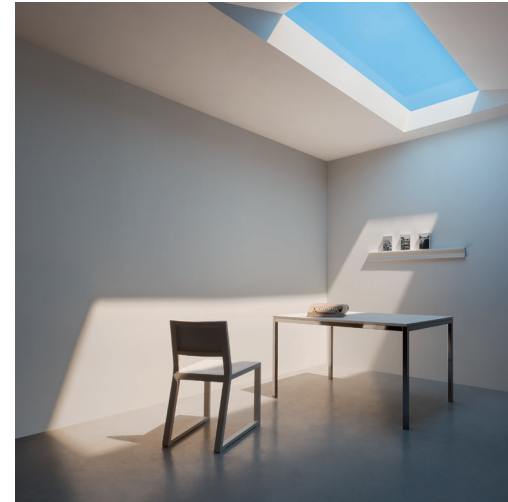
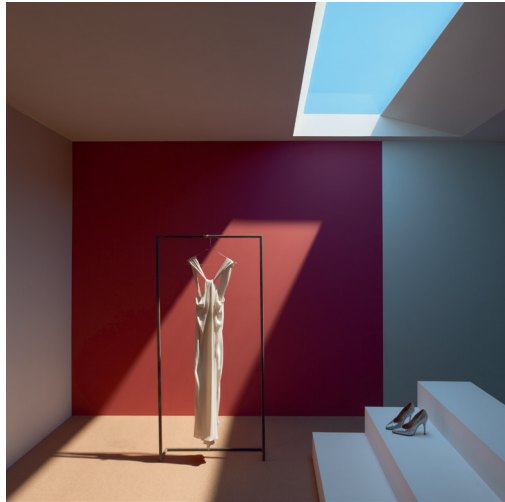




Since its launch at Light + Building earlier this year, the CoeLux artificial skylight system has been causing a stir in Lighting Designer circles. Product designer Jonathan Morgan takes a look at the technology behind a ground-breaking new effect.

# HEAVENS ABOVE



The CoeLux skylight system, developed by Professor Paolo Di Trapani, uses a series of nanostructured materials to mimic the light transmission of sunlight through our atmosphere, delivering the brilliant blue of a clear sky. A sophisticated optical system creates the sensation that the 'sun' is far away, tracking across the blue 'sky' as the occupant moves through the room below.

CoeLux is no ordinary luminaire. Essentially it is a product that reproduces, with remarkable veracity, the effect of bright sunlight passing through our atmosphere, through a skylight and into the room where it is installed. Through the clear skylight window you can see the unmistakable blue hue of the sky above. The 'sun' itself is a hugely powerful LED projector which is concealed above the ceiling at one end of the room, but which can be seen through the skylight if you stand at the opposite end of the room. The artificial 'sunlight' is cast against one of the walls in that warm, dramatic and evocative way that bright sunlight enters a room on a sunny day. Professor Paolo Di Trapani, creator and CEO of CoeLux, cites René Magritte's surrealist painting 'Empire des Lumieres' as one of his sources of inspiration. Magritte's painting depicts a house dimly lit by a street lamp in the dark of night, and above it, a paradoxically bright blue daytime sky. 60 years on from the creation of that painting, Di Trapani's skylight installation is indeed a surreal experience; installed in a basement room in central London that receives no natural light, CoeLux reproduces the physical effects and optical phenomena of natural sunlight almost exactly. You have to constantly remind yourself that the bright

sunlight pouring through the skylight above is completely artificial. As with Magritte's painting, there is a kind of paradoxical joy which is felt in experiencing this seemingly impossible simulation of reality. Paolo Di Trapani, a physicist of the Department of Science and High Technology at the University of Insubria in Como, has been working on CoeLux for twelve years but it is only now that the public are getting a chance to experience it. The technology behind the CoeLux combines three key elements: the latest LED technology that reproduces the sunlight's spectrum; a sophisticated optical system that creates the sensation of the distance between the sky and the sun; and nanostructured materials to mimic the light transmission of sunlight through our atmosphere. Di Trapani and his team created their 'Optical sky-sun diffuser' by embedding transparent nanoparticles within a clear polymer sheet. The ratio of blue and red scattering optical densities within this diffuser is designed to recreate the Rayleigh scattering process - the naturally occurring process where the light from the sun is scattered off the molecules of the atmosphere. This is what gives the sky its blue hue - Rayleigh scattering is more effective at short wavelengths (the blue

end of the visible spectrum). When you look up through the skylight, the chamber above is perfectly sky blue as the white light from the LED sun has passed through this optical sky-sun diffuser making the blue wavelengths more dominant. The areas of the room in shadow also have a bluish hue, which is very similar in a naturally sunlit room. Richard Kelly, one of the pioneers of lighting design, coined his definitions 'focal glow' and 'ambient luminescence' in the 1950s. He describes ambient luminescence as light "...in any art gallery with strip-lighted walls, translucent ceiling, and white floor. Ambient light produces shadowless illumination. It minimises form and bulk." His focal glow "is the follow spot on the modern stage. It is the pool of light at your favourite reading chair. It is the shaft of sunshine that warms the end of the valley. It is candlelight on the face, and a flashlight on a stair... Focal glow draws attention, pulls together diverse parts, sells merchandise, separates the important from the unimportant, helps people see." In an age of often ubiquitously uniformly lit interior spaces, CoeLux reintroduces the vivid interaction between light and shadow that Kelly would describe as 'focal glow'. CoeLux describes the 'bliss and the joy'

of sunny skies and there is certainly an inexplicable positive feeling that is created with the skylight installation. Although it has none of the actual health benefits of natural sunlight - it doesn't have ultraviolet radiation that works to synthesise vitamin D3 - there is a claim that CoeLux could be beneficial to those who spend extended periods of time in spaces that don't receive natural sunlight. The idea is that the natural daylight effect of CoeLux will encourage the circadian rhythm that can be disrupted by spending days indoors without daylight. Because of these potential benefits, the CoeLux research project was awarded €2.5m in funding from the European Union under the 7th Framework Programme. Michael Jennings, spokesperson for European Research, Innovation and Science Commissioner Maire Geoghegan-Quinn, said: "Many areas of our lives - from energy, transportation, medicine, food safety, health and well-being - are being enhanced and even revolutionised by nanotechnology. CoeLux is a great example of how science can turn a simple idea that is difficult to achieve - replicating sunlight - into a reality. It clearly has huge potential to make a difference in people's lives." Part functional light source, part light-art installation, it has a utopian and

ever so slightly futuristic feel to it. The skylight is designed to be used in interior spaces where there is no natural light. CoeLux expect its application to be used in basement gymnasiums, underground car parks, subways, airports, shopping malls, offices, museums and even small spaces such as elevators or ship cabins. At approximately €40,000 for each skylight plus €10,000 for transportation and installation, CoeLux will almost certainly be used only in ultra high-end developments. Touching on the light-art tradition, CoeLux is reminiscent of James Turrell's installations, in particular 'space that sees' or 'Deer Shelter', part of his 'Skyspace' series, where he creates an architectural space with an aperture in the ceiling that serves to frame the sky. In doing so he creates a space where visitors can meditate on the innate beauty of the seemingly infinite blue sky. It also recalls Olufur Eliason's 2003 weather project at Tate Modern in London, in which hundreds of visitors basked in the glow of an enormous artificial sun. A year before that, Di Trapani himself was involved in an art exhibition in Como, Italy. In 'Di Luce in Luce' Trapani and others 'reconstructed nature within a gallery, reproducing spectacular optical

atmospheric phenomena, in which light is diffused, diffracted or refracted by the air, the clouds, drops of rain, branches of a tree, etc.' This exhibition was an early stepping stone in Di Trapani's research into the replication of natural lighting effects. At the moment, CoeLux is installed in only a few places in the world - one is the IdeaWorks Experience Centre in central London. To enjoy this simplest of experiential pleasures you can get in touch with IdeaWorks directly for an appointment-only visit to their showroom. A room illuminated by a CoeLux 45 solution will also be on display at the Euroscience Open Forum in Copenhagen and at the Architecture Exhibition of la Biennale di Venezia this year. [www.coelux.com](http://www.coelux.com)

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