majorca has crafted a new line of porcelain tiles in five colors and five atypical textures for use in vertical and horizontal applications. The tiles have integral color, and their edges may be left natural or edge-ground for minimal joint lines.

[www.majorca.it/RicercaSet.asp?codlingua=2&formato=2](http://www.majorca.it/RicercaSet.asp?codlingua=2&formato=2)

#### Topographic Ceilings

The Topo 3D system (pictured left) consists of preformed translucent and opaque Lexan infill panels installed into a curved suspension system. The infill panels are designed in four panel modules to create the appearance of gently rolling curves. The 2' x 2' Geometrix metal ceiling panels (middle) are available in four profiles: flat, wedge shaped, and wedge shaped with either inside or outside corners. Transparencies (right) is a fully accessible luminous ceiling system which produces the feeling of sunlit glass block with just a fraction of the weight, cost, and installation difficulties of real glass. Panels consist of nine injection molded 8" x 8" blocks, factory

assembled into a 2 x 2 lay-in panel for fast installation and full accessibility.  
[www.usg.com](http://www.usg.com)

#### Twigs

When Ronan & Erwan Bouroullec received a commission to create a rooftop shelter in Paris, they devised a system based on a tiny three-dimensional motif. Like their Algues product, Twigs is comprised by an aggregation of polypropylene units resembling small branches. The Twigs clip together on supporting cables, creating an extensive, irregular, and colorful tapestry. A Twig wall approximates camouflage, with a visual complexity resulting from the repetition of simple units.

[www.vitra.com/products/designer/ronan\\_erwan\\_bouroullec](http://www.vitra.com/products/designer/ronan_erwan_bouroullec)

#### Undulating Veneer Panels

Ply is a wall panel consisting of a solid-wood frame with an undulating birch veneer of 0.4-mm-thick plywood. This new material is so thin that it folds nearly as easily as fabric. Thanks to the wavy surface, the element absorbs sound well. Still in development is a version with built-in lighting and panels thin enough to let light pass through. Panels with an extra backing of sound-absorbing material are another option.

[www.showroomfinland.fi/wall/plywallpage.html](http://www.showroomfinland.fi/wall/plywallpage.html)

## REPURPOSED

Materials which act as surrogates replacing precious raw materials conventionally used in various applications.

### Beams/ Columns

#### Collapse-Preventing Structure

Not everyone believes building performance can be improved greatly. The actions that took out the World Trade Center were so damaging and unexpected that many engineers have said there was no way to protect against them. Bombproofing buildings, they argue, would be too expensive and would allow only forbidding, cavelike structures. Nonsense, Hassan Astance, a Berkeley civil engineering professor said. "Are you going to say, 'If the Sears Tower is attacked, there's nothing we can do. It's too bad?'" "Cost-effective ways exist to build stronger buildings and to retrofit existing buildings, he said. The secret: Lengths of steel cabling of the type that holds up suspension bridges could be placed in building floors before concrete is poured. Although the concrete might shatter, the cables will hold it in place. If the concrete Murrah building — which Astance calls "a house of cards" — had contained such technology, Astance said most lives could have been saved. The engineer also is developing and testing a new shear wall, lightweight concrete bolted to steel, that can absorb much of a bomb's blast. In tests using extreme force, the concrete crumbled, but columns holding up the building held.

### Glazing

#### Ionoplast Interlayer Glass

On James Carpenter's Blue Glass Passage at Seattle's new City Hall, fully exposed edges and the "lack of cumbersome fixtures" give the glass bridge the look of a "transposed slice of water." New DuPont SentryGlas Secure technology enabled aluminium inserts to be laminated directly into the bridge's glass floor, giving an innovative technical solution for the aesthetic look the designers wanted. In the first application of DuPont SentryGlas Secure technology worldwide, James Carpenter Design Associates (JCDA) of New York has created a striking, cobalt blue, laminated glass bridge, 20 m long, over which Seattle City Hall council members walk to enter the building's chambers. The patented DuPont technology was designed to enable architects to design with a robust new generation of laminated glass applications that meet stringent security — or seismic — standards worldwide. Its inventors at DuPont Glass Laminating Solutions Central Research & Development have said: "SentryGlas Secure technology utilizes the engineered properties of SentryGlas Plus ionoplast interlayer with astonishing results." This is based on the fact that SentryGlas Plus ionoplast interlayer bonds well to a range of materials beyond glass, meaning that enhanced performance can be 'engineered in' to the overall construction.

[www.dupont.com/safetyglass/lgn/stories/2601.html](http://www.dupont.com/safetyglass/lgn/stories/2601.html)

#### Light-Emitting Laminated Glass

Schott's LightPoints product range comprises transparent glass conductor plates equipped with Light Emitting Diodes (LEDs). The power supply to the LEDs is provided via virtually invisible conducting paths on the glass. The glass conductor plate is protected by a laminated cover glass.

LightPoints glass is available in rectangular formats up to a maximum of 1,300 mm (51") x 2,500 mm (98"), and larger rectangular formats and free forms are available on request. Standard glass thickness is: 2 x 4 mm or 2 x 6 mm (.079" x .157" or .079" x .236"). Schott is developing the LightPoints range for skylight windows, walkable glass and accessories for home use.  
[www.us.schott.com/architecture/english/lightsolutions](http://www.us.schott.com/architecture/english/lightsolutions)

#### Metallic Laminated Glass

A remarkably tough protective interlayer, also known as polyvinyl butyral or PVB, is the highperformance component in laminated glass. Laminated architectural glass is produced by bonding the PVB based interlayer between two or more panes of glass under heat and pressure. The result is durable, adaptable, high-performance glazing which, if broken, tends to retain glass fragments and reduces the risk of injury or property damage. While exploring the possibilities of creating a metallic interlayer for glass, Solutia's technology team discovered a way to add texture to the glass at the same time. The effect is glass that appears to have a rich, almost fabric-like appearance, while incorporating subtle shimmering elements. To add color, this special metallic interlayer can be combined with Solutia's range of ten foundational Vanceva Design color hues to achieve jewel-like brilliant color or softer shades. For a more custom look, various palette colors can be combined to create up to 62 different colors.

[www.vanceva.com](http://www.vanceva.com)

#### Structural Channel Glass

Pilkington Profilit is a translucent cast glass structural glazing system which consists of a series of self-supporting glass channels within an extruded metal perimeter frame. The system is relatively cost-effective, and well-suited for exterior and interior curved wall applications. The long, sweeping wall of Steven Holl's Museum of Contemporary Art in Helsinki, for instance, is comprised of Pilkington Profilit. The U-shaped glass channels are formed by computer-controlled furnaces, and are inherently strong enough to be installed without additional vertical or horizontal supports. A high-quality translucent silicone sealant which matches the natural tint of the glass must be used at all joints to make the system weathertight.

[www.reglit.com](http://www.reglit.com)

#### Translucent Insulated Glazing Unit

Solera is a glass-based insulated translucent glazing unit manufactured using a proprietary honeycomb transparent insulation material. This semi-rigid insulating core is mounted between two layers of glass, similar to the way that conventional insulations such as rigid foam or glass fiber fill the gap inside a wall. Solera provides insulation value by suppressing convection and thermal radiation in the space between the glass layers. At the same time, the honeycomb structure of the core ensures that light striking the cell walls is reflected forward through the material to the interior of the building. A choice of translucent veil material used in conjunction with the insulation core provides the opportunity to "dial in" light transmittance values from 22% to 73%. Solera delivers both maximum insulation value as well as high light transmittance, which cannot be achieved by using conventional fiber-reinforced plastic construction.

[www.advancedglazings.com](http://www.advancedglazings.com)

## Lighting

#### Conductive Plastic

You might mistake Alan Heeger for a slimmeddown Jerry Garcia clone – white mane and beard, laid-back attitude, all-black outfit. Ask the UC Santa Barbara physicist to empty his pockets and you won't find guitar picks and a roach clip. But he will produce a handful of transparent vials. Inside each is an ounce of clear liquid infused with invisible flecks of plastic that mimic the molecular structure and behavior of metal. Zap the solution with electricity –or simply expose it to a bright light –and the mixture emits a steady glow. Neat trick. Heeger and two colleagues won the 2000 Nobel Prize in chemistry for the accomplishment: coaxing conductivity from plastic. (The material in the vials is a luminescent semiconducting polymer.) Now their efforts, and those of a growing number of chemists, physicists, and engineers, are clearing the way for superthin digital screens, polymer computer memory, disposable electronics, and a new generation of smartcards. Conventional plastic is a lousy conductor. Viewed using an electron microscope, its molecular structure resembles a snarl of spaghetti. But arranging polymer molecules into long, straight rods lets electrons flow freely, approximating the conductivity of traditional materials like silicon or copper. Heeger and his co-Nobelists, for example, discovered that oxidizing the polymer polyacetylene with iodine vapors increased conductivity more than a billionfold.

### X-Ray Lamp

Working long hours in the lab, cancer-immunology researcher Jahan Khalili was inspired one night to create light fixtures using x-ray film. A DNA or Proteomic x-ray film forms the exterior of this innovative lighting design, which is structured to be hung from the ceiling. The typical fixture is 16" tall by 12" in diameter, weighs 3 pounds, and is comprised by x-ray film, thread, wire, adhesive, and a lamp fitting 120v. According to Realm Dekor, the X-Ray Lamp is "perfect décor for those who appreciate the unique graphic quality of everyday surroundings."

[www.realmdekor.com](http://www.realmdekor.com)

## Surfaces

### 100 Percent

3form is developing a new materials platform called 100 Percent, which is comprised of recycled household HDPE containers. HDPE (high-density polyethylene) is a remarkably useful material and something each of us comes in contact with everyday. Bottles made from HDPE have good stiffness and barrier properties and are ideal for packaging products having a short shelf-life such as milk. HDPE's good chemical resistance allows it to be used in containers holding household detergents or industrial chemicals. Unlike PETG which is used to make ecoresin, HDPE is an opaque material. 3form is transforming this utilitarian packaging material into engineered panels, and production and engineering personnel are working to attain optimal surface characteristics and panel dimensions for partitions, work surfaces, furniture, lab/research environments, educational environments, and outdoor surfaces.

[www.3-form.com](http://www.3-form.com)

### Abacá

Abacá employs residues from banana harvesting and recycles them into a high-pressure decorative laminate. Developed by Lamin-art, the laminate consists of fibers which are sprinkled over an array of background colors to yield a random, non-directional design and texture. Abacá is offered in ten natural hues in 4' X 10' sheets, and standard grade thickness (.048"). Abacá is suitable for both horizontal and vertical applications where maximum impact resistance and durability are required. Moreover, the recycled banana fibers and paper products in Abacá comprise approximately 40% of post-industrial recovered content.

[www.laminart.com](http://www.laminart.com)

### Acoustical

Acoustical is an acoustic insulation material made from 100% recycled rubber. The rubber comes from old car tires and is broken down into small strips to make this non-woven sheet material. The insulation is supplied in 10mm thick rolls for floors and 1 m2 panels for walls.

[www.soundservice.co.uk/Acoustical%20M20AD.htm](http://www.soundservice.co.uk/Acoustical%20M20AD.htm)

### Almute

Almute is an engineered metal panel that absorbs sound. Manufactured by Peer Inc., Almute represents the culmination of many years of development in advanced sintering and fine-grain metal processing. Peer Inc. mixes aluminum grains mixed with pre-alloyed metal powders and forms them into rigid panels in a sintering furnace. Sintering allows the particles to fuse together at a temperature below their melting points, and the result is a strong, durable panel that is nevertheless highly porous. It is this porosity that gives Almute its broad-band acoustic absorption characteristics. Almute may be used outdoors in harsh, corrosive, and high temperature environments, and is non-flammable. Almute is easily cut and installed on-site, and also provides RF and EM shielding.

[www.almute.com](http://www.almute.com)

### Aluminum Flooring

Conceptually developed by Rem Koolhaas of the Office of Metropolitan Architecture, aluminum flooring has been incorporated in his Bordeaux house and Prada store in Manhattan, and is planned to be included in many future projects. Aluma-tek is a newly-formed manufacturer established in Chicago which produced the aluminum floor for OMA's IIT student center. According to Aluma-tek, aluminum floor products are custom developed with #5052 alloy aluminum sheets, 3/16-1/4 inch thick, which are cut to specified sizes (2ftx4ft, 2ftx6ft etc.). A choice of three hand finishes are then applied to the surface of the aluminum creating a unique look, and a protective coating of oil is applied to minimize maintenance.

[www.aluminumfloors.com](http://www.aluminumfloors.com)

### Biopaver

Every parking lot, driveway, sidewalk and road is an impervious surface acting as an unbroken barrier between the wet rain falling from the sky and the dry earth below. Water draining from these surfaces gains speed and quickly rolls off all exposed ground, and even minor rains become small scale floods eroding what little soil is exposed, quickly filling municipal storm systems. Biopaving is a "green" solution for storm water management that integrates impervious surfaces and islands of biomitigating and bioremediating plant material. These bio-islands of phytoremediating plants are manufactured into the product and unwrapped by the environment after installation through biodegradation. The Biopaver is an innovative interlocking concrete paver with prepackaged soil and phytoremediating planting material. Once the paver is exposed to the elements, the mold and packaging biodegrade and help set the paver into place, and bioremediating plants begin to grow. These tough plants filter the contaminants from the storm water as it passes through this pervious heart of the paver.

[www.biopaver.com](http://www.biopaver.com)

### Bombproof Fiber-Metal

After a bomb went off in 1988 on Pan Am flight 103 over Lockerbie, Scotland, killing all 259 passengers onboard, the Federal Aviation Administration created standards that industry would have to meet if it chooses to deploy luggage containers capable of withstanding such a blast. During the 1990s, the FAA tested 10 hardened luggage containers made from a variety of materials, including reinforced aluminum, fiberglass, aramid fibers and polymers. Only one container – concocted from fiber-metal laminates developed originally by the Delft University of Technology in the Netherlands – passed the FAA's test and received certification. The material, called Glare (short for glass reinforced), consists of multiple aluminum layers interspersed with layers of fiberglass and adhesive bonding that are supple yet strong. When used in fabricating luggage containers, Glare can absorb bomb blasts without breaching. As Glare expands with a blast, it absorbs the explosive energy and redistributes the impact load to the adjacent surface area rather than to one specific weak spot. The bomb blast leaves a sizable deformation in the container's surface, but it remains intact. Moreover, whereas other FAA-tested containers were also able to contain the bomb blast, Glare could resist the subsequent luggage-fueled fire inside the container.

[www.galaxyavsec.com](http://www.galaxyavsec.com)

### Corrugated Aluminum Panels

Doluflex panels consist of a corrugated aluminum plate machined with a cold forming system and laminated between various materials. Doluflex 1 is a flexible panel used to produce bent elements, and Doluflex 2 is an extremely stiff sandwich panel. Shaped structural panels are also manufactured using Doluflex 2. Traditionally used in the ship-building industry, Doluflex panels possess high chemical-physical resistance which make them suitable for building facade systems. Doluflex can be worked with normal carpentry tools, and is classified non-combustible according to RINA, Lloyd's Register and Det Norske Veritas. The Doluflex 2 panel has a total thickness of 5 mm, a transversal resistance to bending stress  $E \times I = 2.48 \times 10^6$  and longitudinal resistance to bending stress  $E \times I = 1.97 \times 10^6$ , with a total weight of 8.1 Kg/m<sup>2</sup>.

[www.donatigroup.it/inglese/default2.asp?lingua=eng](http://www.donatigroup.it/inglese/default2.asp?lingua=eng)

### Fly-Ash Concrete

Contents: 50% fly ash, 50% cement Use: Building-walls, foundations Bonuses: Fly ash, produced in abundance by coal-burning power plants, replaces a high volume of cement, which is third on the top ten list for CO2 emissions. Problems: Rutherford-Chekene's structural engineer Afshar Jalalian, who created this mix for U.C. Berkeley's Wurster Hall seismic retrofit project, says: "The concrete dries at a slower rate; this is really not a problem but builders will need to adapt." Also, fly ash (a mixture of alumina, silica, unburned carbon, and metallic oxides) is extremely toxic, though it may be that the concrete immobilizes its impurities.

### Frit

Frit is the trade term used to describe recycled glass once it has been ground down into a fine sand. Generally 'Frit' is seen as a midway stage in a longer manufacturing process and is normally supplied as a raw material for making tiles or even recycled glass bottles. However, Frit has an aesthetic all of its own and can be used in a variety of ways which don't involve melting or pressing. TriVitro in Seattle makes specially sized and colored chips of recycled glass for use in terrazzo flooring, tiles, counter tops, concrete pavers, wall finishes and exposed aggregate

surfaces. Available in a variety of colors and sizes, frit is excellent for any project seeking to maximize green building practices and LEED criteria.

[www.trivetro.com](http://www.trivetro.com)

#### Glass-Coated Plastic

Plastics come in many forms. They are used to make boats, magnifiers, skis and all manner of household items. Transparent plastic sheet panels would be ideal in the manufacture of windows or headlamps of cars, for example, and tinted plastic foils could more readily be used to protect against the sun – if only the material was not so easily scratched. Researchers at the Fraunhofer Institute for Electron Beam and Plasma Technology FEP in Dresden have presented a process by which plastic sheet panels and foils can be rapidly coated with a scratchproof glassy layer at moderate costs. There are various means of applying a transparent scratchproof coating to plastic materials: liquid coatings such as paint or sol-gel applications – or methods such as plasma chemical vapor deposition, sputtering or electron-beam evaporation, whereby the coating is applied in a vacuum. Liquid coatings are relatively inexpensive, but do not ensure such a hard and wear-resistant surface as do vacuum coating processes. High-rate electron-beam evaporation is comparatively the least expensive vacuum coating process. To achieve coatings of extreme hardness and resilience it is necessary to apply an intensive plasma during the evaporation process.

[www.fraunhofer.de/fhg/EN/index.jsp](http://www.fraunhofer.de/fhg/EN/index.jsp)

#### Heat Treated Carpet

Carpet-Burns Ltd. manufactures Heat Treated Carpet, which is a 100% recycled material created from carpet manufacturers' faulty or end-of-line carpet waste. HTC may be molded into any 3d form, is waterproof, durable and hard wearing, low maintenance, and non-porous with a very high resistance to staining. HTC is suitable for interior and exterior applications and available in various thicknesses. No glues, resins or stabilizers are used in the production of the material. Possible applications include kitchens, bathrooms, bars, restaurants, flat-packed furniture, flooring (screed and tile), staircases, shop fittings, public seating, architectural features, paneling, tiles, and molded consumables.

[www.carpet-burns.com](http://www.carpet-burns.com)

#### High-Pressure Metal Laminates

Germany-based Homapal has developed a line of specialized high-pressure metal laminates. They offer aluminum, stainless steel, copper, and brass-clad laminates with a wide variety of reliefs and surface finishes for use in interior vertical applications. Typical panel dimensions are 244 x 102 cm and weigh 1.6 kg/m<sup>2</sup>.

[www.homapal.de/englhomapal.html](http://www.homapal.de/englhomapal.html)

#### Honeycomb Panels

Cellbond manufactures translucent honeycomb panels comprised of an aluminum honeycomb core sandwiched between toughened glass or polycarbonate skins. The use of a bonded sandwich results in a high strength-to-weight ratio and provides excellent resistance to deflection. The honeycomb core also provides rigidity with very low density. Cellbond manufactures honeycomb panels which may be used as decorative partitions, as well as durable flooring and vandal-resistant panels.

[www.cellbond.com/architecture/architecture.asp](http://www.cellbond.com/architecture/architecture.asp)

#### Imago

KnollTextiles created Imago, a revolutionary hard surface material that marries the best qualities of glass, fabric and high-performance resin. Developed by Suzanne Tick, creative director of KnollTextiles, Imago is a family of products made through a patented process that encapsulates fabric in an engineered resin for use in both vertical and horizontal applications. Like a frozen fabric, Imago changes with the amount and direction of light cast upon it, and also affects perception of space beyond. The name itself is defined in Latin as "image," referring to the material's ability to transform space through varying levels of transparency and translucency. The inspiration for the development of Imago came from a scientist who perfected the patented encapsulation process and who was looking for a way to develop aesthetics that would match the great performance of this new material. Tick, always searching for new technologies to take textiles to a new level, was intrigued with this process and immediately began experimenting with different types of fabrics.

[www.knoll.com/index.jsp](http://www.knoll.com/index.jsp)

#### Insulating Wood-Cement Forms

Faswall wall-forms are used as the forms for poured concrete walls, yet left in place to provide permanent insulation around concrete structures as well as a durable surface to apply whatever surface finish is desired. No additional insulation, exterior sheathing, bracing or "wrap" is needed. Not only are material costs reduced, but labor costs for installation are eliminated as well. This system allows almost any fibrous material, including waste woods, green timber, and even agricultural by-products to be successfully combined with cement into strong and durable products. Instead of wasting space in landfills, waste wood can now be recycled efficiently and inexpensively into a strong, durable building system. The K-X system uses a two-stage mineralization process to preserve the wood. The ionization between the wood fibers and the K-X minerals makes a permanent chemical bond that allows the fibers to become an integral part of the concrete, not just be coated by it. Faswall forms are unlike other blocks made of foamed plastic, and will not burn, rot, or allow vermin and insects to invade. The forms are made out of 85% K-X Aggregate (treated recycled woodchips) and 15% portland cement. Fly ash can replace 3% cement if desired.

[www.faswall.com](http://www.faswall.com)

#### Kirei Board

Kirei board is a new environmentally friendly building material composed of 100% recycled agricultural fiber. Strong and lightweight, Kirei board has nearly unlimited uses in contemporary design. Manufactured from recycled sorghum stalks and the formaldehyde-free KR Bond adhesive, Kirei board helps to reduce landfill waste and eliminate harmful Volatile Organic Compounds in the ambient airspace. Sorghum, the principal component of Kirei board, is a drought-tolerant food grain requiring little fertilizer or pesticides to grow. Now, through a revolutionary process, these previously discarded stalks provide the foundation for a strong, delicately grained, lightweight building material. Ideal uses for Kirei board include: interior architectural surfacing, cabinetry, furniture, paneling, display fixturing, interior wall coverings, office dividers, home decoration, and finished products & accessories.

[www.kireiusa.com](http://www.kireiusa.com)

#### Lignasil Tile

Madera solid surface tile is made entirely from Lignasil, which is a high performance bio-composite material made from recycled natural fibers. The integral-color tile is designed for high traffic applications, and is less expensive, lighter-weight, and warmer to the touch than ceramics or stone. Standard Madera tiles are precision molded to 12" x 12" x 3/8", but can be cut easily with typical woodworking tools.

#### Liquid Wood

Renewable raw materials ease the burden on the environment. Researchers from the Fraunhofer Institute for Chemical Technology ICT in Pfinztal near Karlsruhe, led by Prof. Peter Eyerer and Dr. Norbert Eisenreich, are developing a thermoplastic material - deformable under heat - based on natural resources. The unusual thing about this material, which is known as Arboform is that although it possesses similar properties to wood, it can be cheaply injection-molded like a plastic. This can be a major advantage in production, for example, in the manufacture of molded parts for the automobile industry. One of the raw materials used in Arboform is lignin. This is the substance that gives wood its rigidity. Lignin is the second most frequently occurring polymer in nature. Every year millions of tons of it are produced as a by-product in the paper industry. Up to now lignin has mainly been burned in order to produce energy, but this renewable material can also be used in a different way: when lignin is mixed with natural fibers, the thermoplastic material Arboform is formed. This can be used in many applications as a substitute for synthetic materials derived from oil. "We have been working for two years on the optimum composition of natural polymers and natural fibers," Helmut Nägele and Jürgen Pfitzer of the ICT report. The scientists are working on ways of making Arboform more malleable and more heat-resistant.

#### liteCORE

When architects Christian Mitman and Emmanuelle Bourlier were unable to find a lightweight, translucent material for a project they were working on, they halted their search and took a different approach to solving the problem: they invented one. Hence the birth of liteCORE, translucent honeycomb panels that are not only perfect for sliding walls, screens and tables, but this sleek material is also sturdy enough to be used for a ceiling or a floor. With such demand for the panels (both residential and commercial,) Mitman and Bourlier's company has expanded

to the West Coast. LiteCORE consists of a bonded composite sandwich construction in which the structural aluminum honeycomb core provides a high strength to weight ratio and excellent resistance to deflection. The fiberglass-reinforced polyester facings require low maintenance and are scratch and weather resistant. LiteCORE can be drilled, machined, and framed using standard woodworking methods. LiteCORE panels are 3/4" thick with a 3/8" honeycomb cell size, and come in standard 4' x 8' and 4' x 10' sheets. However, Panelite will soon be offering a range of core and facing options so that you can design your own sandwich.

#### Metafloor

Metafloor is a hybrid floor covering: carpeting that offers the advantages of a hard surface. Inspired by the attractive lustre of nylon in a carpet sample, the designers revealed the core of carpeting by exposing the backing material. The Collaborative Voice line pictured here comprises four 12-foot-long products with a variety of textured finishes, all of which display the synthetic substrate.

[www.leescarpets.com/collections/MetaFloor/MetaFloor.htm](http://www.leescarpets.com/collections/MetaFloor/MetaFloor.htm)

#### Natural Fiber Insulation

Contents: 85–95% post-industrial denim scraps, 5–15% synthetic fiber to add fluff, and borates for pest and flame resistance. Use: Thermal insulation – denser than standard fiberglass and keeps out more noise. Bonuses: No itchiness, no toxic fumes, despite starched cottony feel and boric smell. Reduces denim waste and uses less energy than fiberglass production. Nice shade of blue. As Liat Margolis, of New York City's Material Connexion, says: "It replaces the conventional material... and nothing out there looks like it. So from a design perspective, it is exciting." Problems: The plastic fiber and borates aren't recycled. Price: About 30% more than typical fiberglass insulation.

[www.bondedlogic.com](http://www.bondedlogic.com)

#### Natural Polymers

Cargill Dow has invented a new technology to produce performance polymers entirely from annually renewable resources. Using a patented technology, they start with natural sugars (derived from plants such as corn, wheat, beets and rice) and use fermentation to create lactic acid (a food additive) and some simple refining steps to create polylactide polymers (PLA). The result is the only commercially viable polymer to combine performance and cost competitiveness with outstanding environmental benefits. Cargill Dow makes polymers from annually renewable resources that can be used in packaging, fibers, and other emerging applications. To meet the demand for PLA from the NatureWorks process, they built a plant in Blair, Nebraska with a capacity of 140,000 metric tons in 2002.

[www.natureworkslc.com](http://www.natureworkslc.com)

#### Palm Fiberboard

Malaysia supplies 50 percent of the world's palm oil, a raw material in high demand for the food processing and chemical industries. In this country, palm trees flourish on nearly eight percent of the land. Their fruit is roughly the size of a plum and grows in umbels. It is harvested every two months for the production of oil. In addition to the stripped fruit stalks, palm leaves and parts of the tree trunk make up the large quantities of waste left behind in the oil production process. Yet these materials are too valuable a resource to merely throw away or burn. Scientists at the Fraunhofer Institute for Wood Research, Wilhelm Klauwitz Institute, WKI, have been cooperating with the Malaysian Palm Oil Board to investigate ways of using this vast volume of fibrous waste. The conclusion: the fibers have been found to be highly suitable for the manufacture of fiberboard for the construction and furniture industries. "The first experimental investigations quickly showed that the various residual materials have the right attributes for being processed to make medium-density fiberboard – MDF," reports engineer Volker Thole of the WKI. The residual materials are crushed and then pulped into fibrous material in a thermomechanical process. Steam heats the fibers and then the soft raw material is ground in a refiner. Finally, adhesive is added and the material is hotpressed to achieve the desired density and final solid form of the fiberboard.

[www.fraunhofer.de/fhg/EN/index.jsp](http://www.fraunhofer.de/fhg/EN/index.jsp)

#### PANELITE

PANELITE panels use a sandwich construction typically exploited in the aerospace industry for its high strength to weight ratio and excellent resistance to deflection. The structural honeycomb core provides strength and consistent rigidity at a very low density: when bonded to similarly light-

weight facings, every honeycomb cell wall acts like the web of an I-beam, forming an extremely strong, stiff yet light-weight composite panel. Panelite promotes resource conservation because they are a strong and durable alternative to precious natural resources and their manufacture draws minimally on natural resources. They also promote minimal and efficient construction (since they are strong and light-weight), and can be broken down into recyclable components (PANELITE is currently developing a "Re-Generation" program designed to reclaim any re-usable PANELITE panel for re-use or recycling).

[www.e-panelite.com](http://www.e-panelite.com)

#### Phenolic Architectural Panels

Trespa Meteon is an extremely weather resistant panel material, unaffected by sunlight, rain – including "acid rain" – or moisture. The phenolic-based material is also highly impact resistant, and the surface of the panel has a closed structure, which does not attract dirt and makes deliberate defacing difficult. The fire behavior of the panel material is safe – it does not melt, drip or explode and retains its stability for a long time. Furthermore, Trespa Meteon is easy to work with and simple to maintain. There's no need to paint, finish or cover the surfaces or cut edges. Sawing, drilling and tooling can be carried out with standard hardwood tools. Trespa Meteon is available in more than 50 colors, ranging from primary to metallic colors, with a decorative surface on one or both sides. Trespa Meteon is supplied in three standard sheet sizes and four thicknesses. There is also a choice of grades: standard with a black core and fire retardant (FR) with brown core.

[www.trespa.com](http://www.trespa.com)

#### Plascrete

Plascrete, a substitute for concrete products in various applications, is a structurally robust, environmentally friendly new industry based on Plasagg; the ideal substitute for mineral aggregate. Plascrete is a novel cementitious composition comprising plastic (preferably a heterogeneous mix of plastic diverted from the waste stream) with, or in certain compositions without, sand bound together with ordinary portland cement. Plascrete is between one third to one half the weight lighter than concrete of the same mix. The density of Plascrete is in the range of 0.9 to 1.9 tons per cubic meter while the density of standard concrete is in the range of 2.4 to 2.8 tons per cubic meter. Some Plascrete compositions give a density of less than 1.0 ton per cubic meter. This composition will float on water. The unconfined compressive strength of Plascrete is essentially the same as standard concrete. Plascrete has strong flexural strength. Plascrete has superior impact and shatter resistance. Plascrete can be nailed using standard nails, drilled with standard drill bits (not hardened), and is easier to cut using conventional concrete cutting methods.

#### Plasphalt

Along with pitch, lime, and gravel, this 2-mile stretch of I-25 in New Mexico is reinforced with another ingredient: plastic. Purple flecks from a toothbrush here, a bit of green tubing there. Gary Fishback and Erik Bowers of Albuquerque's TEWA Technology are paving the nation's roads with plasphalt – a proprietary mix of asphalt and recycled plastic. Though plasphalt costs 10 percent more than the straight alternative, it lasts 25 percent longer. Plus, it diverts 27 percent of all waste from landfill to highway. Right now, TEWA's best local suppliers are Philips Semiconductors, Intel, Coca-Cola, and Sandia National Laboratories.

[www.wired.com/wired/archive/10.02/eword.html?pg=5](http://www.wired.com/wired/archive/10.02/eword.html?pg=5)

#### Plastic Mirror

Andy Ouderkirk and fellow 3M scientist Mike Weber were zapping polymers with powerful lasers as part of a materials science experiment when Ouderkirk realized he could bind together hundreds of sheets of polymer film to create a highly reflective material. The resulting plastic mirror is much cheaper to produce than the traditional vacuum-coated glass variety. And it reflects light waves from across the spectrum: because the film doesn't absorb infrared, it can be used as an invisible window coating, screening out solar rays without blocking any visible light and radio waves, as metallic screens do. 3M plans to launch its first plastic-mirror products later this year. "There's an incredible breadth of apps," says Ouderkirk. "We're having a good time exploring."

[www.3m.com](http://www.3m.com)

#### Poyal

Poyal is produced from manufacturing overruns that were once discarded directly into landfills. The extra polystyrene and aluminum (hence the name Poyal) from the production of yogurt containers are heated and compressed into a solid sheet. As the sheet hardens, the aluminum

slivers begin to stratify and impart rigidity to the material. The resulting solid surface material is attractive, tough and weatherproof. It is ideal for tabletops, shower surrounds, transaction counters, and any application that is appropriate for solid surface material. It is heat resistant and food-safe. Polyal is available in several colors and thickness. Each piece is unique because the foil and original flavor of the container determine its characteristics. Polyal can be cut, drilled and shaped like any other solid surface material. For furniture and tabletops, it can be supplied to size in rectangles, rounds and boat shapes as well as having various edge treatments effected at the factory.

[www.wertstofftechnik.de/home.htm](http://www.wertstofftechnik.de/home.htm)

#### Quartzite Stone

Cambria manufactures engineered quartzite stone which is 93% pure quartz crystal united with a polyester resin binder. Cambria quartz requires no sealing, polishing or conditioning, and costs roughly 20% less than stone. Using natural pigments and advanced technology allows the manufacturers of Cambria to produce a wide range of color choices not available in natural granite and marble tiles extracted from the earth.

[www.cambriausa.com](http://www.cambriausa.com)

#### Recycled Aluminum Solid Surface

Alchemy is a new recycled solid material designed for decorative furniture and counter top surface applications. A result of blending salvaged aluminum waste, fillers and pigments in a monomer base, it is a product of beauty, strength and durability. Alchemy is offered in 1/2" or 3/4" thickness and is produced in custom sheet dimensions up to 36" by 120". The standard surface is textured. Sheets may be cut, shaped and sanded to achieve a variety of finishes from dull to high gloss, similar to other conventional solid surface materials. As Alchemy is currently being tested for product rating and classification, it is only recommended for use as furniture and other decorative surface applications. Test results and classification data will be provided as soon as available.

#### Recycled Billboard Bags

Vinyl billboards are used nationwide as temporary banner advertisements and are usually discarded into landfills where they create toxic pollution. Upset by this wasteful practice, Nicola Freegard and Robin Janson founded Vy & Elle in 2002 in order to transform this landfill-bound material into durable and vibrant products. The strength of PVC vinyl makes it an ideal material for reuse, and because of the different images printed on the vinyl, it's even more interesting as a fabric. The material offers colorful graphics that take urban art into everyday living. Each bag and accessory item Vy & Elle makes is unique: with random colors and designs, every product made is different, offering a chance to carry a piece of art on a shoulder, in a pocketbook or in the home. In 2006, Vy & Elle entered into an exclusive supplier licensing agreement with MMT for the supply of its billboard needs. MMT is the undisputed leader in the development of large, photographic digital graphics, and they emerged in 1987 with an innovative computer technology that replaced slower, less exact conventional methods. MMT's national reach has enhanced vinyl pick-up and deliveries, and their relationships with well-known brands have broadened Vy & Elle's palette of products.

[www.vyandelle.com](http://www.vyandelle.com)

#### Recycled Glass Bricks

Hot Recycled Glass in Bellingham, Washington manufactures glass bricks using 100% recycled glass. The bricks are perfectly clear, which is unusual given that recycled glass has a greenish tint following the second processing. The bricks are 7 7/8" x 4 1/8" x 7/8" in size, and are available in a range of surface textures and patterns, each of which manipulate light in different ways.

#### Recycled Glass Insulation

Insulation materials used for sound insulation, as thermal cladding and in fire prevention play an important role in modern building. Ever since asbestos and a number of other building materials were identified as hazardous, demand has continually grown for non-fibrous building materials that do not present any risk to health. Researchers at the Fraunhofer Institute for Building Physics IBP in Stuttgart have developed the fiber-free material, REAPOR. It is waterproof, fireproof, and even resistant to acid attack. It is extremely stable and at the same time light in weight, it insulates against heat and cold, and absorbs sound. Furthermore, it is extremely environment-friendly. It is made of 90% recycled glass, and can itself be recycled in its entirety. To round off its merits - it is easy to machine, to saw or to drill. REAPOR's basic material is the granular

expanded glass Liaver, a spherical and lightweight building material made from recycled glass. It has already found uses in building, for example as an additive to mortar or plaster to reduce material density and thereby weight. In the production of REAPOR, the granular expanded glass is sintered. The tiny spheres of glass are heated and certain agents added. At the points where the Liaver spheres touch, extremely stable bonds or sintering necks are generated.

[www.fraunhofer.de/fhg/EN/index.jsp](http://www.fraunhofer.de/fhg/EN/index.jsp)

#### Rubber Sidewalks

Concrete sidewalks are uplifted by tree roots, and trees struggling for air and water develop large and invasive root systems below concrete. Rubber sidewalks are made of 100% recycled California tire rubber. Each square foot utilizes the rubber from one passenger tire. Tree roots grow less invasively beneath rubber sidewalks, offering a new strategy for sidewalk maintenance. The modularity of rubber sidewalks allows tree roots to be periodically inspected and trimmed. Easy and economical to install, rubber sidewalks are available in 2' x 2.5' x 1.875" sheets and five different colors. They are pervious, allowing drainage at module seams, are flame resistant, non-toxic, and meet ADA requirements for slip resistance.

[www.rubbersidewalks.com](http://www.rubbersidewalks.com)

#### ShetkaStone

Recycling paper is often just about creating more paper, but a Minnesotan company by the name of All Paper Recycling has been taking recycled paper and converting it into a versatile new building material called ShetkaStone. Completely made from all types of recycled paper (including waxed paper, glossy paper, and magazines), plants, and cloth fibers ShetkaStone can be used to create anything from doors, counter tops, benches, molding, soap dishes, and more. Created by Stanly J. Shetka, president of All Paper Recycling, Inc., the patented process involved in creating ShetkaStone creates a slurry made of the pre and post consumer waste which is then formed into the hardened product. Due to its recycled content, ShetkaStone has a 100% sustainable life cycle. Both the waste created in the manufacturing process as well as products that have become damaged or reached the end of the cycle can go back into the manufacturing process at ShetkaStone. Paper products account for 40% of the solid waste in the US, and only a small portion (white and newspaper) are actually being recycled. The mission of All Paper Recycling, Inc. is "to reduce pre-consumer and post consumer waste through the creation of environmentally responsible products and building materials made from wastepaper, cloth or plant fiber."

[www.shetkastone.com](http://www.shetkastone.com)

#### Silver Screen

Silver Screen is a new architectural material comprised of a two-millimeter layer of technical quality glass beads adhered to an aluminum composite material that is painted with a durable fluorocarbon white topcoat. The reflective glass spheres can be under laid with custom colors, logos, or graphics. The standard sheet size is 60" x 108" x 3/16", and panels may be framed in an anodized aluminum extrusion.

[www.forms-surfaces.com](http://www.forms-surfaces.com)

#### Skatelite

Rainier Richlite produces phenolic sheets for aerospace tooling, commercial food service, marine, materials handling, and skateboard ramps. Their products Richlite, Whalelite, and now Skatelite, consist of many layers of paper from certified managed forests impregnated with a low-v.o.c. phenolic binder. The result is an incredibly dense, smooth, and durable product which may be modified with conventional woodworking tools. The aircraft industry was the first to capitalize on Richlite as a superior tooling material, and the food service industry broadly acknowledges that Richlite makes the world's best cutting boards and work surfaces. Growing demand in the boating industry for non-rotting, stronger materials precipitated a venture into the marine market with Whalelite. Skatelite has been recognized as the long-sought solution to problems of wear, rot, heat, maintenance, performance, etc. in high-wear exterior applications such as skateparks. Skatelite is available in 5' x 12' panels and has a 30,000 psi compressive strength. Logos may be printed directly onto the material and will not wear off. Skatelite is fire resistant and self-extinguishes even under intense flames. Skatelite is also unaffected by paint thinners and chemicals, and maintains its smooth finish even after graffiti removal. Skatelite is long-lasting despite excessive use and punishing weather conditions.

[www.skatelite.com/home.html](http://www.skatelite.com/home.html)

### Strawboard

Headquartered in Elie, Manitoba, Canada, Isobord Enterprises Inc. manufactures Isobord, a premium engineered strawboard product. Made from finely-chopped wheat straw and nonformaldehyde resins, Isobord is an environmentally friendly product used in the construction of furniture, cabinetry, countertops and case good items. Isobord Enterprises Inc. began operations in 1998 with the production of 4-foot by 8-foot Isobord panels in a variety of thicknesses. The formaldehyde-free product immediately caught the attention of furniture, cabinetry and countertop manufacturers for use as a component product. Isobord's ability to hold lamination, paints and veneers has made it a sought-after environmentally friendly product by industries worldwide. Isobord Enterprises also produces several products that are sold directly to consumers in home improvement retail locations throughout North America. The environmentally friendly products currently available to consumers include Shelfbord shelving products; Storagebord attic storage system panels; and, Isounderlay underlayment panels for flooring applications.

[www.dow.com/bioprod/index.htm](http://www.dow.com/bioprod/index.htm)

### Soy Polymer

At first glance you would be forgiven for thinking this is (a petrochemical) plastic. It also behaves similarly to plastic and the manufacturers are currently investigating the potential to vacuum form this range of bio-polymers. There are numerous advantages that this material has over conventional plastics. It comes from a renewable resource, can be processed at lower temperatures, toxin free production and of course its 100% biodegradable. The only downside may be related to durability.

### Stratified Wood Panels

Parklex is a timber that has undergone a physical and chemical process that creates a material with excellent thermal and mechanical performance levels. The Parklex line includes: Parklex 1000 - Stratified panel; Parklex 500 - Stratified panel for internal use; Parklex 2000 - Floating floor; Parklex 3000 - Raised floor finish; and Parklex Encimeras - Bathrooms and Kitchens. The Parklex 1000 is a stratified high-density timber panel, formed internally with kraft paper or wood fibres treated with phenolic thermoset resins and compressed at high pressure and temperatures. Parklex 1000 may be used externally or internally, and is generally fastened onto a metal or timber batten structure, providing a decorative finish that also acts as a rain screen. The surface is always 100% natural wood and has been developed to withstand the special demands of environments exposed to the elements, where it is subjected to the action of atmospheric agents such as rain, extreme sunlight, wind, snow, etc.

[www.parklex.com/index\\_ing.htm](http://www.parklex.com/index_ing.htm)

### Suspensions

Suspensions is a new product which consists of layers of handmade translucent wall coverings and fabrics that are suspended within panels of clear high-impact polyester resin. Each layer is hand laid and finished with a variety of textures, and thus each piece is unique. The panels can be used for everything from walls, furniture and case goods to lighting fixtures and window treatments.

[www.cannonbullock.com/SUSPENSIONS](http://www.cannonbullock.com/SUSPENSIONS)

### Syndecrete

Syndecrete is a solid surfacing material (precast lightweight concrete material) developed by Architect David Hertz at Syndesis, Inc. as an alternative to limited or nonrenewable natural materials such as wood and stone, and synthetic petroleum based solid and laminating materials. Syndecrete is a restorative product, reconstituting materials extracted from society's waste stream to create a new, highly valued product. The advanced cement-based composite contains natural minerals and recycled materials from industry and post consumer goods which contain up to 41% recycled content. Such materials include metal shavings, plastic regrinds, recycled glass chips and scrap wood chips to name a few. These materials are used as decorative aggregates, creating a contemporary reinterpretation of the Italian tradition of Terrazzo. Syndecrete is less than half the weight with twice the compressive strength of normal concrete and is available in a variety of densities ranging from 35 - 100 lbs/c.f. For more information about concrete and the environment, read A Material for a Finite Planet, a paper presented to the Portland Cement Association conference on sustainability in Las Vegas, 1994 and the Architects, Designers and Planners for Social Responsibility conference on ecology in 1995 held at SCI-Arc, the Southern California Institute of Architecture.

[www.syndesisinc.com/index-syndecrete.html](http://www.syndesisinc.com/index-syndecrete.html)

### Textile Wallpaper

Gathering unexpected inspirations, Tracy Kendall rethinks wallpaper. Tracy Kendall's wallcoverings generate their own patterns from shadow and light. They have textures that sigh audibly in a breeze or click like ice cubes in a tumbler. Using hand-sewn sequins and crystals, hand-cut paper, and bold but simple graphics, the London designer has become a pivotal figure in the current renaissance of British wallpaper. "Tracy's work is moving in a new direction entirely," design historian Lesley Jackson says, "treating paper more like a textile, weaving it, or creating 3-D effects by manipulating and involving the paper. That in its own right is completely new."

[www.tracykendall.com](http://www.tracykendall.com)

### Thin-Film Photovoltaics

Photovoltaic (PV) modules, also called "solar panels," have come a long way since the '80s, when the best words to describe them were: clunky, heavy, rigid, and awkward. Today, PV modules have evolved to become graceful, flexible, elegant architectural design elements. This evolution has been driven by new thin film PV material technologies. Crystalline silicon PV is the standard technology for producing solar electricity. Each cell contains doped silicon material which captures light wavelengths to convert sunlight into electricity. Silicon sheds electrons when exposed to sunlight, creating an electrical charge that can be "harvested" and used. A new breed of PV solar module, produced exclusively by Iowa Thin Film Technologies using DuPont Tefzel high performance thin fluoropolymer film as an encapsulant, is helping architects explore ways to integrate this technology into their structural designs. Architect Nicholas Goldsmith, FAIA, of FTL Happold, New York, recently incorporated the aesthetic and environmental advantages of Solar power-producing systems into a tent-like pavilion with a thin film PV membrane which diffuses sunlight into fine, speckled patterns, and allows air to vent. Goldsmith believes this is the first time solar cells have been used in a tensile structure.

[www.dupont.com/teflon/films/next-gen.html](http://www.dupont.com/teflon/films/next-gen.html)

### Translucent Fabric

Libby Kowalski has produced the first fabric made from completely clear extruded polymer yarn. The resulting aesthetic is similar to woven drawn glass. So-called Krystal Weave comes in 54" wide sheets, and is available in clear and translucent designs. It can be used as a fabric or in a laminate form which may be produced in varying thicknesses, finishes and colors. Fabric uses include window coverings, room dividers, shower curtains and pillows (from \$65 yd).

[www.kovatextiles.com](http://www.kovatextiles.com)

### Varia

3form's Varia encapsulates colorful hand-made papers, metal screens and woven mesh within specially engineered, high-performance translucent resin, which itself can be embossed with a variety of molds. A green product from the beginning, Varia is produced in a clean and environmentally friendly process and is a recyclable material—fire rated for use in interiors with half the weight and 40 times the impact strength of glass. Varia also outperforms all acrylic resin-based products—it will not shatter, crack or discolor and can be contour heat-draped to any form. Sheets can be easily drilled and custom cut to size and shape on site, saving time and money on fabrication and installation. Varia can be used for partitions, cladding, tabletops, and even flooring. With full in-house fabrication and rapid prototyping capabilities, 3form gives designers fast sampling and technical support.

[www.3-form.com](http://www.3-form.com)

### Wood-Faced Panels

Prodema S.A. offers natural wood-faced external cladding products which have evolved from the manufacture of composite boards developed in the 1960's from paper, resins and wood. They have a variety of high-density panels composed of a thermosetting phenolic resinbonded cellulose fiber core, faced with natural wood that has been coated with an acrylic resin-PVDF protective finish, which ensures a panel colour fastness of 3-4 after a 3000-hour xenon lamp test. Prodema panels are also specially designed to resist attacks by chemicals (anti-graffiti).

[www.prodema.com/Ingles/Presentacion.html](http://www.prodema.com/Ingles/Presentacion.html)

### Woven Resin

Xorel Surfaces are woven high-tech resins that look like textiles but are durable and as easy to clean as laminates. Created by thermofusing PETG (a polyester resin) with Xorel, the end result is a tactile, hard surface that is durable, cleanable and environmentally sound with no chlorine

content or plasticizers. Because the textile is the surface, each pattern and color is as vibrant, tactile and dimensional as the fabric it is crafted from. Depending on the pattern chosen, it can be translucent or opaque and the surface can be embossed or textured with different patterns. The material itself can be drilled, cut, bent, tapped into and heat draped, and comes in 4' x 8' sheets in six gauges, with pricing ranging between \$416 and \$960.  
[www.carnegiefabrics.com](http://www.carnegiefabrics.com)

## INTELLIGENT

Materials that are designed to improve their environment and which take inspiration from biological systems.

### Beams/ Columns

#### Advanced Structural Fabrication

TriPyramid was founded in 1989 to bring new technologies and materials to architectural projects, in response to a growing desire for structural tension elements that are elegant, unobtrusive, strong and efficient. TriPyramid's founders had significant design and metallurgical experience from their work on America's Cup yacht rigging, and have applied these technologies and aesthetics to glass walls, sculptures, skylights, stairs, memorials, and residences. TriPyramid's clients are architects, structural engineers, contractors, and artists. TriPyramid's engineers work in close collaboration with the client in developing solutions that will realize and enhance the architect's vision. TriPyramid's clients are architects, artists, and structural engineers. On a specific project, TriPyramid enters a collaborative design relationship with the architect/artist and his structural engineer, before the manufacturing phase. TriPyramid then manufactures the stainless steel and other hardware as called for in design specifications. TriPyramid's impressive portfolio includes work on the Tokyo International Forum, the New York Museum of Natural History Planetarium, the Corning Glass Center, and several of glass artist James Carpenter's designs.  
[www.tripyramid.com](http://www.tripyramid.com)

#### Alog

Alog is a modular shelving system made from MDF and ash which features a wall-mounted modular block and easily detachable shelves that require no fittings. The nature of the design allows for various combinations and compositions of shelves, allowing the user to create his/her own customized system. Developed by Johannes Herbertsson & Karl Henrik Rennstam, the design has strong roots in the language of graphic design and functions as both shelving and a visual wall display. Alog is 648 x 648 x 200 mm in size, and the shelving provides a playful solution to storage requirements with simplicity of use built in.  
[www.vujj.se](http://www.vujj.se)

### Glazing

#### Activ

Self-cleaning glass has been described as an impossible dream, yet Pilkington now offers Activ glass which they claim does just that. Activ's unique dual-action uses the forces of nature to help keep the glass free from organic dirt, providing not only the practical benefit of less cleaning, but also clearer, better-looking windows. Pilkington Activ is an ordinary glass with a special surface on the outside that exhibits the unique dual-action. Once exposed to daylight, the surface chemically reacts in two ways: First, it breaks down any organic dirt deposits and second, rain water 'sheets' down the glass to wash the loosened dirt away. From certain angles Activ has a slightly greater mirror effect than ordinary glass, with a faint blue tint. Otherwise, the glass is just like any other. The PhotoActiv surface is an integral part of the glass itself, so it can only be affected if the glass itself is damaged; for example, by pointed objects, abrasive cleaners or steel wool. Tests have also shown it will not flake off or discolor, and the surface should last as long as the glass itself. The surface contains harmless chemical substances already found in the home, in such things as toothpaste and paint. In fact, with only small amounts of cleaning agents needed, Activ self-cleaning glass is supposedly kinder to the environment than ordinary glass.  
[www.pilkington.com/international+products/activ/usa/english/default.htm](http://www.pilkington.com/international+products/activ/usa/english/default.htm)

#### Embedded Air Graphics

Vector Glass combines the the precision of digital fabrication with the serendipity of handmade, kiln-formed glass. PadLAB works with architects and clients to translate vector patterns, drawings, text, and logos into custom-made panels of glass that contain controlled air-bubble imagery. The process begins by digitally incising the desired vector graphic into sheets of glass, which are

layered and then fused into a uniform panel, indelibly trapping controlled air bubbles within the glass. The glass panels can be side lit to highlight the air-bubble images, patterns, and/or text frozen within the glass.

[www.padlab.com](http://www.padlab.com)

#### IQ Glass

IQ Glass transforms the cold surface of glass into a source of heating. Connected to the electrical wiring concealed within the walls of the room and frame of the window, IQ Glass heats spaces with radiant heat – a healthy, sumptuous heat comparable to that of the sun, minus UV rays. In single family residences, IQ Glass windows may be used as the sole heating source for an entire home. Suitable for both retrofitting and new construction, IQ Glass can easily be installed in windows, doors, ceilings, walls, pools, and aquariums. The IQ Glass heating system is connected to and controlled by its own thermostat, although it may be connected to any thermostat on the market. IQ Glass may even be controlled remotely, such as from one's computer or car. A microprocessor option regulates the glass temperature at all times, ensuring optimal energy conservation. A variety of glass and accompanying features are available. IQ Glass is guaranteed against moisture or condensation build up, as well as against an assimilation of dust particles in between the panes.

[www.iqglass.com](http://www.iqglass.com)

#### Light-Diffusing Glass

OKALUX produces even room illumination without hard shadows. The light-diffusing property of OKALUX is based on a light-fast capillary plate located in the space between the panes. OKALUX can also be produced as curved glass or as OKALUX look-alike opaque panels. OKATECH is an insulating glass in the intermediate space of which many different designs of wire mesh are integrated as design elements with variable functions. The use of wire mesh focuses attention not only on functional but also on aesthetic aspects. KAPILUX is an insulating glass with an integrated capillary slab consisting of a large number of honey-comb structured thin-walled transparent or white capillaries. This capillary slab can be integrated into the most different kinds of insulating glass, resulting in a very good light diffusion. OKASOLAR is a light-directing solar control insulating glass incorporating a panel of highly reflective louvre blades within the unit cavity. Depending on the technical requirements of the project, different louvre positions can be selected. Depending on the geographical orientation and inclination of the glass panes, solar control can be achieved according to the time of year and the time of day.

[www.okalux.de/Okalux\\_2003/englisch/frames\\_e.html](http://www.okalux.de/Okalux_2003/englisch/frames_e.html)

## Lighting

### Cielos

Conventional luminous ceilings actually use relatively little lighting technology. They rely exclusively on a maximum clearance between lamp and difusser – typically 300 to 700 mm – in order to produce uniform illumination, and rarely offer many color options. Cielos is a multi-colored luminous ceiling system comprised by the lowest-profile, wide-area luminaires available. Cielos meets all the functional requirements of a luminous ceiling within a 70 to 150 mm depth, and the lighting extends all the way to the edge of the luminaire. Every module is a self-contained luminaire element, fully equipped with ballasts and a double-diffuser chamber. Light is actually diffused twice: first in a diffuser layer with backing, then in the safety glass with a visually high-grade finish. The problem of eliminating any unwanted greenish hue is solved with high-grade iron-free glass. Using glass also prevents aging and solves the problem of fire-load regulations.

[www.zumtobel.com/com/en/default.htm](http://www.zumtobel.com/com/en/default.htm)

#### Low-Voltage LED Light

A light emitting diode is an electronic component that converts electrical energy into light or infrared radiation in the range of 550 nm (green light) to 1300 nm (infrared). An LED is made of semiconductor material, such as gallium arsenide phosphide, that glows when electricity is passed through it. (The first digital watches and calculators had LED displays, but many later models use liquid-crystal displays.) Although LED technology has not historically possessed the necessary intensity appropriate for lighting applications, Bruck has developed a low-voltage fixture powerful enough for accent or display lighting. The benefits of LED light include: 1) little or no heat emission and 2) color control superior to neon or fiber optics. When this technology becomes commercially competitive with other forms of lighting, we may see why the president of Bruck Lighting believes it will replace other popular technologies in the near future.

[www.brucklightingsystems.com](http://www.brucklightingsystems.com)

#### Meso-Optics

Ledalite's MesoOptics technology delivers advanced optical control utilizing holographically recorded microstructures. MesoOptics can replace conventional optics in a wide range of luminaire types and lighting applications. Just as a hologram is a three-dimensional image recorded in a two-dimensional medium, MesoOptics are three-dimensional luminous distributions, or optical control effects, that are recorded holographically and reproduced as patterns of "microstructures" on the surface of a flat plane element. When light interacts with these microstructures, the recorded optical control effects are "replayed." Viewed under an electron microscope, the microstructures that form a MesoOptics diffuser appear like minute beads. As light passes through or is reflected off the microstructures, it is diffused and modified to produce controlled beam patterns ranging from circular to linear. MesoOptics microstructures are applied to the surface of a suitable substrate such as acrylic, polycarbonate or glass using conventional holographic manufacturing techniques. A reflective metallized coating is applied for MesoOptics reflectors.

[www.ledalite.com/products/meso](http://www.ledalite.com/products/meso)

#### Power Glass

XsunX has developed very thin translucent coatings and films that create large area monolithic solar cell structures. This semi-transparency makes their so-called Power Glass glazing desirable for placing over glass, plastics, and other see-through structures. Using patented processes, such as reel-to-reel manufacturing techniques and multi-terminal cell structure designs, XsunX is working to commercialize large area cell manufacturing processes for thin film flexible plastics. XsunX claims that Power Glass may provide as much as a 100% efficiency-to-cost gain over conventional opaque solar cells. This 100% gain in efficiency-to-cost is based on estimates of Power Glass solar cells operating at as much as 50% the efficiency of conventional opaque amorphous solar cells yet costing as little as 25% to produce.

[www.xsunx.com](http://www.xsunx.com)

## Mechanisms/ Substances

#### Clampology

Clampology is a family of informal objects designed to increase functionality of interior spaces. Manufactured by London-based designer Jorre van Ast of plastic and spring steel, the collection of adaptive utensils for the domestic environment include a bookend accompanied by a "book finger," a book display, a hook and a rail that clamp onto the side of horizontal surfaces, a hook to clamp onto electrical pipes, a candle holder, and a cable manager that can be clamped onto a table leg.

[www.jorrevanast.com](http://www.jorrevanast.com)

#### EcoSmart Fire

While the traditional open fireplace is appealing, it is often incompatible with modern housing and contemporary living standards and lacks the necessary environmental care, efficiency and design flexibility that consumers are looking for. The EcoSmart Fire presents a solution to these problems. The EcoSmart Fire is an Australian innovation – an environmentally friendly open fireplace. Flue-less and easily transportable, the EcoSmart Fire does not require any installation or utility connection for fuel supply, which makes it ideal for apartment and city living. Fuelled by a renewable energy (Denatured Ethanol), it burns clean and is virtually maintenance free. The fuel is housed in a stainless steel chamber called the EcoSmart Burner. The built-in regulatory mechanism allows you to regulate and extinguish the flame, which means you can manipulate the amount of heat being generated and the quantity of fuel used. The life of the fire is determined by the amount of fuel in the burner. Once the fuel is burnt there is nothing to clean or clear. EcoSmart

Fires can be free standing, wall mounted, fully fitted into a range of personalized finishes, shapes and colors or inserted into a closed-off fireplace. The burner can also be inserted into joinery to create a streamlined bench top feature. Without the need for flue or pipe connections, EcoSmart Fires offer remarkable design flexibility previously unavailable to the consumer.

[www.ecosmartfire.com](http://www.ecosmartfire.com)

#### Fabric Air Dispersion

DuctSox Fabric Air Dispersion Products present an interesting alternative to metal ductwork in open ceiling architecture applications. Manufactured in Dubuque, Iowa since the early 1980's, DuctSox can be used in virtually any environment with open architecture and an exposed ventilation system. Facilities of all types benefit from DuctSox innovative fabric air dispersion including: retail, commercial, educational, athletic, static-free, warehousing, food processing facilities and more. Because each of these facilities have different air throw requirements, DuctSox fabric air dispersion products are designed within the parameters of three air delivery methods utilizing a variety of fabrics (comfort-flow, lowthrow, and high-throw). Each method is then customized to meet the specific needs of an application.

[www.ductsox.com](http://www.ductsox.com)

#### Turbogenerator Power System

Imagine a typical summer afternoon. Your business is using electricity from the utility company to light your interior, run your climate control system, and power your equipment. At the same time, everyone else is doing the same thing. To handle peak demand periods like this, the power company's costs go straight up. So they charge you peak demand rates. This is where the Parallon 75 from Honeywell makes all the difference in the world. It's a simple, quiet generating system. It doesn't replace your local power company, and it doesn't ask you to get into the power business. Instead, it works along with the power company, as a second source of power--we call it Parallel Power--that's ready to help whenever it's needed. This self-contained system has controls that monitor the grid around the clock, and determine exactly when to start saving you money. Whenever this system can generate electricity for less than the utility company, it starts up automatically, and replaces electricity from the grid with electricity that costs much less. The Parallon 75 uses an advanced new technology that makes it the most efficient source of power. It's low-cost, fuel-efficient, low in emissions, and almost maintenance-free. There's no gearbox, and almost no internal friction. As a result, it can generate an amazingly high amount of power for a system this size: 75 kW.

#### Watercone

When on vacation from his job as a designer for BMW in Munich, Stephan Augustin enjoys traveling around Africa. On one such trip seven years ago, he was struck by how many people were in desperate need of water. He noted the huge amounts of energy consumed by desalination and purification plants in Third World countries and learned that an estimated 2.5 billion people on the planet lack consistent supplies of clean drinking water. In the years since, Augustin has been perfecting the Watercone, his invention for purifying water by the oldest method known: distillation. A cone of clear plastic set on a black tray base, the Watercone is entirely solar powered. Sunlight evaporates the water, leaving impurities behind, and the moisture that condenses on the inner surface of the cone runs down its curved edges. Flip it over and the Watercone becomes a funnel with a screw lid. If the cap gets misplaced, no worry: The lid is compatible with any standard plastic soda-bottle cap. Augustin calculates that at the latitude of Casablanca, one Watercone can provide about a liter of water a day. Several could be laid out as a miniature water farm, one for a household, hundreds for a village system. Eight Watercones stack into a standard box and two boxes fit on a Euro shipping pallet.

[www.watercone.com](http://www.watercone.com)

## Roof/ Shading

#### Terra-Cotta Façade System

Argeton Ziegelfassade is a terra cotta rain screen system developed by the German manufacturer Moding. Generally speaking, the product is a panelized brick curtain wall, and has been most visible in the recent work of Renzo Piano. Designers of the system recognized the fact that brick is currently used in building façades more often for its durability and weather protection than for its traditional qualities as a load-bearing material. The factory-produced panels consist of reinforced, stacked bricks (no grout) within zinc-hardened aluminum frames which are fastened to a back-up wall that has been previously insulated and sealed. The system is designed to shed water while allowing the cavity to 'breathe,' maintaining a consistent air pressure between the

cavity and the exterior.  
[www.argeton.com](http://www.argeton.com)

#### Texlon Roof System

The Texlon Foil System is an intelligent and dynamic cladding system that has the capability to adjust its shading, thermal, and aesthetic characteristics as the sun moves across the sky, responding to specific program and climatic requirements. Made of fluoroplastic film, Texlon is self-cleaning and will not deteriorate with UV exposure. It is designed to withstand local snow and wind loads, in addition to hail. The Texlon foil elements are stabilized by a slight overpressure between the individual layers. The air-filled elements prevent the sheets from becoming slack. Moreover, the air-filled chambers provide the roof system with its excellent thermal insulation properties. However, the system is not part of the structural system, as is the case with air-inflated buildings, where a breakdown in the air supply would cause the entire structure to collapse. With the Texlon Transparent Roof System, a breakdown in the air supply would only affect insulating properties, and the building would remain intact.

[www.foilteca.com/eng/main.html](http://www.foilteca.com/eng/main.html)

## Surfaces

#### Clear Paint

Nissan Motor Co., Ltd., has developed the world's first clear paint that repairs scratches on painted car surfaces, including scratches from car-washing machines, off-road driving and fingernails. "Scratch Guard Coat" contains a newly developed high elastic resin that helps prevent scratches from affecting the inner layers of a car's painted surface. With "Scratch Guard Coat" a car's scratched surface will return to its original state anywhere from one day to a week, depending on temperature and the depth of the scratch. The water-repellant paint also has a higher resistance to scratches compared with conventional clear paints. A vehicle painted with "Scratch Guard Coat" will have only one-fifth the abrasions caused by a car-washing machine compared with a car covered with conventional clear paint. Scratches from car-washing machines account for the majority of scratches to painted car surfaces. "Scratch Guard Coat" is effective for about three years. "Scratch Guard Coat" will be applied for the first time on an SUV model that is scheduled for a partial makeover in the near future. The paint will be applied to the car's chassis, bumpers, door mirrors, among other parts.

[www.nissan-global.com/EN/NEWS/2005/\\_STORY/051202-01-e.html](http://www.nissan-global.com/EN/NEWS/2005/_STORY/051202-01-e.html)

#### Eco-Curtain

Inaba Electric Works has developed Eco-Curtain, a wind-powered system designed for integration in building facades. The curtain, displayed here above the entrance to a shopping mall in Nagoya, Japan, demonstrates a creative solution for environmentally-friendly power generation within a dense urban environment. The structure is comprised by 775 vertical-axis windmills which should produce 7,551 kilowatt-hours annually. Inaba has also integrated solar panels at the top of the structure for increased generation capacity.

[www.inaba.com](http://www.inaba.com)

#### Digital Paper

For many years, Xerox researchers have been working on a technology to embed digital data on paper (computer screens that look and feel like sheets of paper). Today, this research has been taken up by various other companies (Intel's E-Ink, Fujitsu's bendable color E-Paper, Hitachi's LCD Paper, etc.).

[www.extremetech.com/category2/0,1695,1596236,00.asp](http://www.extremetech.com/category2/0,1695,1596236,00.asp)

#### Fiber-Cement Façade System

Eternit Switzerland is the leading European manufacturer of fiber cement facade systems for rainscreen cladding and ventilated façade applications. Swisspearl's unique formulation and revolutionary coloration processes were pioneered by Eternit Switzerland. They are the foundation of a wide facade panel range, which offers great creative freedom in the design of the facade. Swisspearl Carat is an integrally colored sheet available in several shades. Swisspearl Natura is a fiber cement sheet with a translucent coating. The smooth and semi-matt surface finish and the visible natural texture of the fiber cement impart an unrivalled expressiveness to the material. Swisspearl Xpressiv is a grey cement panel with a vivid fiber cement structure. Swisspearl Tectura has an opaque acrylic coating to resist harsh weather conditions and ultraviolet rays.

[www.swisspearl-architecture.com](http://www.swisspearl-architecture.com)

### Reben

Developed by Japan-based Suzuran Corporation, Reben is an environmentally remediating paint made from 100 percent natural ingredients. Created as a response to sick-building syndrome and poor indoor-air quality, Reben emits no harmful volatile organic compounds and actually cleans the air. The environmentally friendly coating, which means “alive” in German, is comprised of powdered Japanese washi paper, seaweed glue, scallop-shell powder, titanium dioxide, and natural pigments. Washi naturally controls humidity, absorbing moisture during the summer and releasing it during the winter. Scallop-shell powder prevents mold and bacteria growth, as well as flame-spread. Titanium dioxide acts as a photocatalyst, deodorizing the air and absorbing pollution when the paint surface is illuminated. Despite its completely natural and edible composition, Reben is a durable coating that is preferable to wallpaper. Its textured surface conveys a plasterlike richness, and it is available in a variety of textures, colors, and integrated natural grasses. Reben has no chemical glues or dyes that would negate its positive effects.

[www.ydny.com](http://www.ydny.com)

### Synthetic Gecko

Scientists at BAE Systems have created an artificial surface that grips incredibly tightly without glue or pressure. A sheet of this material just over 1 square meter could be used to suspend the weight of an average family car. Called Synthetic Gecko, the new adhesive is inspired by the gecko lizard, whose ability to scurry up vertical walls and windows has intrigued people for centuries and inspired comic book characters like Spiderman. “We wanted to mimic this ability,” said Jeff Sargent, research physicist at BAE Systems’ Advanced Technology Centre. “We recognized that a synthetic material could have tremendous engineering potential not only in our own aerospace and defense businesses, but also in other commercial applications.” The gecko gets its ability to stick without glue from the soles of its feet which are patterned with millions of tiny hairs with split ends. At the tip of each split is a mushroom shaped cap less than one-thousandth of a millimeter across. These ensure the gecko’s toes are always in very close contact with the surface beneath – so close that molecular forces of attraction create the grip. The grip is released by a peeling action when the animal lifts its foot to break the bond. Using their micro-engineering clean room facilities, BAE Systems’ scientists, led by Jeff Sargent and Sajad Haq, created layers comprising thousands of microscopic polyimide stalks with splayed tips, closely resembling the mushroom headed hairs on a gecko’s feet. The next step in the development program comprises further research into the influence of surface roughness and water on the adhesive properties of the material, to ensure that it is effective on a wide range of surface roughness. A number of potential business applications for Gecko have been identified, ranging from instant repair patches for holed structures such as fuel tanks and aircraft skins, access panels without fasteners or even the rapid attachment of armor panels. Synthetic Gecko could also be used for new building materials, personal safety harnesses and for super grip tires and training shoes.

[www.baesystems.com](http://www.baesystems.com)

### Interactive Ink

Inks that change color with temperature or light intensity. They can be painted on architectural surfaces.

[www.ctiinks.com](http://www.ctiinks.com)

### Maximillian’s Schell

The new vortex-shaped, outdoor installation by architects Benjamin Ball and Gaston Nogues warps the flow of space with a featherweight rendition of a celestial black hole. Hovering over the courtyard of Los Angeles-based Materials & Applications, “Maximilian’s Schell” is a spectacle the size of an apartment building that has been stopping traffic along Silver Lake Boulevard since its unveiling in June. Constructed with tinted Mylar resembling stained glass, the vortex functions as a shade structure, swirling above the outdoor gallery. Beginning development over a year ago, the designers created a project that functions as architecture, sculpture, and a “made-to-order” product. They achieved their aesthetic effects by manipulating Mylar, internally reinforced with bundled Nylon and Kevlar fibers, with a sophisticated computer controlled (CNC) cutting machine. The transparent amber-colored film offers UV-resistance through a golden metallic finish. The result is neither a tent-type membrane nor a cable net structure in the manner of Frei Otto, but a unique tensile matrix comprised of 504 different instances of a parametric component, each cut using the CNC system. As though warped by the force of gravity, the components continually change scale and shape as they approach the center or “singularity” of the piece.

[www.ball-nogues.com](http://www.ball-nogues.com)

### Microparticles

It's maybe a bit too expensive to use for the baubles on a Christmas tree, but it's already available for car owners who like to "be different": a paint that shimmers in a myriad of colors like an oil slick on a wet road. The appearance of all the colors of the rainbow is created by the interference pattern of extremely thin films applied to minute flakes. These microparticles measure less than a tenth of a millimeter across. The special properties of these tiny particles make them increasingly popular, because they can give products undreamed-of capabilities. Three Fraunhofer institutes have joined forces in the strategic alliance "Microstructured Composite Particles." Its aim is to improve the methods used to produce the tiny objects. Microparticles are used to give many materials additional, unusual properties: like the screws that stick fast when they are tightened, because the thread is coated with microcapsules containing adhesive. A familiar product is the carbonless paper used for multiple copies of forms – they contain minute encapsulated particles of ink. There are plastics with incorporated hard microparticles, which can be shaped like any other plastic but offer unusual resistance to impact. Altogether, experts estimate that the world market for micro-encapsulated products is worth around five billion US dollars per year.

[www.fraunhofer.de/fhg/EN/index.jsp](http://www.fraunhofer.de/fhg/EN/index.jsp)

### paraSITE

paraSITE proposes the appropriation of the exterior ventilation systems on existing architecture as a means for providing temporary shelter for homeless people. The paraSITE units in their idle state exist as small, collapsible packages with handles for transport by hand or on one's back. In employing this device, the user must locate the outtake ducts of a building's HVAC (Heating, Ventilation, Air Conditioning) system. The intake tube of the collapsed structure is then attached to the vent. The warm air leaving the building simultaneously inflates and heats the double membrane structure.

[www.possibleutopia.com/mike/parasite.html](http://www.possibleutopia.com/mike/parasite.html)

### Pollution-Reducing Cement

John Harrison, an Australian inventor, has developed a new cement which is based on magnesium carbonate rather than calcium carbonate, and absorbs carbon dioxide from the atmosphere. One ton of concrete made with the cement can absorb about 0.4 tons of carbon dioxide as it hardens, and tower blocks built with it could become as important as natural carbon sinks like forests and grasslands. New Scientist reports that cement-making is responsible for around 7% of total man-made CO<sub>2</sub> emissions worldwide. Harrison says his cement mixture is made at much lower temperatures – halving the amount of carbon dioxide it produces during manufacture. He also claims his version is cheaper and more durable and, during setting and hardening, a process called carbonation reabsorbs CO<sub>2</sub> from the air. Harrison says that "The Kyoto Protocol was a good effort but it got things wrong when it assumed that trees were the only things that could absorb carbon from the air. The opportunities to use carbonation processes to sequester carbon from the air are just huge. It can take conventional cements centuries or even millennia to absorb as much as eco-cements can absorb in just a few months."

[www.tececo.com](http://www.tececo.com)

### Porocom

Porocom – short for 'porous construction material' – is an environmentally friendly product that reduces noise pollution. It consists of granules of recycled materials (sintered coal ashes, clay, glass shards, eco grid and so forth) heated to about 200°C before being brought into contact with thermosetting powder paint, a residue of the manufacture of coatings. The paint quickly covers the granules, but does not completely harden at this point. The coated granules, a semi-manufactured product, are marketed as Porocom. The end product is made by sintering the granules in a mould, causing them to stick together and achieve maximum hardness.

[www.tenbergecoating.nl](http://www.tenbergecoating.nl)

### Solar Shading Systems

The intensity of direct sunlight through windows can reach 700watts/m<sup>2</sup> of glass area, causing overheating and affecting building occupants' comfort level, which can lead to reduced productivity as well as higher mechanical operating costs. Dasolas' Unisun System is designed to deal with overheating problems in new and existing buildings, and is manufactured from high grade extruded profiles using modular construction techniques. The system may be used vertically or horizontally as well as on sloping facades, with a wide selection of blade profiles. Unisun is designed to reflect diffused light through shaded windows, and the amount of diffused light depends on the color selected for blade profiles. Unisun saves on mechanical costs, with

the option for the system to be motorized and linked with building mechanical services. Unisun is designed and manufactured in compliance with relevant local building codes, and Dasolas provides full design, construction or consultancy services if needed.

[www.dasolas.dk](http://www.dasolas.dk)

#### Smog-Fighting Paint

A paint that soaks up some of the most noxious gases from vehicle exhausts will go on sale in Europe in March. Its makers hope it will give architects and town planners a new weapon in the fight against pollution. Called Ecopaint, the substance is designed to reduce levels of the nitrogen oxides, collectively known as the NO<sub>x</sub> gases, which cause respiratory problems and trigger smog production. Patents filed last week show how the novel coating works. The paint's base is polysiloxane, a silicon-based polymer. Embedded in it are spherical nanoparticles of titanium dioxide and calcium carbonate 30 nanometres wide. Because the particles are so small, the paint is clear, but pigment can be added. The first paint to go on sale will be white. The polysiloxane base is porous enough to allow NO<sub>x</sub> to diffuse through it and adhere to the titanium dioxide particles. The particles absorb ultraviolet radiation in sunlight and use this energy to convert NO<sub>x</sub> to nitric acid. The acid is then either washed away in rain, or neutralised by the alkaline calcium carbonate particles, producing harmless quantities of carbon dioxide, water and calcium nitrate, which will also wash away.

[www.newscientist.com/article.ns?id=dn4636](http://www.newscientist.com/article.ns?id=dn4636)

#### Recyclable Partition System

According to Preform Manufacturing, Decato is the most environmentally sensitive interior partition product available on the market. Over 80% of the product is from recycled, bio-based, or sustainable materials, and is virtually 100% recyclable. Core materials are totally non-toxic. Furniture component parts are available from Environmentally Friendly Industries, featuring 100% recycled content core materials and finished with biodegradable low VOC finishes. Moreover, the panels are available in any height or width, and the system is designed to accommodate almost any other manufacturer's components, including cantilever brackets, worksurfaces, shelves, upper cabinets, and paper organization systems. The system is engineered such that panels can be added or de-mounted in two minutes or less without electrical or communication interruptions. With regard to materials, Decato achieves a high tech appearance with a variety of panel materials and textures. The system makes a broad statement with its generous use of aluminum. Panel types include Acoustic, Non-Acoustic, Plexiglas, Graphic Plexiglas, Perforated Metal or Wood, and Ribbed Aluminum. Doors include Sliding Glass, Conventional Glass or Solid Core Doors - all with locksets. Privacy elements do not have to be panels - they can be Canvas Sails, or Silk Screened Images.

[www.preformpanels.com](http://www.preformpanels.com)

#### Solar PV Technologies

As global warming accelerates and our energy demands continue to rise, we have to adopt cleaner, more sustainable sources of energy. Solar PV generates electricity directly from light, whatever the weather. If every suitable roof had PV, we could generate 10,000 times more energy than the world currently uses. All PV cells have at least two layers of such semiconductors: one that is positively charged and one that is negatively charged. When light shines on the semi-conductor, the electric field across the junction between these two layers causes electricity to flow - the greater the intensity of the light, the greater the flow of electricity. Facts: If we covered a small part of the Sahara desert with PV, we could generate all the world's electricity requirements. If you install a solar PV tiled roof, you could prevent over 34 tons of greenhouse gas emissions during its lifetime. Today all TV and communication satellites are powered by PV. The earth receives a continuous power input from the sun of 200 x 10<sup>15</sup> Watts - an unimaginably huge amount of energy which completely dwarfs the capabilities of fossil fuels or nuclear fission....and it's clean and free.

[www.solarcentury.co.uk](http://www.solarcentury.co.uk)

#### Solar Wall

The Solarwall system is based on a metal (aluminum or steel) cladding that is installed on the south-facing wall of a building. The system operates in a very simple manner using economical and environmentally-benign solar energy to heat buildings. Solarwall also reduces building heat loss during the winter. All buildings lose heat to the outdoors. On the south-facing wall, heat lost to the cavity between the metal panels and the building is captured by the incoming air and returned to the building along with the heated fresh air from the Solarwall. Even at night,

a Solarwall acts to reduce building heat loss. Solarwall provides summer cooling by preventing solar radiation from striking the south wall of a building. Warm air between the Solarwall and the building rises and is ventilated through holes at the top of the cladding. This reduces cooling loads in the building. Fresh ventilation air is drawn directly into the building via bypass dampers. Solarwall has an operating efficiency of up to 75% (rated by both the Canadian and US governments). On a sunny day, the Solarwall can raise the air temperature by 30 to 76 degrees F depending on flow rate. The cost of a Solarwall solar heating system in new construction is usually less than the cost of a brick wall or even a metal-clad wall.

[www.solarwall.com/sw/solarwall.html](http://www.solarwall.com/sw/solarwall.html)

#### Spherical Solar Cells

The spherical micro solar cell is superior to the conventional plate type for its higher conversion ability and assembly flexibility. High photoelectric conversion efficiency is obtained because incident light from every direction can be utilized for the generation of electricity. Also, the cell has excellent strength and durability, with the advantage that it can be easily interconnected, which enables assembly in various modular configurations. The spherical micro solar cell is assembled in a special plastic seal. Potential applications include traffic communication, such as in vehicles; rechargeable batteries; and power supply for residential houses.

[www.kyosemi.co.jp/index\\_e.html](http://www.kyosemi.co.jp/index_e.html)

#### Transparent Solar Cells

Imagine a smart credit card that not only stores electronic money and records your transactions but also has its own energy source. Or a sun roof that delivers electricity to your car battery. Imagine each powered by flexible, ultra-thin, see-through solar panels. These scenarios may not be far off, thanks to a photovoltaic cell production process unveiled by Toshiba scientists in May at the 16th European Photovoltaic Solar Energy Conference and Exhibition in Glasgow, Scotland. The Toshiba design is an improvement to the Graetzel cell, a new type of solar panel that relies on titanium dioxide nanocrystals coated with a dye. When struck by light, the dye "injects" energized electrons into the semiconducting titanium, which generates electrical power. Graetzel cells' advantages over conventional silicon solar panels include transparency, low materials costs and the ability to operate efficiently under cloudy skies. Shuzi Hayase, a chief research scientist at Toshiba's Power Supply Materials & Devices Laboratory in Kawasaki, says the cells achieve a respectable 7.3 percent solar-energy conservation efficiency and should be easy to manufacture. "We do not need expensive production lines and sophisticated vacuum systems currently employed in the manufacture of silicon-based cells. The new cells could be manufactured by [silk-screen] printing technologies."

<http://optics.org/articles/news/6/8/3/1>

#### TX Active

TX Active is a photocatalytic cement that can reduce organic and inorganic pollutants present in the air. In a large city such as Milan, researchers have calculated that covering 15% of visible urban surfaces with products containing TX Active would enable a reduction in pollution of approximately 50%. "With what we have termed urban photocatalysis," explained Enrico Borgarello, Group Research & Development Manager, "in the presence of air and light a natural process of oxidization is created which leads to the decomposition of organic and inorganic substances present in the city. Let us take, for example, nitric oxides and dioxides, sulfur dioxides, carbon monoxide, i.e. some of the elements which we see controlled everyday by air monitoring stations: the photocatalytic reaction which occurs on the surface of the material treated with TX Active, thanks to its cement matrix transforms these pollutants into salts which have no impact on the environment and health. Laboratory tests have shown that just 3 minutes of exposure to the sun is sufficient to obtain a reduction in polluting agents of up to 75%." According to Deputy General Manager Fabrizio Donegà, who runs the Italian operations, "TX Active will initially be marketed in Italy, then in France and in the United States, and subsequently in some other of the 19 countries where the Group operates worldwide. It is an industrial project which allows us to enter the exclusive product market and which gives us the opportunity to underline that cement, which is often popularly associated with environmental decline, is in fact a very environmentally efficient product."

[www.italcementigroup.com/ENG](http://www.italcementigroup.com/ENG)

#### Ventilated Curtain Wall

To date, improvements in curtain wall weather protection have relied on attempts to develop perfect seals and multiple defenses against inevitable leakage. The result of this approach is

that virtually every curtain wall will leak; it is only a matter of when, where, and what it will cost to fix. Developed by Dr. Raymond Ting, TingWall utilizes an “air loop” principle to neutralize the effects of both wind and rain by incorporating separate air and water seals. The result is a curtain wall system that can tolerate imperfect seals anywhere in the system and still not leak. TingWall has surpassed the most rigorous AAMA standards in multiple tests, and can withstand greater seismic and wind loads than a conventional system. TingWall is designed to allow for the use of multiple facing materials without edge conflicts, and is cost competitive with so-called “stick” systems.

[www.tingwall.com](http://www.tingwall.com)

#### Water-Repelling Paint

The leaves of the lotus flower are water-repellent. After a shower of rain they immediately appear dry and clean, as water runs off them like marbles off a glass plate. Lotusan has duplicated this effect, one of nature’s own inventions which has proved itself over millions of years, in a new silicone facade paint. Lotusan combines the well-known water-repellent properties of silicone paints with a surface micro-structure based on the lotus leaf. This considerably reduces the contact area for water and dirt, and adhesion is also greatly reduced. The result is that dirt is repelled by water droplets and facades stay dry and clean – even highly stressed weather-exposed facades. The lotus effect was discovered by Prof. Dr Wilhelm Barthlott of Bonn University, a scientific achievement in the field of biology which created a worldwide sensation.

#### Wind Sculptures

Ned Kahn is an accomplished North California sculptor who deploys materials in order to celebrate and amplify natural forces. His large-scale wind installations, which have names like Wind Portal, Technorama Facade, and Fragmented Sea, utilize vast arrays panels made of aluminum, steel, and other materials to shimmer and dance in the breeze, allowing the natural environment to influence the design. In Articulated Cloud, for example, thousands of 9-inch squares of perforated aluminum are mounted on low friction hinges so that the entire surface of the facade responds to the wind. Each moving panel is perforated with thousands of different sized holes that, when viewed from a distance, create a photographic mosaic of sand dune images. When sunlight passes through the screens, intricate shadow images of the dunes are projected onto the walls and floor of the building lobby.

<http://nedkahn.com/wind.html>

## TRANSFORMATIONAL

Materials which undergo a physical morphosis based on environmental stimuli.

### Glazing

#### Lumisty Film

Lumisty first drew widespread attention when it was used on the windows of Pleats Please, Issey Miyake’s clothing boutique in SoHo. Since then many of the world’s top designers and architects have opted to put the film at the service of their own rich imaginations, and the results have been stunning. Lumisty’s applications range from museums, hotels, banks, restaurants, and bars, to storefronts, conference rooms, trade show exhibits—and even bathrooms. If you’ve seen Lumisty in action you’ve experienced the unexpected visual sensation it creates. Upon first encountering the product, people are often struck by what they think is an optical illusion. Walking past a window with Lumisty applied, a perfectly clear, transparent glass surface becomes, in a step or two, partially fogged. Two or three steps later, the same window is completely fogged. Walk backward or forward, and it’s clear again. As the viewer’s angle shifts, so does the transparency or translucency of the film.

[www.lumistyfilm.com/lumisty.htm](http://www.lumistyfilm.com/lumisty.htm)

#### SmartGlass

Suspended Particle Device (SPD) technology is a “switchable” light-control technology that has numerous performance and cost advantages over other technologies. SPD-Smart products allow you to instantly and precisely control how clear or dark glass or plastic is, and to easily adjust the light transmission of the product manually or automatically. This is made possible by a thin, flexible SPD film invented by Research Frontiers. Available as a film or already incorporated into glass, SPD film can be easily adapted to a variety of products that people use every day, such as architectural windows, automotive windows, sunglasses, display screens for laptop computers, cellular telephones, instrument panels, electronic games and point-of-purchase and advertising

displays, billboards and road signs.  
[www.refr-spd.com](http://www.refr-spd.com)

#### Thermotropic Cast Resin Glass

Our longing for summer and sunshine has not been answered too often this year. But no sooner do the sun's rays make their way through the clouds, complaints abound about the heat and dazzling light this generates in our modern glass buildings. Venetian blinds, shutter blinds and curtains are rolled up and down, pulled from left to right. A markedly more elegant and less bothersome solution is provided by windows that automatically produce their own shade. Researchers at the Fraunhofer Institute for Building Physics IBP, Stuttgart, under contract to industry, are developing window panes which transform to a milky white when temperatures reach a certain level, thus serving as protection from the sun. Dr. Holger Gödeke, an engineer at the IBP, explains, "The goal of our work was to find a thermotropic system that could be easily produced and thus compete with conventional mechanical sun-shade installations." The outcome is T-OPAL®, a cast resin glass with an integrated polymer layer. "Cast resin glass has long been used in fire and sound insulation. In order to provide protection against the sun, the production method is slightly altered," Gödeke explains. "The polymer is poured between two panes of glass as a thin liquid mass. When exposed to UV rays the polymers turn into a solid mass."

[www.fraunhofer.de/fhg/EN/index.jsp](http://www.fraunhofer.de/fhg/EN/index.jsp)

## Lighting

#### Electroluminescent Wire

Electroluminescent Wire consists of a concentric series of layers, each performing a different function. In the center is a solid copper conductor, which is coated with an electroluminescent phosphor. Two very fine wires are wrapped around the phosphor. A clear or colored plastic sheath comes next, and a second plastic sheath surrounds the first. The functions of each of these layers are as follows: The center copper conductor and the two fine wires together supply power. The copper conductor also provides a small amount of mechanical rigidity, and is used as a substrate upon which to deposit the phosphor. The phosphor is the key element of Elwire; it emits light when subjected to an AC field. The inner plastic sheath protects the phosphor and in some cases is used to filter the light produced by the phosphor, emphasizing certain colors. The outer plastic sheath provides further protection. Many phosphors are highly sensitive to moisture; the two sheaths together provide good protection against infiltration. EL wire can be driven by any AC source. Power is applied between the inner conductor and the two outer wires (which are tied together). This applies an AC field across the phosphor, causing it to glow. A high voltage in the range of 100V is required to make the wire glow brightly.

[www.elwire.com](http://www.elwire.com)

#### Hanabi

Like the Lotus flower, which opens its petals in the presence of the sun and closes them in its absence, Hanabi opens its lamp-shade "petals" when its bulb is turned on and closes them after it has been shut off. Representing an innovative use of shape-memory alloy, the heat of the bulb makes the metal "bloom" whenever the fixture is illuminated. Hanabi is the Japanese word for fireworks and literally means flower fire. Like its namesake, the Hanabi light flickers between beauty and disappearance, embodying the Japanese appreciation of ephemerality.

[www.nendo.jp/en](http://www.nendo.jp/en)

#### Illuminated Flooring

Munich-based Leuchtboden has unveiled an extra-thin, heavy-duty illuminated floor with long-life 12V lamps. Ideal for retail, exhibition, or entertainment applications, one meter of illuminated flooring can carry 4 tons. The floor material is available in 60 x 60 x 2 cm modules, and the bulbs last 50,000 hours.

[www.stiers.de/frame\\_lb.html](http://www.stiers.de/frame_lb.html)

#### Illuminated Tiles

Rogier Sterk has developed two products which consist of illuminated tiles, Tiled Wall and Lightfloor. The Tiled Wall consists of basic ceramic tiles and fluorescent lighting. A mechanism behind each tile allows the tiles to be pressed and depressed, one at a time. A tile left untouched conceals the light behind it, except around its edges. Pushing in a tile allows the light to shine across its surface and thus to emit a reflection into the surrounding space. The abundance of tiles provides an opportunity to create countless patterns of light. So far the design is unique and production is limited, which means it is custom made. The design is modular so basically

there are no limitations to wall size. You can use any tile, with a preferable standard size of 15 x15 cm, in any color. Total costs for a square meter with mechanisms are estimated at 1150 euro, excluding installation cost. It is also possible to make a fixed light pattern, leaving out the mechanisms, making the design more affordable.

#### Light-Emitting Polymer

Make way for the dawn of light-emitting plastics. Twenty years in development, conductive and semiconductive polymers are coming out of the lab. Polymer emissive displays promise full color and high contrast at a very low price. First app: Organic LED cell phone displays fast enough to support full-motion video.

[www.ilight.com](http://www.ilight.com)

#### Solar Light

"Imagine ... A city square by night, the paving is scattered with hundreds or thousands of tiny lights. Each light is set into the paving and sparkles and shimmers. Walking across the square is like walking over a magical glowing sea of sparkly lights." – SVA The Tsola is a light-tile that works on sunlight. Measuring 20 x 20 cm, the tile contains a solar cell. The tile is illuminated by sunlight during the day and emits light for approximately eight hours at night. Its major advantage is that it needs no wiring; hence, it is less likely to malfunction. Applications include parks, walks, car parks, steps, and drives. The lamp inside a Tsola Light is available in a range of colours and has a life of twenty years. The light can also be made to shimmer or even flash like a camera. The light looks like an unobtrusive glass panel measuring about 200mm or 8 inches square. It can be set flush with paving, lawns or flower beds, or it can be turned on its side and set into walls.

[www.sva.co.uk](http://www.sva.co.uk)

#### SUN-TEC

SUN-TEC is a producer of transparent LED embedded films specifically designed for lamination in glass. These films are made of PVB or resin. Applications include architectural glass in commercial and residential buildings, interior design, automobile windows and sunroofs, aircraft and marine lighting and windows, floors, walls, ceilings, doors, mirrors, windows and any other possibility where glass can be used to good effect. The SUN-TEC system is low-voltage, and has extremely long life. Both white and colored LEDs are available, and the LED layout is entirely customizable.

[www.suntecamerica.com](http://www.suntecamerica.com)

## Surfaces

#### Active Protection System

Dow Corning's Active Protection System is a "smart" textile that remains soft and flexible until it is struck by high-impact force, in which case the material instantly stiffens to help protect against injury. When the collision has passed, the material immediately becomes flexible again. The active ingredient in the fabric is a dilatant silicone coating, which is a shear thickening fluid (STF). The viscosity of this coating increases with the rate of shear, therefore defining it as a smart material as it responds to changes within its environment. The Active Protection System is breathable and flexible for outstanding comfort and freedom of movement, and it can be stitched directly into garments, eliminating the need to insert and remove components. It is less bulky than hard armor, allowing for many creative and fashionable design possibilities. The washable fabric can be layered to provide customized levels of protection for specific areas, and it integrates easily into existing manufacturing processes. Independent testing shows that the Active Protection System exceeds certain European Standards' impact protection requirements for sports apparel by as much as 40 percent. The fabric's superior effectiveness is due to its ability to both absorb and distribute impact force, providing protection that is activated earlier and lasts more than twice as long as rigid protective systems.

[www.activeprotectionsystem.com](http://www.activeprotectionsystem.com)

#### Algorithmically-Shaped Metal

Milgo/Bufkin can bend complex shapes in metal, providing solutions to the most demanding problems. These shapes are economical alternatives to extrusions and roll forming. Just as our genetic code permits each of us to be unique, so too AlgoRhythm Technologies generates a wide range of unique forms from its genetic code. AlgoRhythm Technologies offers a wide range of curvilinear structures with fluid movements mirroring the flows of nature. Material flows under

its own weight and other forces according to morphologic laws that pertain more to fluid motion than to static objects. By freeing the elements of construction from their rigid geometries, AlgoRhythm Technologies unfolds infinite opportunities to model a new architecture. The undulating look of these structures results from the behavior of sheet metal under force. The forms are non-deformational, thereby maintaining the integrity of the metal. Dr. Hareesh Lalvani, architect-morphologist and inventor of these new forms, states: AlgoRhythms proceed from the "bottom-up." Columns, walls and ceilings, the first series of products introduced here, are based on morphologically structured information (meta architecture) that permits endless variations on a theme.

[www.milgo-bufkin.com](http://www.milgo-bufkin.com)

#### Auto Door

Cleanliness, efficiency, compactness, cool-factor – for a variety of reasons, automatic doors have become a standard feature of Japanese shops. While the typical sliding star-trek style design has proven itself, the Tanaka Auto Door aims to improve upon a good concept. This new design entails strips equipped with infrared sensors that open to the approximate shape of the person or object passing through, minimizing entry of dust, pollen, and bugs while keeping precious air-conditioning in. The technology for the new design seems to be in it's infancy, but Japan has proven once again that it's a least ten years ahead of everyone else.

[www.e-taf.co.jp/cgi-bin/e-taf/sitemaker.cgi?mode=page&page=page2&category=0](http://www.e-taf.co.jp/cgi-bin/e-taf/sitemaker.cgi?mode=page&page=page2&category=0)

#### Backlight Images

Backlight Images are three-dimensional solid-surface topographies created from digital images. Developed and manufactured by the R. D. Wing Company, the Backlight Image process transforms user-provided images into reliefs within the surface of 1/4-inch-thick, translucent DuPont Corian. The images are first converted to grayscale mode with 256 shades, and each shade effectively becomes a different height of contour. Unlike other digitally fabricated products that utilize the relief surface as the viewing surface, Backlight Images are sculpted from the reverse side. Only when light is transmitted from behind does the image emerge through the material. Backlight Images may be created from photographs, logos, or other graphic content. Once images are produced, they can be thermoformed to create sculptural objects and curved surfaces. Backlight Images may also be colored using theatrical studio film and can match Kodak PMS or Pantone designated colors.

[www.blimages.com](http://www.blimages.com)

#### Biodegradable Plastic

It could be the biggest thing since sliced bread was wrapped in cellophane: biodegradable food packaging that's cheap enough to compete with conventional plastic. Once used, it can be thrown onto the compost heap or even eaten. This year, startup Plantic Technologies will roll out a cornstarch-based bioplastic that can be molded into everything from Twinkie wrappers to cracker trays. The technology, developed by the Australian government, could help usher in a 21st-century green revolution. Cornfields rather than oil fields could satisfy much of the enormous demand for plastic. A huge chunk of the 24million tons of plastic that Americans toss each year would end up in backyard com-posters instead of landfills. And then there's the carnage that would be avoided if the plastic polluting the world's oceans dissolved rather than killing sea turtles, fur seals, and other wildlife. The road to ecologically safe, consumerfriendly bioplastic is littered with expensive failures and technological dead ends. But those problems are now being overcome, spurred in part by stringent recycling regulations in Japan and Europe. In 100,000 German households, for instance, chemical giant BASF is testing food bags and packaging made from its Ecoflex bioplastic, which contains a biodegradable petrochemical polymer.

[www.plantic.com.au](http://www.plantic.com.au)

#### Body Props

Body props are five soft forms moulded in expanded polyurethane, with elastic varnish finish, created as an extension of the body to support it in all its different postures. "I thought of living in a house as a physical exercise," relates creator Olivier Peyricot. "In sport the body offers an increasingly unbelievable performance. Body props are an invitation to conquer space as in a sport competition." Body props are supports for lying on the ground, propped on one elbow or in a comfortable kneeling position, or to use a bed like a work surface, to kneel in order to relieve the pressure of the spine. Four have ergonomic forms whose symmetry derives from that of the body. The fifth item is like a comma and tempts a more personal use. The project was developed in collaboration with VIA (valorisation of furnishing innovation) in Paris and introduces a new

philosophy of comfort that embraces the floor as a living space.  
[www.idsland.com/q.php?prj=32](http://www.idsland.com/q.php?prj=32)

#### Casula

Using the most advanced technical procedures that the textile industry has to offer, Nanni Strada engineered a vibrant fabric that reacts to light. Out of this she constructed a religious garment that expresses the immateriality of sacredness. "The invitation to rethink the casula, a ritual garment worn during religious ceremonies, provided a chance to take to the extreme an approach that I have unconsciously used in all my designs. Rather than working on the symbolic nature of the colours, I preferred to concentrate on the amount of light reflection. In this way I was able to work on the brilliantness and vibration of light. Gold has been used a great deal in sacred garments, but it is a metal that needs to be woven into the fabric. However, in modern times we see the use of a metallic yarn called Lurex. It is very shiny and used a lot in haute couture to decorate evening wear, producing results that are both sophisticated and vulgar. My idea was to "lamine" the surface of the material in order to obtain an effect that is shiny and more metallic. It is possible to alter the fabric's surface and give it the qualities of other materials (paper, plastic, metals) and/or transform it into a mutant material, creating a kind of process of crossbreeding. In the process of coupling, textile "leaves" or different materials are joined together. This fusion occurs by calendaring, passing the fabrics through cylinders that whirl round as well as altering the brightness simply by calibrating the number of passages and the speed of the cylinders. The different degrees of brilliance, levels of luminosity and the different perception linked to the vibration of the light are all important components of this design." – Nanni Strada  
[www.nannistrada.com](http://www.nannistrada.com)

#### Photonic Textiles

At the Internationale Funkausstellung (IFA) 2005, Philips is demonstrating photonic textiles – fabrics that contain lighting systems and can therefore serve as displays. With the development of this new and unusual technology, Philips Research is pointing the way toward a new age in the long history of textiles. At first glance, objects such as clothing, towels, upholstery, and drapes would seem unlikely places on which to place intelligent and interactive systems. Yet these low-tech objects figure prominently in our lives. By integrating flexible arrays of multicolored light-emitting diodes (LEDs) into fabrics – and doing so without compromising the softness of the cloth – Philips Research is bringing these inert objects to life. To meet the challenge of creating light-emitting cloth objects that retain their softness, Philips Research and textile institute TITV Greiz have developed an interconnecting substrate made entirely of cloth. Researchers from Philips have also created flexible and drapable substrates from plastics and films. On these substrates, the researchers have placed passive matrices of compact RGB LED packages. The pixelated luminaires with relatively large distance between the RGB pixels have been embedded in such everyday objects as cushions, backpacks, and floor mats. Since the fabric material covering the miniature light sources naturally diffuses light, each pixel seems bigger than it actually is. The LEDs, therefore, remain small and unobtrusive, while the fabric retains its soft look and feel. Photonic textiles can also be made interactive. Philips has achieved interactivity by incorporating sensors (such as orientation and pressure sensors) and communication devices (such as Bluetooth, GSM) into the fabric. The results of these innovations are as various and promising as they are novel. Photonic textiles open up a wide range of applications in the fields of ambient lighting, communication, and personal health care. Photonic textiles are still a young business. Even at this early stage, however, Philips envisions partnerships with interior and apparel brands that see the potential of photonic textiles to revolutionize the very concept of fabric. The demonstration at IFA is also meant to show the opportunities offered by this technology and to gain customers' and visitors' feedback on these options.

[www.research.philips.com/newscenter/archive/2005/050902-phottext.html](http://www.research.philips.com/newscenter/archive/2005/050902-phottext.html)

#### Plantic

Cost competitive biomaterials are in demand by industry as they are usually sourced from renewable resources. Plantic is a new and developing type of biomaterial based on starch. The first commercial application of Plantic technology is in packaging and display trays. Plantic trays look, feel and function the same as traditional plastic trays except that Plantic trays are made from renewable resources, are compostable and, most interestingly, dissolve when in water. The production facility in Melbourne, Australia produces flat sheet roll stock in a range of standard colors and gauges for use by industry. The standard color range is natural, white, brown, black and gold and it can be produced to tailor individual requirements. Plantic finished products are priced competitively with plastic trays made from petrochemical plastics. Plantic trays are not subject to the dramatic price variations petrochemical products are exposed to. Plantic is suitable

for dry foods packaging such as biscuit and confectionary trays, blister packaging, and trays for electronic components.

[www.plantic.de](http://www.plantic.de)

#### CLOUD

CLOUD is a portable room for rest, meeting or concentration. A space of its own that can be used within any space or outdoors, cloud instantly defines an area and a mood apart. Easily transported from place to place, when it is unpacked a silent fan inflates the chamber and keeps it inflated as long as required. The room inflates in less than three minutes, and it folds away into a bag. CLOUD is entered and exited via a self-closing slit door. "Whenever I fly on a plane I wonder what it would be like to step inside a cloud. I started to research clouds and came across the cumulus. It is called the happy cloud and forms from moisture in the air, rising in the morning and disappearing in the evening. This is exactly how I imagine the cloud room - it goes up in the morning and then it disappears when you leave at night. It is very simple to use and takes up no space when it isn't inflated. It is a place where you can totally escape, but it has no rules as to how you use it." - Monica Förster

#### Computer-Driven Architectural Surfaces

Texxus creates 3D surface forms and textures for architectural, industrial & consumer products. Using advanced modelling and production software, Texxus creates surfaces at any scale, and produces them in suitable materials using computer controlled manufacturing technology. Texxus creative design enhances the appearance, performance and value of surfaces. The Texxus design studios support architects, designers and manufacturers with a seamless group of four services: SurfaceStructure: designs and manufactures large organic morphologies and freeform structures for architecture and sculpture. SurfaceDetail: designs and manufactures architectural ornament. SurfaceMotif: designs relief textures, patterns and motifs for industrial and consumer applications. SurfaceView: is a visualisation and rendering service for designers using Surface products.

[www.texxus.com](http://www.texxus.com)

#### Computer-Driven Free-Form Structures

Lamina 1.0 software facilitates fabrication of large scale free-form structures from planar (sheet) materials like plastic, metal, or plywood. This fabrication technology can be applied to interior design, architecture, lighting, signage, clothing, and sculpture. Lamina 1.0 uses computer methods to build precise physical structures in the real world. The 3D model is approximated by a number of 2D parts that are numerically cut and attached to fabricate the final structure. Laser cutting, abrasive waterjet cutting and plasma cutting services are widely available and make creating parts inexpensive and fast. This software takes into account the physical behavior of planar materials, and uses the material thickness to inset the edges of cutting paths to make parts that fit together with precision. Where parts join at right angles, the inset for an "Edge to edge" join is half the material thickness. In addition to correcting for thickness, the angle between parts is taken into consideration when generating cutting path insets. The join angle and the appropriate inset may vary along edges.

<http://laminadesign.com>

#### Digital Print Laminates

Abet Laminati's high-pressure laminates (HPL) stand out for their exceptional properties of strength and resistance to any type of stress, their workability and surface quality. Abet Laminati now presents its DigitalPrint range. These digitally printed laminates represent a direct and immediate link between the designer's computer and the production of laminate surface. The designer's concept can now be transferred digitally and directly using internet technology, to the company plotter, which can produce even just one sheet of any product type. This printing technique offers countless advantages: it is a simple process; no minimum quantities are required; any decor or optical effect can be created on flat or curved surfaces, the sizes of which are only limited by the supporting structure; there is excellent colour quality: the image that is obtained is practically identical to that requested; production times are reduced; and this printing technique can be used on a variety of product types and finishes, without altering technical characteristics.

[www.abet-laminati.it/english/digitalprint/presentazione.htm](http://www.abet-laminati.it/english/digitalprint/presentazione.htm)

#### Digital Wallcovering

When Marybeth Shaw, creative director at Wolf-Gordon, met Karim Rashid at a MoMA party during

ICFF last year, she approached him about designing a wallcovering collection that references nature. Rashid jumped at the opportunity, but put a spin on the concept. "Nature can be dull," Rashid says. "It's a given; it's already created. I am much more interested in what we can create." So he proposed Digital Nature, which takes two-dimensional wallcoverings and makes them appear to come alive. "I tried to get a complexity that makes them appear 3D with abstract forms so that one can read things in them that have to do with nature." The five patterns allude to distinct natural aspects, from the pairs of bud-like shapes of Rosetta, to Zenith's tentacles that rise the height of the wall, to the irregular grid of Space Warp with its avian-influenced forms. "But none of the patterns in this collection are actually Cartesian – no real grid," Rashid continues. "All are very organic, very human. You look at them and see all organic forms: Legs, birds, waterfalls, when in fact all are digitally produced. I like that diametric."

[www.wolf-gordon.com](http://www.wolf-gordon.com)

#### Dimension Elevator

The Dimension Elevator serves as a publicly accessible forum for immersive art. Environments are realized through synchronized video projections on four walls accompanied by fourchannel audio. Imagine four large video screens arranged to form a room for up to 20 people. Vivid panoramic imagery and sounds surround and engage you. The focus of the installation is to provide a new level of viewer experience and encourage creative explorations for both new media artists and the viewing public. While immersive experiences have long been available in venues such as IMAX theatres, rides at theme parks, and arcade hall videogames, the Dimension Elevator is different in that it is accessible to both artists and art viewers. Rather than requiring a company to spend a year creating a show that is highly strategized and targeted so that it can be economically successful, a single person can create a unique sensory experiment in an afternoon.

[www.dandelion.org/dimensionelevator](http://www.dandelion.org/dimensionelevator)

#### Film Speaker

Q-TI has produced a speaker which is as thin as paper, transparent as glass, light as vinyl, and can be rolled up like tape. The speaker emits audio in all directions, and can be printed or painted with any image. Film Speaker is made of a piezoelectric coating bonded with PVDF (Poly Vinylidene Fluoride). Previously, it had been very difficult to adhere any material to a PVDF surface. However, a new surface modification technology makes it possible to form electrodes on the PVDF surface with strong adhesion. After the polymer surface is irradiated by a low energy ion beam in a reactive gas environment, polar functional groups can be formed on the surface and change into a hydrophilic state. This IAR treated polymer can be easily printed with strong adhesion. Ultra flat and uniform film can be obtained using a P&I coating technique (PICT). Electrical signal from audio source, such as tape or CD player, is transmitted to a speaker via electric wire or wave. Then a diaphragm vibrates air and reproduces the original sound. A simple sandwich structure is created by forming polymeric electrodes on both sides of the surface-modified PVDF film. Sound can then be generated from a sheet of film without any thermal treatment and additional process.

#### GlassFresco

GlassFresco is an innovative new product that combines continuous-tone color imagery with Cesar Color's proprietary interlayer technology. Working from photographs, slides, digital-data files or customer provided artwork, it is possible to create dramatic architectural glass products in opaque, transparent or translucent compositions. As shown in Amanda Weil's three-sided shower design above, fine art and photographic images can now be used as design elements achieving effects not previously possible. Processed under heat and pressure, Cesar Color's tough and resilient thermoplastic laminating interlayer permanently bonds two lights of glass. The completed product is a laminated safety glass which complies with all major building codes and industry standards. Laminated glass resists penetration by impacting objects and is almost impossible to cut from one side. GlassFresco offers significantly greater resistance to forced entry than ordinary monolithic glass. Cesar Color's design staff assist specifiers by facilitating the transfer of artistic expressions within the glass medium. Custom applications and designs are encouraged.

[www.cesarcolor.com](http://www.cesarcolor.com)

#### Intelligent Fabrics

Today's switching and sensing technologies are basically rigid or semi-rigid. This results in extensive limitations on their applications and new product design becomes constrained by their physical inflexibility. ElekTex is the combination of conductive fabric structures and

data processing. It is the first technology to have been developed to enable a new generation of consumer products with soft, flexible and lightweight interfaces. By designing new fabric structures that include conductive fibres, ElekTex offers lightweight switching and sensing technology that can conform to 3D shapes, is durable, cost effective, washable, wearable, and above all, desirable. Numerous variations of ElekTex can be designed and manufactured to provide a varied level of responsiveness and data output. The main emphasis is currently XY position and pressure sensing.

[www.elektex.com](http://www.elektex.com)

#### Interactive Ink

Founded in 1993, Chromatic Technologies, Inc. is a privately held corporation that creates offset, flexographic, and screen inks which change color with heat and cold (thermochromic) or sunlight and darkness (photochromic). CTI was the first to develop a thermochromic offset ink and holds several U.S. and Canadian patents for this technology. CTI also makes a Glow-in-the-Dark ink. Thermochromic Inks come in three standard temperatures: 15C (Low temp), 31C (Body temp) and 45C (High temp). The 'Low Temperature' ink is used for applications in the refrigeration temperature range, like beverage labels. 'Body Temperature' ink is designed to show color at normal room temperature and to change when rubbed with the finger or by breathing on it. It is used on documents and security packaging. The 'High Temperature' formulation changes color just below the pain threshold temperature for skin, and is used on safety labels and hot beverage labels. Photochromic Inks are invisible unless UV light, e.g. sunlight, hits them. Once UV light hits the ink, it blooms into color. This special brand of ink is great for everything from high-security documents and products to interactive advertising and direct mail pieces.

[www.ctiinks.com](http://www.ctiinks.com)

#### Interactive Surface

The Aegis project consists of an interactive mechanical surface which deforms in realtime based on various environmental stimuli, including the sounds and movements of people, weather, and electronic information. This hyposurface is comprised by a matrix of actuators which are given positional information via a highly efficient bus system, as well as an array of electronic sensors used to trigger a variety of mathematical deployment programs. The hyposurface effectively elevates a highly responsive pneumatic mechanical system to a level of articulate and fluid control through its interception by a highly performative digital control. dECOi Architects' goal for the Aegis Hyposurface is "to utterly radicalize architecture by announcing the possibility of dynamic form, and to then explore the cultural possibilities afforded by this new traumatic medium. It is, of course, a harbinger of nanotechnology - the intersection of information and matter itself."

#### Living Glass

B.Lab has created a line of products consisting of layered acrylic panels which contain a pigmented membrane. This membrane actively transforms based on touch and vibration, enabling one to move and mix colors at will. This technology is currently available in B.Lab's so-called Flex-Interactive tables and is being developed in a line of floor tiles.

[www.blabitalia.com](http://www.blabitalia.com)

#### Memory Foam

Like many high-tech devices, an emerging style of fancy office chair stuffed with "memory foam" owes its existence to NASA. The National Aeronautics and Space Administration invented the foam more than 30 years ago, when it had to develop comfortable seating for astronauts who had to first withstand stiff gravitational forces, then spend several days sitting in a tiny space capsule. The soft, pliant material, which molds to the body of the user, failed in space. But today the foam is used in a growing array of consumer products, from mattresses to bicycle seats, and now office chairs. "Memory foam didn't work well in space because it's temperature-sensitive and space is very cold, so it got very firm," said Kevin Berg, store manager at Relax the Back, which specializes in products using memory foam. But for the average desk jockey working at home or in a heated office, memory foam works well.

#### Metal Laminated Tooling

Gazing through a car showroom window, have you ever asked yourself how they manage to make such a variety of different models? One thing's for sure: The days of "any color as long as it's black" and one model for all have gone forever. The new buzzword not only in the car industry is mass customization - still mass production, but incorporating a maximum of personalized features. Quite apart from the logistics, this trend also challenges manufacturers by requiring

them to rapidly build new presses and forming tools and integrate them in production lines. Rapid technologies are ideal for tool-making. What sets them apart from traditional methods like casting and milling is that the chain of steps from the first CAD drafts to the final part should be almost entirely an electronic one. One of the youngest members of this "rapid" family bears the name MELATO, or Metal Laminated Tooling. Dr. Anja Techel, project manager at the Fraunhofer Institute for Material and Beam Technology IWS in Dresden, describes the first step in this process: "Like a salami slicing machine, the computer first divides a model of the tool into thin layers. Using a software program developed by our industrial partner, it then virtually arranges the individual slices in an optimum layout, and a laser cuts them out from a real sheet of metal."

[www.fraunhofer.de/fhg/EN/index.jsp](http://www.fraunhofer.de/fhg/EN/index.jsp)

#### Movable Partitions

Flexibility and communicative working environments are the determining factors in office design for the future. Moveable partitions from Hüppe Form offer "maximum flexibility and practicality combined with top quality." Scales range from room-in-room systems for shopfloors or versatile office layouts to giant mobile-walls for foyers or auditoria. Hüppe Form claims "there are virtually no limits to individual design in terms of shape, material and color. All the usual interior surfaces are possible, and individual design ideas can be turned into reality."

[www.hueppeform.de/home.php](http://www.hueppeform.de/home.php)

#### Photo-Cast Tile

Photo-Form LLC is a unique tile studio which provides the ability to create bas-relief tiles from photographs. Utilizing a patent pending process called Photo-Cast, Photo-Form can create bas-relief tiles from any type of two-dimensional image. Photo-Form currently offers a gypsum based polymer tile with the following metallic finishes: bronze, brass, nickel/silver, and copper. They also offer ceramic tiles with tough and durable glazes. The nontoxic formulation is ideal for a wide range of applications.

[www.photo-form.com](http://www.photo-form.com)

#### Photographic Tile

Imagine Tile has developed a process of applying glazes to ceramic tile in much the same way that a printer applies ink to a page, but when the tiles are fired at extremely high temperatures, glaze and tile literally fuse; the design becomes a permanent part of the tile. Imagine Tile's advanced technology opens up many possibilities: the reproduction of textures, patterns, photos, illustrations, even three-dimensional images on a single tile or as a mural. The tiles can be used indoors or out, on walls or floors, are frost and waterproof, unaffected by UV, and abrasion and chemical resistant. The images shown are from a stock series, but designers are encouraged to provide their own images conforming to three sizes: 8"x8", 12"x12", or 16"x16".

[www.imagnetile.com](http://www.imagnetile.com)

#### PixelBlocks

Conventional construction toys are modeled after objects in the physical world such as stone bricks, wooden beams, and metal girders. PixelBlocks are the first "digital-age" construction toy in that they are modeled on the world of the computer screen - pure light and color. PixelBlocks come in a single shape, featuring a peg-and-hole combination for stacking top-to-bottom, and a unique tooth-and-groove combination on the other four sides. The unique shape allows PixelBlocks to be connected in three versatile ways that enable one to build effortlessly in 2-D or 3-D. The blocks themselves are approximately 3/8" (0.9 cm) translucent cubes. PixelBlocks come in 20 carefully chosen colors. Used in combination, PixelBlocks can express any mood from the vibrancy of childrens' toys to the subtle shading of a photograph. Digital Stained Glass is a PixelBlocks feature that lets one turn any photo or artwork into a permanent translucent creation made from PixelBlocks. The finished creation resembles glittering stained glass - catching sunlight and changing moods throughout the day, and makes an intriguing window display in any room.

[www.pixelblocks.com](http://www.pixelblocks.com)

#### Regenerative Plastic

Scott White wants to make obsolescence obsolete. After nearly a decade of research, the associate professor of aeronautical and astronautical engineering, along with fellow scientists at the University of Illinois at Urbana-Champaign, has developed a plastic that heals itself like skin (translation: self-repairing PDAs, cell phones, garden hoses). When the polymer splinters, invisible capillary-like microcapsules filled with a liquid agent called dicyclopentadiene flow into

the crack. As the liquid comes in contact with the powdery catalyst (black spots) embedded throughout, the two chemicals coagulate and harden, as in the center-fractured test polymer shown here. The whole process is triggered by a fracture no more than 100 microns in length. Once repaired, the plastic regains up to 75 percent of its original strength. The regenerative material will hit the market in two to three years, showing up first in the sporting goods and automotive industries, then the aerospace, microelectronics, and medical sectors, where every component is mission critical. The next challenges are to extend the technique to substances such as ceramic and glass, and to develop a scheme that mimics the body even more closely. "Presently, once the capillaries in one area have broken open, the whole thing is over, and it's like any other plastic," says White. "So we're experimenting with a circulatory system that will pump in replacement fluid automatically."

#### Sculpture for Seating

The 1991 Ocean Series consists of large functional works in redwood and bronze. The 18 ft. to 22 ft. long, 4 ft. high pieces have been used by Foster and Partners at the Al Faisaliah Center Riyadh in Saudi Arabia and in a high school designed by Kajioka Yamachi Architects in Maui. Custom designs and sizes may be commissioned, and various colors of patina can be selected. Production time is six months.

#### Self-Healing Polymers

Structural polymers are susceptible to damage: cracks form deep within the structure where detection is difficult and repair is almost impossible. Damage in polymeric coatings, adhesives, microelectronic components, and structural composites can span many length scales. Structural composites subject to impact loading can sustain significant damage on centimeter length scales, which in turn can lead to subsurface millimeter scale delaminations and micron-scale matrix cracking. Coatings and microelectronic packaging components have cracks that initiate on even smaller scales. Once cracks have formed within polymeric materials, the integrity of the structure is significantly compromised. Inspired by biological systems in which damage triggers a healing response, Scott White at the Beckman Institute at the University of Illinois developed a structural polymeric material with the ability to autonomically heal cracks. The incorporation of a microencapsulated healing agent and a catalytic chemical trigger within an epoxy matrix accomplished this healing process. An approaching crack ruptures embedded microcapsules, releasing healing agent into the crack plane through capillary action. Polymerization is triggered by contact with the embedded catalyst, bonding the crack faces.

[www.autonomic.uiuc.edu](http://www.autonomic.uiuc.edu)

#### Smart Shirt

The Sensatex Solution utilizes a groundbreaking electro-optical textile, the Wearable Motherboard Smart Shirt, to seamlessly incorporate sensory capabilities with radio and computing devices, representing a highly effective and unobtrusive means of integrating broad-based sensors with the human body. By supporting voice and data communications from multiple sensory locations through one wireless backbone, the Sensatex Solution provides an extremely versatile framework for a host of biomedical monitoring applications. The Smart Shirt eliminates the need for loose wires and discomfort experienced by many current patient monitoring devices, while also reducing the false alarm rates associated with their use. Its dependable and unobtrusive monitoring environment remains virtually transparent to the patient, while improving communications with remote monitoring locations, maintaining quality of patient care, and reducing healthcare costs.

[www.sensatex.com](http://www.sensatex.com)

#### Soft Wall

Made of felt, the Soft Wall is a partition and storage element in one. The Soft Wall can be used in both the home and office. It rests on a frame with a glossy chrome finish. Dimensions (in cm): W 250, D 20 H 207.

[www.vagonews.com/issue01/products4.html](http://www.vagonews.com/issue01/products4.html)

#### Thermojet Printer

3D Systems' thermojet printer generates threedimensional models directly from 3d cad data using multi-jet modeling technology and thermopolymer building material. The thermojet printer can create models up to 10" x 7.5" x 8" at 300 x 400 x 600 dpi resolution and in three colors: neutral, gray, or black. "The Thermojet printer allows CAD designers the freedom to quickly 'print' and hold a 3-dimensional model in their hands. This is not virtual reality - this is physical reality, and

the applications and opportunities go beyond one's imagination" – Mervyn Rudgley, Sr. Director Product Management  
[www.3dsystems.com/products/multijet/thermojet/index.asp](http://www.3dsystems.com/products/multijet/thermojet/index.asp)

#### Transparent Projection Surface

HoloPro is a transparent surface for rear projection, which is almost completely unaffected by the surrounding light and can be used indoors and outdoors. HoloPro is a hologram, i.e. a film irradiated with a refraction grid. This film is laminated between two special plates of glass. HoloPro consists of several holographic optical elements (HOE), which are arranged on one level, and is irradiated by a projector. The projection on the HoloPro screen is made from a specific angle, and as a result only light from this stipulated angle is visible. With this direction-oriented projection, the surrounding light which shines on the HoloPro screen from any other angle has almost no effect on the picture quality. Compared to other projection surfaces, HoloPro screens have "an eye-catching brilliance."

[www.holopro.com](http://www.holopro.com)

#### Veriflex

First introduced in Japan and then the United States in 1984, shape memory polymers are polymers whose qualities have been altered to give them dynamic shape "memory" properties. Using thermal stimuli, shape memory polymers can exhibit a radical change from a rigid polymer to a very elastic state, then back to a rigid state again. In its elastic state, the polymer will recover its "memory" shape if left unrestrained. However, while pliable it can be stretched, folded or otherwise conformed to other shapes, tolerating up to 200% elongation. While manipulated, the shape memory polymer can be cooled and therefore returned to a rigid state, maintaining its manipulated shape indefinitely. This manipulation process can be repeated many times without degradation, and CRG can tailor most polymers with shape memory properties. Veriflex is a two-part, fully formable thermoset shape memory polymer (SMP) resin system with unique "memory" properties. Heated above its activation temperature, Veriflex changes from a rigid polymer to a very elastic state. In this elastic state, it can be twisted, pulled, bent, and stretched, reaching up to 200% elongation. If cooled while constrained in the new shape, the polymer hardens and can maintain its deformed configuration indefinitely. When heated above its activation temperature again, this polymer returns to the shape in which it was cured. This process can be repeated indefinitely without loss of the memory shape or degradation of the material. Thermochromic Veriflex allows for easier use and functionality of the cured resin. When the thermochromic version of Veriflex has reached its transition temperature, it changes color to signal its readiness to be molded, shaped, and formed. This eliminates possible problems with heating the material too much or not enough. Both standard and thermochromic Veriflex resins are engineered with a transition temperature (Tg) of 62°C.

[www.crg-industries.com/veriflex.htm](http://www.crg-industries.com/veriflex.htm)

## INTERFACIAL

Materials which facilitate the interaction between physical and virtual worlds.

### Surfaces

#### 3d Display Cube

3D Display Cube is a true spatial display unit that utilizes one thousand individually controllable LEDs to create three-dimensional forms and animations. The display cube, with its creative use of LED technology, can be used for retail or public display, signage applications, home display, or advertising. James Clar conceived of 3D Display Cube as a reaction to the limitations of current display technologies. Televisions and computer monitors, for example, can only deliver two-dimensional information because their display surface is flat. In contrast, 3D Display Cube uses a spatial array of LED pixels, which in aggregate create true spatial images and animations. 3D Display Cube's technology is backed by one issued utility patent and two pending utility patents. Upon purchase, the buyer may select up to five one-minute animations to be preloaded onto the device for immediate use upon delivery. A serial cable is also included, allowing users to design and upload their own animations and content to the cube.

[www.jamesclar.com](http://www.jamesclar.com)

#### Board 16

Developed by Traxon Technologies, Board 16 SMD RGB is a lighting system which allows for

the easy installation of LED on floors, ceilings, walls and other horizontal and vertical surfaces. Installed behind fixed or malleable foregrounds, the Board spreads its light from 16 high performance RGB SMDs (Surface Mounted Diodes). The Board's compact size of 23 cm x 23 cm x 1.85 cm allows for the realization of a variety of geometric shapes, and the wide beam angle of 120° guarantees an even light spread. As an optional accessory, the installation pad ensures a fast and easy mounting of the boards in a precise way. Board 16 may be used in interior applications such as exhibition spaces, interiors, bars, casinos, offices, restaurants, shops, shopping centers, and a wide number of commercial applications.

[www.traxontechnologies.com](http://www.traxontechnologies.com)

#### Bubble Screen

The Bubble Screen is a dot-matrix display that uses air bubbles as pixels. Developed by Eyal Burstein at Beta Tank, this display can show images, text, and patterns and may be used as a low-resolution screen. The project required two years of development during which experts in the fields of automation, pneumatics, and academia were employed to solve a fluid dynamics challenge. The Bubble Screen is intended to reveal alternative methods of information display and consumption and is exemplary of Beta Tank's ongoing ambient information-design project.

[www.beta-tank.com/bubble-screen.html](http://www.beta-tank.com/bubble-screen.html)

#### Concrete Rear Projection Screen

In co-operation with Christoffer Dupont, student of engineering; Lene Langballe, student of architecture; and Dalton Beton, a Danish manufacturer of concrete components; the Innovation Lab project team has developed the first rear-projection screen made of concrete. The screen consists of concrete with embedded optical fibers, arranged as pixels, capable of transmitting natural as well as artificial light. The light-admission points are on the back of the screen where the fibers are positioned. The light, or the picture, is displayed in pixels on the front. The light source can be a projector emitting pictures or film footage, or a window emitting natural daylight. While it is possibly the heaviest projection screen known, the potential applications are interesting, such as solid walls displaying images or real-time video, integrated lighting, interactive sports backboards, or illuminated flooring.

[www.innovationlab.net/sw5639.asp](http://www.innovationlab.net/sw5639.asp)

#### Flickr Umbrella

Researchers with Keio University's Okude Laboratory in Tokyo have developed an unlikely platform to showcase content from the burgeoning image website Flickr. The Flickr Umbrella, also known as Pileus (which refers both to the head of a mushroom and a cloud formation), can download and project still image and video content in real-time from Flickr or other websites using the umbrella fabric as the projection surface. Images are advanced with a simple flick of the wrist, which rotates the umbrella shaft a couple degrees. The umbrella also comes equipped with a simple camera mounted to the shaft, and a low-resolution photograph may be taken, uploaded to the Flickr website, and actively projected by the umbrella within two to three seconds.

[www.ok.sfc.keio.ac.jp/pileus](http://www.ok.sfc.keio.ac.jp/pileus)

#### Illuminated Surfaces

Thanks to research from the University of Southern California and Princeton University, almost any surface in a building, whether flat or curved, could become a light source: walls, curtains, ceilings, cabinets or tables. Scientists studying organic light-emitting devices (OLEDs) have made a critical leap from single-color displays to a highly efficient and long-lived natural light source. The invention, described in the April 13 issue of Nature, is the latest fruit of a 13-year OLED research program led by Mark Thompson, professor of chemistry in the USC College of Letters, Arts and Sciences, and Stephen Forrest, formerly of Princeton University and now vice president for research at the University of Michigan. "This process will enable us to get 100 percent efficiency out of a single, broad spectrum light source," Thompson said. If the device can be mass-manufactured cheaply – a realistic expectation, according to Thompson – interior lighting could look vastly different in the future. Since OLEDs are transparent when turned off, the devices could even be installed as windows or skylights to mimic the feel of natural light after dark – or to serve as the ultimate inconspicuous flat-panel television.

[http://smarteconomy.typepad.com/smart\\_economy/2006/04/new\\_high\\_effici.html](http://smarteconomy.typepad.com/smart_economy/2006/04/new_high_effici.html)

#### Image Mesh

Image-Mesh is a video wall comprised of a plastic mesh embedded with tiny, pixel-addressable 3-in-1 RGB LEDs. Its panel structure is unobtrusive, lightweight, and may be easily erected and

dismantled. It can be bent to a radius of 0.5m. Each 0.9m x 0.9m panel 'module' weighs just 1.5kg and is only 6.5mm deep. There are 1296 LEDs per module with the 25mm pitch product. Each LED has its own chip and can be individually identified and addressed. A basic Image-Mesh unit consists of 6 x 0.9m square modules, simply clipped together. The basic unit is then controlled with its own driver and DMX splitter. For instance, six basic units will create a 5.4m x 5.4m screen. The control system consists of the Software Suite and media/video processor connected to a DMX converter. The converter feeds optical cables to the relay boxes and drivers. This setup enables the system to take any video feed that the customer chooses, whether that's live video, web streaming or pre-recorded DVD. Kapas II is a full color LED display system for outdoor installations. The LED RGB clusters are fixed to a plastic mesh with different pitch options ranging from 62.5mm to 100mm. Kapas II works and is configured in a similar way to Image-Mesh, and can be flexed and bent in the same way. It is designed to be installed outdoors, as a temporary or permanent installation. Its power, luminous intensity, and wide viewing angle make it optimal for cityscape applications or large outdoor concerts and events. It is IP68 rated and can even be installed underwater and in ice.

[www.vivideffect.com](http://www.vivideffect.com)

#### iMAT

Developed by New Zealand-based Zephyr Technology Ltd., iMAT is sensing technology which uses electric field measuring techniques to determine the distance between two surfaces. This technology allows flexible and formable sensors that can measure displacement, force, pressure, weight, impact events, movement, and breathing. iMAT sensors are cost effective, flexible, and may be manufactured in a variety of shapes. Any compressible medium such as PE foam or EVA may be used. Typical applications include wearable smart fabrics, 3D mapping of bodies, non-contact patient movement and respiratory analysis, real-time radio-linked pressure mapping, in-field patient monitoring, and body armor impact sensing.

[www.zephyrtech.co.nz](http://www.zephyrtech.co.nz)

#### Light-Emitting Roof Tiles

The roof has historically focused on one primary function: keeping out the elements. New technologies, as present in Light-Emitting Roof Tiles, allow the integration of additional functions within roof surfaces. Manufactured by Lambert Kamps, the transparent roof tiles are integrated light-emitting diodes (LEDs) and designed to display text, pictures, and other graphical content in multiple colors. Information may also be animated, such as with an illuminated news trailer. Light-Emitting Roof Tiles also come with their own self-supporting solar-photovoltaic power system.

[www.lambertkamps.com](http://www.lambertkamps.com)

#### Lumalive

Lumalive fabrics feature flexible arrays of colored light-emitting diodes (LEDs) fully integrated into the fabric - without compromising the softness or flexibility of the cloth. These light emitting textiles make it possible to create materials that can carry dynamic messages, graphics or multicolored surfaces. Fabrics like drapes, cushions or sofa coverings become active when they illuminate in order to enhance the observer's mood and positively influence his/her behavior. Lumalive jackets are comfortable to wear, and the Lumalive fabrics only become obvious when they light up to display vivid colored patterns, logos, short text messages or even full color animations. The electronics, batteries and LED arrays are fully integrated and invisible to the observer and wearer. The jackets feature panels of up to 200 by 200 mm<sup>2</sup>, although the active sections can be scaled up to cover much larger areas such as a sofa. "Taking the Lumalive fabrics from prototypes to integrated products has been a major challenge," said Bas Zeper, Managing Director of Photonic Textiles, Philips Research. "The light emitting textiles have to be flexible, durable and operated by reasonably compact batteries. Fitting all that into a comfortable, lightweight garment is a considerable engineering success."

[www.philips.com](http://www.philips.com)

#### Magink

Magink Display Technologies, Inc. is the world's first developer and provider of full color digital ink displays. Magink's full-color digital ink is based on environmentally-friendly materials. Using proprietary technologies, magink manipulates the ink molecules to generate all colors of the visible color spectrum, including all gray levels, to be exhibited in a wide color gamut. Magink's proprietary technology provides high resolution, high contrast, full-color, low energy consumption and cost effective digital display applications to a broad array of global industries. Magink displays may be used extensively in exterior applications, and the technology utilizes

ambient light to enhance the image visibility and quality, just like paper. Real-time content management of single/multiple displays is available using magink software. The magink line of standard displays is available in three size formats – 2mx3m, 3mx4m and 3mx6m (6'6" x 10', 10' x 13'3" and 10' x 20') – for either indoor or outdoor applications. They can be retrofitted and customized within the size range.

[www.magink.com](http://www.magink.com)

#### Meshglass

Meshglass combines an enhanced flexible tiling system with a web-based digital design tool. Comprised by stained-glass and mirror pieces connected via a fiberglass underlayment, Meshglass may be easily overlaid onto complex, curvilinear surfaces like pool shells and furniture. Moreover, the glass in the product is entirely UV-stable and 100% recyclable. The Meshglass website also offers design tools which allow one to create custom configurations using a myriad of patterns and colors. While their current tools are for online use, the company plans to offer a downloadable software package for direct output of custom patterns for fabrication.

[www.meshglass.com](http://www.meshglass.com)

#### Multi-Touch Interaction

While touch-sensitive screens commonly work for single points of contact, multi-touch sensing enables a user to interact with a system with more than one finger at a time, as in chording and bi-manual operations. Such sensing devices are inherently also able to accommodate multiple users simultaneously, which is especially useful for larger interaction scenarios such as interactive walls and tabletops. Developed by Jefferson Han at New York University, Multi-Touch Interaction offers a wide variety of application scenarios and interaction modalities that utilize multi-touch input information. These go far beyond the "poking" actions you get with a typical touch screen, or the gross gesturing found in video-based interactive interfaces. Multi-Touch Interaction is force-sensitive, and provides unprecedented resolution and scalability, allowing the creation of sophisticated multi-point widgets for applications large enough to accommodate both hands and multiple users.

[www.meshglass.com](http://www.meshglass.com)

#### Ombrae Optical Tiles

Quin Media Arts And Sciences designs and sells sculptural images using the Ombrae System, an optical tile technology. Conceived by founder Rod Quin, Ombrae translates digitized images or other input into an array of light-reflecting three-dimensional tiles. An Ombrae image is highly responsive to changes in environmental light and changes in the audience's viewing angle. It stimulates viewer interaction as it appears to shift, while preserving the source image. It can be made from a variety of materials with different surface and structural characteristics. The Ombrae system is effective at virtually any scale, so it is equally useful on buildings and consumer products.

[www.qmaas.com](http://www.qmaas.com)

#### Photo-Engraving Formliners

Photo-engraving formliners offer yet another tool for designers seeking to transfer images directly to concrete. The Photo-engraving process is a computer-based method for transferring image data onto sheet materials by means of milling technology. First, an image template is scanned and converted into 256 grey scales. In order to transfer the image onto the sheet material, a machining file is generated from the identified grey values, and this file includes milling commands for a CNC milling machine. The milled module is used as master for casting the elastic Reckli Photo-engraving formliners. The flexibility, precision, and reusability of the formliners allow for quality image transfers with an efficient use of materials.

[www.reckli.de](http://www.reckli.de)

#### Pixel Skin

Developed by Sachin Anshuman, Principal Organizer for the Intelligent Building Laboratory at GCU Glasgow and creator of Orange Void, Pixel Skin is a heterogeneous smart surface designed to regulate light, solar radiation and views, as well as display dynamic signage. Anshuman's prototype uses shape memory alloys (SMA) to actuate each of four triangular panels residing within a single module, and each surface acts as a "pixel" with 255 increments between open and closed states. Pixel Skin is designed to create dynamic windows which allow views or control internal lighting conditions across the building membrane in response to particular subject states and their positions. The surface may also simultaneously be used to generate low resolution images, low refresh-rate videos, or abstract patterns. A response to common conflicts encountered with

daylighting and signage in contemporary architectural surfaces, Pixel Skin is a multi-layered electrographic surface which allows the integration of illumination and view controls with real-time communications media.

[www.orangevoid.org.uk](http://www.orangevoid.org.uk)

#### Plastic Logic

Plastic Logic is developing licensable manufacturing solutions for printing thin and flexible active-matrix displays. When combined with an electronic-paper imaging film, Plastic Logic's backplane technology enables highly portable, readable and power efficient displays. The initial application focus is e-readers (e.g. e-books, e-dictionaries, e-maps, e-newspapers). These displays will often be wirelessly connected to WAN devices such mobile phones and PDAs, allowing users to access content 'on-the-move' more comfortably and efficiently than is possible using a small integrated display. This is the first step towards flexible and plastic backplanes for a range of display applications and frontplane technologies including LCD and OLED. Features include resolution up to 150ppi (pixels per inch); scaleable area to A4 (210mm by 297mm) and above; 4 levels of grayscale; high aperture ratio / fill factor; and bistable e-paper which enables high contrast reflective display (sun-light readable) and ultra-low power consumption.

[www.plasticlogic.com](http://www.plasticlogic.com)

#### Printed Food

Printed Food is an edible material that provides a way to convey the nutritious elements of food to consumers in an extremely compact, visually appealing, and information-rich manner. Developed by Chef Homaro Cantu, Printed Food has a number of possible applications, including the delivery of nutritional supplements and ingestible pharmaceuticals, as well as for promotional and advertising uses. The manufacturing process of Printed Food allows for the incorporation of text and images, such as the food ingredients, directly on digestible food. Instructions for usage, references, and storage information may also be included. Chef Cantu even "serves" a dinner menu as Printed Food. Printed Food's stability, compact nature, and innovative communication capability make it an ideal food source for people in extreme environments, such as outer space or countries with severely limited resources.

[www.cantudesigns.com](http://www.cantudesigns.com)

#### Sensitive Floor

We're accustomed to seeing interactive digital media projected on walls, and sometimes ceilings, but what about floors? Developed by iO, Sensitive Floor is an interactive video projection designed specifically for walking surfaces. Conventional touch-screen panels and kiosks don't actually entice much interaction, but a floor projection placed in a well-trafficked area is nearly unavoidable. The Sensitive Floor system utilizes a ceiling mounted projector which displays a variety of pre-programmed visual effects when a moving presence is detected within the field of projection. Installations may be temporary or permanent, and applications include retail, entertainment, and exhibition environments, or anywhere that interactive art, information, or advertising may be featured. According to iO, "We devised Sensitive Floor to be the first interactive media that makes you smile."

[www.sensitivefloor.com](http://www.sensitivefloor.com)

#### Smart Slab

The SmartSlab has been described as the world's toughest digital video display for walls, floors, billboards and buildings. Each slab is designed in a honeycomb structure inspired by the optics of a fly's eye. Instead of using standard pixels it uses hexels (hexagonal pixels) that provide an 18% better resolution than just the standard pixel. The SmartSlab display is suitable for any position in any environment; it is capable of holding a ton of weight; it is water, fire and vandalism resistant and doesn't power down an entire energy grid when powered up. The SmartSlab is bright too: the standard luminance is 1,000 Cd/m<sup>2</sup> and a high brightness model is available at 5,000 Cd/m<sup>2</sup>. Moreover, the SmartSlab can also be used as a speaker, providing a 3D immersive "heightened reality" sound system.

[www.smartslab.co.uk](http://www.smartslab.co.uk)

#### Super Cilia Skin

Super Cilia Skin is a tactile and visual system inspired by the beauty of grass blowing in the wind. It consists of an array of computer-controlled actuators (cilia) that are anchored to an elastic membrane. These actuators represent information by changing their physical orientation. The current prototype of Super Cilia Skin developed by MIT's Tangible Interfaces functions as an output device capable of visual and tactile expression. Most existing computational tools rely on

visual output devices. While such devices are invaluable, influential studies in neurophysiology have shown that physical experience creates especially strong neural pathways in the brain. When people participate in tactile/kinesthetic activity, the two hemispheres of the brain are simultaneously engaged. This type of learning experience helps assure that new information will be retained in long-term memory. Super Cilia Skin is essentially a tactile and visual system. Its ability to replay dynamic gestures over time and to communicate remote gestures makes it a potentially valuable tool for education and haptic communication. The Tangible Interfaces team envisions Super Cilia Skin as an I/O membrane with a variety of applications in education and haptic communication. On an architectural scale, a facade covered with Super Cilia Skin could represent the "wake" of a local wind pattern billowing up and down the surface during the day generating energy. As a more general display surface, a Super Cilia Skinned floor could trace movement over one's house or weather patterns over the entire state of Massachusetts. This sensibility is intended to pervade a sense of relationships between local and global conditions.  
<http://web.media.mit.edu/~hayes/mas834/scs1.html>

#### TileToy

TileToy is a modular, electronic game prototype for tangible LED game tiles. TileToy brings the flexibility inherent in digital software to a physical tile that people can touch and interact with. By arranging the electronic tiles, players can engage themselves in various kinds of game play, ranging from fast-paced arcade style games to puzzle and learning games. The tiles are plastic cases approximately 2" square. The main inspiration for the look and feel comes from the heyday of the LED, when plastic hand-held games ruled the gaming world. This retro-look is fused with a more modern minimal design. The minimalism enhances the magic of cordless boxes that simply communicate with each other. In TileToy, technology is sealed within the design. The interaction is based on tactile experience where no user manual is needed. The flexible architecture of the tiles makes TileToy a versatile platform for development of various applications from several genres. Compared with traditional tile games TileToy can take advantage of such things as changing state, animations and games where the tiles can effect the state of adjoining tiles. Simple word games can be created where each tile displays a random letter and the players organize the letters into the longest word possible. Numbers and arithmetic characters can be displayed with the player having to arrange the tiles into a sum to give a specified result. Matching games are yet another way the tiles could be programmed to act as a learning aid. Applications can be developed also to utilize the tiles purely for display purposes to show patterns, animations or even live information. The re-programmable and constantly updated graphical information on each tile is displayed with a LED matrix system. The screen displaying the information is an endlessly versatile surface for updated visual communication. Each tile is controlled individually and can be used to transmit information on its own or in groups of several tiles. The assembled tiles transmit wirelessly their individual position in relation to each other and based on that changing information, a central computer, or a dedicated tile runs the different applications. TileToy is an open project. Both the source code and the hardware will be made available via open licenses. This will allow anyone interested to create their own applications and games and feed these back into the community hopefully to spark innovation further. It may even lead to new projects that branch off to make new version of TileToy based on the original hardware.  
[www.tiletoy.org](http://www.tiletoy.org)

*More information on 'transmaterials' available at:  
<http://transstudio.com>*