



When Olfactory Art meets Climate Engineering

OSNI – Unidentified Scented Object, OSNI.1 – LE NUAGE PARFUMÉ, Cartier, Press Kit, Paris 2017:

An OSNI – Unidentified Scented Object – is a project in which olfaction, in other words the sense of smell, regains its rightful central place and all of its artistic functions. A sensorial installation designed to restore perfume to its full nature and arouse reflection, debate and curiosity.

Imagined by Mathilde Laurent, the Maison Cartier's perfumer-creator since 2005, Le Nuage Parfumé is a mix of olfaction, technology and dreams. A poetic cloud floats as if by magic in a transparent glass cube. Visitors are invited to enter into this closed space, then take a spiral staircase leading through the cloud. Once they reach the summit, it is not longer about seeing but about smelling the notes of L'Envol de Cartier.

Towards an architecture of the immaterial

Transsolar developed the concepts of the floating cloud, based on a precise manipulation of climatic conditions inside the glass cube. A stable thermal stratification of the air is created so that the cloud can be held in position even at dynamic environmental conditions – changing in a wide range of air temperature, humidity, wind and solar insolation. The cloud nicely separates two air volumes in the same space so that the fragrance can be diffused in the upper volume only.

Le Nuage Parfumé is a follow up to the first cloud in the cube entitled Cloudscapes, the results of a working collaboration between Transsolar and Tetsuo Kondo Architects that was shown at the Tokyo Museum of Modern Art in 2012.



**Transsolar
KlimaEngineering**

Le Nuage Parfumé

**OSNI.1 –
UNIDENTIFIED
SCENTED OBJECT,
CARTIER, PARIS,
OCT 2017**

Who we are

Transsolar is an international climate engineering firm determined to create exceptional, highly comfortable indoor and outdoor spaces with a positive environmental impact. The company was founded and registered in Stuttgart, Germany in 1992 and ever since we believe that the very measures taken to create remarkable architecture can simultaneously enhance human experience and minimize resource use. To us, sustainability is not separate from design, but an indispensable component that enhances the experience of the built environment.

What we do

We are vision facilitators, idea generators, and design integrators. Our engineers are not just experts in fundamental principles of physics; their creativity enables the collaboration necessary to develop deeply integrated comfort and energy concepts. Beginning from a project's earliest conception, we work alongside the client, architect, design team, and the most vital participants of all – the occupants. We study the seasonal behavior of sun, wind, heat, light and other energy flows in and around the building, and formulate concepts based on the complex interdependence of the local climate, user needs, architectural design and engineered systems. Our toolbox is ever-growing with custom software, tailored engineering analysis, and physical experiments used to develop and validate these ideas.

What we offer

We believe that the built environment is more than the physical building. Our approach explores all factors affecting the occupant experience – including their variation in time and space. Indoors or outdoors, a climate is continually changing. We respond with dynamic solutions that work with this natural variability, not against it. While we are constantly developing new technologies and finding innovative applications, we recognize that more technology alone is not the answer. We are also pioneers in creatively integrating passive design strategies.

Our product is a process. We ask difficult questions, challenge convention and propose new solutions, and thoroughly test ideas. Each project requires both sharing our knowledge and generating new ideas – ultimately creating unique experiences, but always achieving the same goal of high comfort with low environmental impact.

How we work

We characterize ourselves as collaborators. A collaborator challenges the very questions being asked and works with the team to develop previously unknown solutions – sometimes to previously unknown problems. Although this collaboration occurs with the entire design team, our relationship is closest with architects.

Our specialty is climate engineering: applying fundamental principles of physics and leveraging the local environment to influence and support architectural design. Transsolar introduced this discipline in Germany over 20 years ago and combined it with an integrated design approach. Though our first partnerships began in Germany, our network is now diverse, encompassing firms small and large from the U.S. to China.

Our practice is based on developing deep, trusting rapport with architects. These rappers begin on one project and develop in time to result in a shared portfolio. We have divided our impact into five categories:

Informing and inspiring design

Early collaboration – often before pen has touched paper – is key to our process. These conversations with architects about climate, program, and local context result in new and novel building forms, façades, and program organization. These collaborations have benefited the industry by repeatedly demonstrating that climate-responsive design does not have to degrade architectural quality, but rather can inform and inspire both interior and exterior designs which are beautiful and create new experiences.

Recognizing the value of instilling climate-consciousness in the minds of young architects and engineers lead many of us to accept teaching positions at top universities in Germany, the U.S. and worldwide, extending our collaborative influence. To reach an even broader audience and deepen our connections to different parts of the world, we recently established the Transsolar Academy.

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Integrating and developing new technologies

Each of the above influences has required integration and development of technologies – both specific products and broader system concepts. Transsolar is a technology broker: we revive and reapply old technologies in new ways; we bring rare or new technologies to the forefront so they become more widely accepted. Examples of such technologies include thermally activated structural slabs and double façades. Transsolar's demonstration of these concepts has made them more widely understood in climates and cultures across the world.

Sometimes, we are a link between the architect and the manufacturer, providing design requirements in response to specific project needs and often exposing the manufacturer to design considerations they were previously unaware of. Our work has even led to the introduction of such project-specific products to the general market.

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Realizing architectural vision

Collaboration also requires an understanding and sensitivity to architectural design intent. Many radical architectural innovations are first perceived as having high energy use and low occupant comfort. Simultaneous consideration of the critical design concepts and fundamental scientific principles, however, often reveals solutions which can provide exceptional comfort and energy performance while maintaining – and even enhancing – the design intent.

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Demonstrating unimagined performance

Transsolar has also expanded the boundaries of design possibility by demonstrating that 'unachievable' performance is, in fact, possible. This is true for comfort and energy performance, in highly glazed, low energy buildings, ultra-low and net-zero energy buildings, and buildings in extreme climates.

The resultant buildings are not merely prototypes but fully functioning offices, museums, and classrooms with measured data that prove how performance boundaries can be pushed. Such real-world applications encourage other clients and design teams to consider possibilities beyond their initial expectations.

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Creating new design and practice areas

In the last ten years, Transsolar has continued to broaden how climate engineering can be applied, creating new practice areas for ourselves, and in turn expanding the possibilities of architectural design.

The first new area is the creation of so-called 'environmental art', either led by or supported by Transsolar. These installations inspire the public to recognize how their surrounding environment influences their daily experience.

The second new area is an increased focus on outdoor comfort. This allows optimization of traditional architectural outdoor spaces such as stadiums and creation of unimagined thermal environments in public spaces such as parks and plazas.

Last is the application of these climate engineering concepts to a master plan scale. We have expanded the traditional scope of master planning to include considerations for outdoor comfort (at both the city and street scale) and building performance. The result is improved urban environments with both better comfort and energy performance.

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Informing and Inspiring Design



Parc de Ateliers, Arles

"The opening of Mécanique Générale together with the Rencontres 2016 represents the second completed building by Selldorf Architects at LUMA Arles, following the summer 2014 opening of Les Forges. Originally built as the repair shop for SNCF railcars, Mécanique Générale required almost a total rebuild to transform it to an exhibition space. Given LUMA Arles' fundamental commitment to experimentation, innovation and collaboration it was critical to design an exhibition space that would have great flexibility while still having a strong presence." [Luma-Arles.org Journal no 4 – summer 2016].

For both completed buildings, Transsolar has designed a sustainable climate and energy concept with a strong sense of the Mediterranean place. The passive and active design of the building has been optimized for daylight, natural ventilation and thermal comfort. Considering the local climate as well as the highly fluctuating visitor densities throughout the year, a sustainable and resilient design was created satisfying the requirements of the curators and artists with reduced mechanical systems and a low energy demand.



Mécanique Générale and Les Forges, Arles, France, ©Transsolar

Parc de Ateliers, Arles

When the Parc des Ateliers is completed in 2018, LUMA Arles will house an art and research center with exhibition spaces, workshops, artists' studios and a library. The project repurposes the industrial ruins of a 16-acre rail depot and revolves around a public park-garden designed by landscape architect Bas Smets and a new arts resource building designed by Frank O. Gehry. Two structures originally built as the repair shops for SNCF railcars, the Mécaniques Générale and Les Forges, have already been renovated by Selldorf Architects. The Parc des Ateliers is intended to be an outstanding project in regards to both the architectural approach and energy efficiency and sustainability.

Transsolar developed the climate, comfort and energy concepts for all buildings. The focus was to achieve a high level of both visitor comfort and excellent environmental control for the various program areas in the complex. The energy goals were to

reduce overall building demand by 60% when compared to a reference project, fully utilize the site's potential for renewable energy, and, consequently, minimize dependence on nuclear power. This is achieved by optimizing architecture forms, employing passive strategies for comfort, and developing an energy supply system based on bio-fuel cogeneration and photovoltaics.



Arts Resource Building, Arles, France, © Transsolar

La Seine Musicale, Paris

Located on an exceptional site, along the Seine river, this new cultural facility dedicated to music suggests an iconic architecture, that is full part of the urban requalification of a former industrial territory, l'île Seguin. The complex consists mainly of music halls, in particular an auditorium with 1100 seats and a concert hall for 4000–6000 spectators depending on the configuration, where a large variety of events will take place. La Seine Musicale is also hosting Insula Orchestra, la Maîtrise des Hauts-de-Seine (Paris National Opera Children's Choir), a

center for rehearsals and recordings, an administrative section as well as commercial and business spaces, a large lobby and a restaurant.

La Seine Musicale presents a very bold and innovative architecture by Shigeru Ban Architects Europe and Jean Gastines Architecte, embodied by the wooden egg-shaped auditorium, which is covered with a solar 'sail' that follows the sun path. Furthermore, the building is characterized by an exceptional acoustics, which is now one of the main references in France.

Regarding this issue, balancing the acoustical performance with thermal performance was one of the key challenges of the building design. Transsolar's scope of work consisted in tracking environmental performance and energy consumptions, for which a commitment has been signed with the General Council of Hauts-de-Seine.



La Seine Musicale, Paris, France, © Didier Buy de la Tour

Integrating and Developing Technologies



Integration of Modern Technology

One of our primary aims is to seamlessly integrate highly-efficient climate control systems into a building while preserving the building's architectural narrative. To do so, we must remain at the frontier of new technical developments while maintaining our expertise with existing technologies so we can maximize system synergies. This enables us to question the current capabilities of technology and make demands on how to improve it.

Completed in 2002, the Deutsche Post Tower (Murphy Jahn Architects) in Bonn is one exemplar. The tower is located along the scenic Rhine River, adjacent to well-used public promenades and verdant landscapes. It was therefore crucial for the building to be unobtrusive. On the other hand, the high occupancy number and small footprint of the site dictated that a tall tower must be built to accommodate the office workers. Furthermore, operable windows were mandatory for all 40 storeys.

The tower's resulting glass façade allows the building to be in harmony with its surroundings, and is also key for the building's ventilation strategy. The double façade incorporates decentralized supply air units, which increases usable space on the interior, and operable windows, which augment occupant comfort. To reduce energy use, user-controlled shading devices reduce solar loads. Any cooling required is drawn from the open-loop ground-water wells. This combination of technical systems and architecture renders Deutsche Post Tower as a landmark in Bonn and in technology integration.



Integration of Vernacular Architecture

In some cases, our concepts serve as reminders that vernacular architecture is still relevant today. Our projects in the Middle East employ solar chimneys and wind towers that have been used in the region for centuries to maximize passive cooling abilities of the built environment.

The use of local materials, and low-tech, low maintenance systems were important for the French School in Damascus (Ateliers Lion Associés). The summer climate consists of hot dry days and cool

nights, so Transsolar conceived a ventilation and conditioning system that would take advantage of the climate and refer back to traditional architecture. Preconditioned outdoor air is drawn from vegetated, shaded courtyards through concrete floor slabs. Wind-assisted solar chimneys are used to drive natural cross-ventilation through the classrooms. The chimneys are faced with a locally-produced polycarbonate sheet to trap solar radiation and enhance stack effect during the night. During nighttime, cool night air flushes the classrooms, cooling

the heavyweight thermal mass of the concrete structure and providing comfort the next day.

The Masdar City master plan in Abu Dhabi also borrows from vernacular architecture. Limited air infiltration is desired during hot periods, while increased infiltration is welcome during cold periods. Transsolar adapted the classical wind tower to suit the needs of the development. Simple flaps in the tower allow infiltration to be controlled depending on outdoor conditions.



Lycée Charles de Gaulle, © Adria Goula

Design Process and Innovation

Innovative design concepts can only be successfully, cost-effectively developed by validation throughout the design process. Transsolar uses a suite of analysis tools to perform dynamic thermal simulations, and computational daylight and fluid-dynamics simulations. We generate design recommendations from the outcome of these simulations in order to support the design team during an iterative, integrated design process. We do not shy from practical testing of innovative concepts either. Mock-ups are built as required to test our innovative climate concepts.

Gardens by the Bay is a park with 100 ha reclaimed land in central Singapore, adjacent to the Marina Reservoir. Besides large outdoor gardens two cooled conservatories (Wilkinson Eyre) form part of the world class visitor attraction: the 'Flower Dome' features cool-dry climate of the Mediterranean and semi-arid sub-tropical regions and the 'Cloud Forest' features the cool moist climate of the tropical mountain region. Besides developing the client's design brief Transsolar's role was providing technical consultancy for the Conservatories, developing the climate and energy concept for the Garden office and the support biome. The concept aimed at creating spaces comfortable for visitors and climatically adequate for the flora exhibited in the two biomes while minimizing

associated operation energy of the large volume. Initially, 6 prototype glass houses were built to develop, test and monitor different climate engineering strategies. The results were used for the development of the design brief and performance specifications of the large conservatories. Space conditioning relies on both passive and active technologies. Optimizing the building envelope included the specification of solar protective glass (g-value 0.35) with low-emissivity properties, using the internal flora to create shading and natural stratification of temperature, keeping the occupied zones naturally comfortable for visitors. The high amount of daylight (daylight transmittance 0.7) assures growth and flowering of the respective plants. Space conditioning is performed through activation of the

radiant concrete floor, whereas fresh air is provided through mechanical yet efficient displacement ventilation – at occupant level only. The client is responsible for some million trees in Singapore generating plenty of timber clippings. Transsolar initiated a zero carbon operation of the cooling of the conservatories by utilizing this renewable energy source to be burnt in a steam biomass boiler to drive a combined heating, cooling, liquid desiccant dehumidification and electricity plant.



Gardens by the Bay, Singapore, © Transsolar

Realizing Architectural Vision



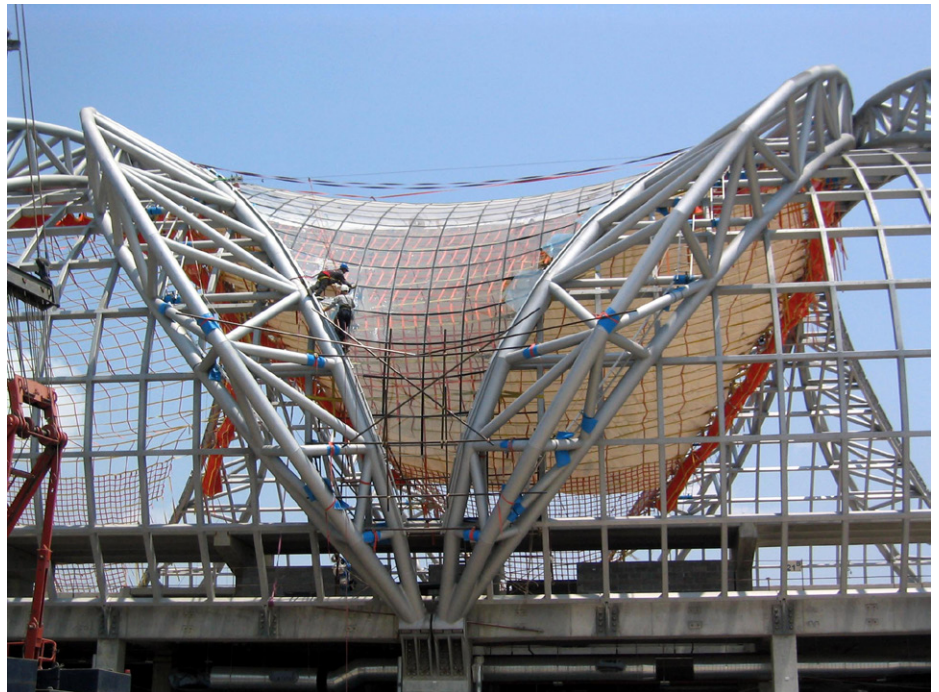
Murphy Jahn Architects

Murphy Jahn Architects had a vision for the Suvarnabhumi Airport at Bangkok which emphasized openness: the experience of the open spaces, the gestures of the roof and spaces as memorable images and the way the boundaries between public and private spaces are blurred. To realize this vision in a tropical hot and humid climate was a real challenge. Conventional methods would have required energy-intensive solutions with extreme amounts of air conditioning. Instead, an innovative and truly integrated architectural,

structural and environmental design solution consisting of new material developments and advanced technology systems was developed.

An innovative roof trellis (one of the largest in the world at the time) was conceived by Transsolar. The roof consists of a three-layer membrane roof structure: an outer skin of PTFE, a transparent thermoplastic sound-insulating middle layer, and a sound-absorbing low-emissivity inner layer (to reflect the cold inner radiation into the interior space). Coupled with

a radiantly-cooled floor, it resulted in a building carefully illuminated with daylight, shaded against intense tropical sun and comfortable in the hot and humid climate. New solutions for weather, noise and heat protection were developed, while building envelope and installed mechanical equipment worked together to create optimal comfort at minimum energy consumption.



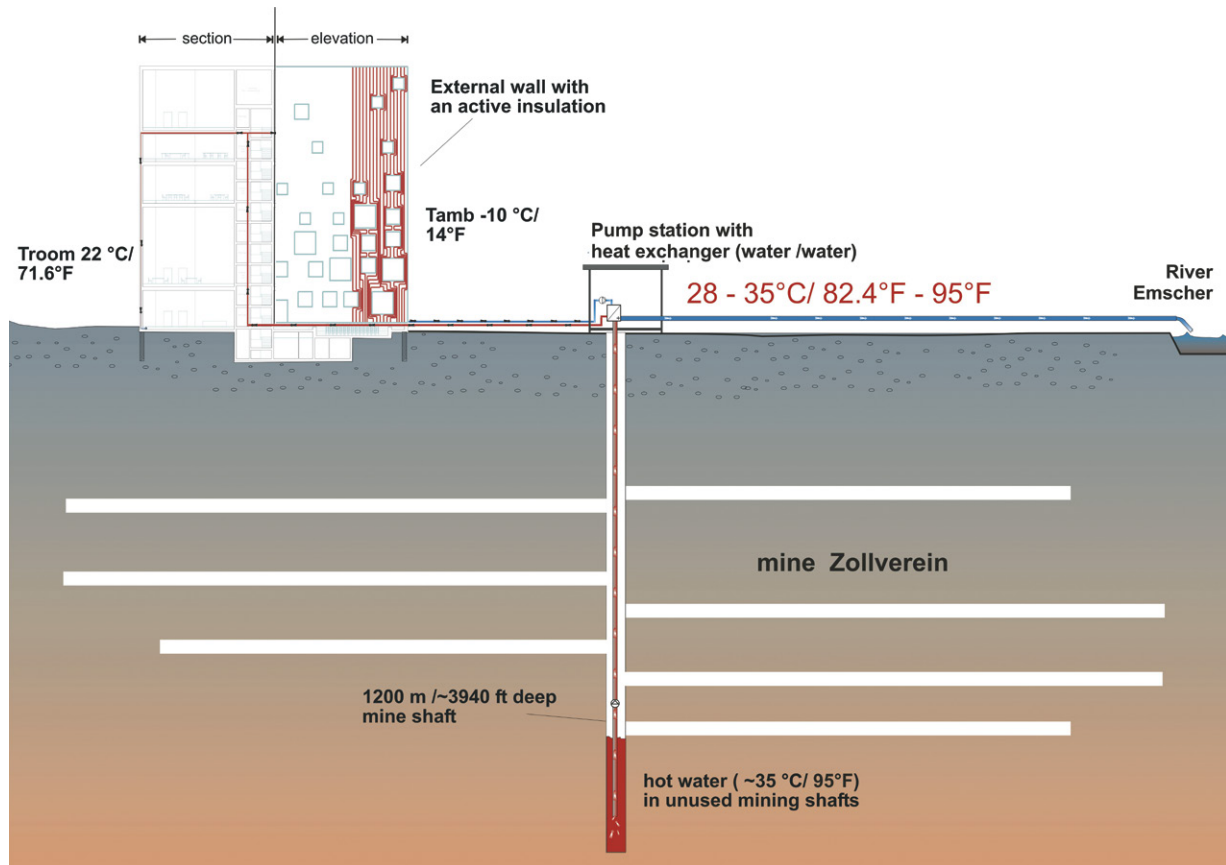
SANAA

Kezuyo Sejima is a design minimalist and approaches each project with a quest to refine and advance the minimalist design philosophy further. One example from our continued collaboration with the architect is the Zollverein Design School in Essen. It is considered a model project for systems integration.

The initial concept for the project was a concrete cube, perforated by numerous apertures of different sizes. The interior spaces were designed to be expansive and largely column-free. However, conventional German walls with conventional levels of insulation demanded thick walls, compromising the minimalist architectural vision.

Transsolar developed an integrated design concept which allowed for thin, highly-perforated exterior load-bearing walls that meet German insulation requirements. This sophisticated active thermal insulation system consists of preheated water circulating through the facade. This concept takes advantage of the free high-temperature groundwater which is continuously pumped from a local abandoned coal-mine.

In the design process, the team leveraged architectural vision, smart engineering, and site-specific free thermal energy to create the desired, sleek form. Other successful projects of this partnership include the Glass Pavilion for the Toledo Museum of Art in Ohio, and Grace Farms in Connecticut.



Zollverein Design School, Active insulation schematic, © Transsolar

Steven Holl Architects

Steven Holl is recognized for his ability to shape space and light with great contextual sensitivity. The firm also emphasizes sustainable building and site development as fundamental to innovative and imaginative design. Steven Holl Architects and Transsolar have developed over the past decade a strong working relationship, which spans exemplary projects such as Linked Hybrid (Beijing), Herning Museum of Contemporary Art (Herning), and Iowa School of Art (Iowa City). With each of these projects, Transsolar has raised the bar in engineering and innovation,

producing the largest geothermal system in China, the first open-well geothermal system in Denmark and first application of slab cooling in a bubble deck*.

Among upcoming projects is the Houston Museum of Fine Arts; it incorporates an exciting façade system dubbed the 'cold jacket' or 'breathing glass envelope'. The glass façade, scalloped in plan view, reduces incoming solar heat while retaining colourlessness and transparency by means of a special coating. The heat collected by the façade is then exhausted by outdoor

air using natural ventilation and buoyancy effects. These projects and other collaborations with Steven Holl Architects continue to introduce novel strategies that realize breath-taking and comfortable architectural works.

*A bubble deck consists of a plastic ellipsoids sandwiched by reinforcing in a concrete slab. This technology enables light-weight concrete components to be used for wide spans while minimizing material usage and embodied energy, and maintaining thermal capacity.



Linked Hybrid, © Iwan Baan



Demonstrating Unimagined Performance

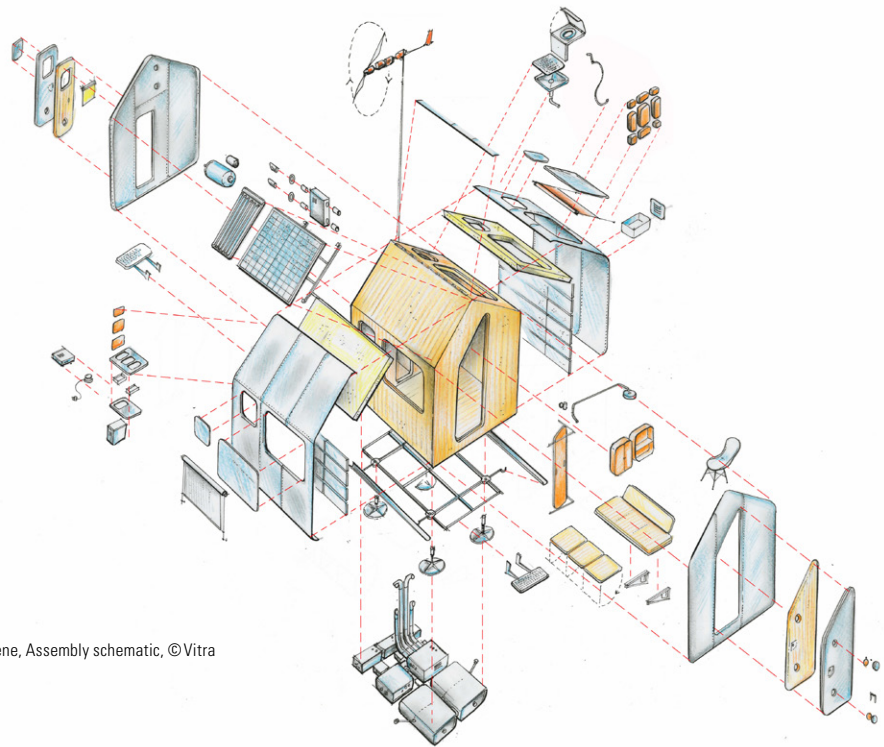


Net-zero Energy Residences

Similar to office buildings with ground-breaking environmental performance, Transsolar has set the path and demonstrated the possibility of net-zero living with a modern lifestyle.

The R-128 house in Stuttgart, Germany is one of the earliest modern residences with measured net-zero energy consumption. The designer, Werner Sobek, has lived in this house since 2001. Transsolar applied concepts that were uncommon for homes at the time; they include triple-pane glazing with inert gas filling, hydronic systems, and seasonal heat storage by an architecturally-integrated passive thermal storage system. Renewable energy production on site generates any required electricity.

In order to address the very likely future trend of pre-fabricated houses, and to demonstrate that net-zero resource consumption residences are feasible even with such a design/production/supply/use strategy, we recently developed the energy and water concepts for 'Diogene', a modular, pre-fabricated house by Renzo Piano. The house is installed in the Vitra campus in Germany. General response is very positive so far and the prototype design is being optimized for mass production.



Diogene, Assembly schematic, © Vitra

Energy Efficiency in Extremes

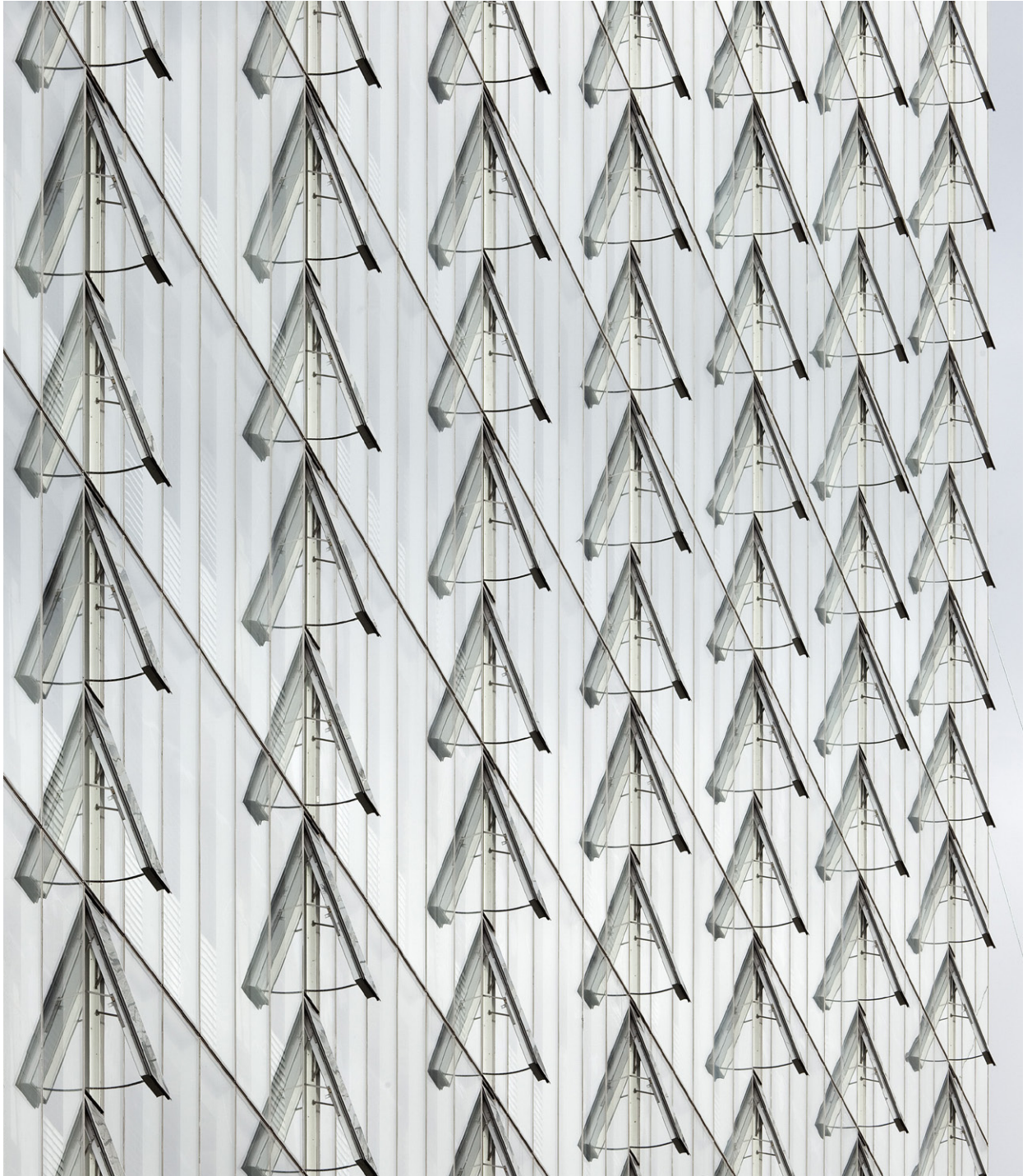
Three years after opening, Manitoba Hydro (KPMB Architects) has surpassed its highly aggressive energy target by 5% to achieve 65% energy savings per ft² compared a typical office building in Canada. The latest measured energy performance data shows annual energy consumption of approximately 27 kBtu/ft²/year (85 kWh/m²/year) for a 695,000 ft² (64,650 m²) office building in an extreme climate that fluctuates from -31 °F to +95 °F (-35 °C to 35 °C) annually.

The measured data has also shown the building utilizes solar chimney-driven natural ventilation for approximately 38% time of the year. Even under mechanical ventilation mode, the entire building is provided with 100% outside air. This means, all the occupants always receive 100% fresh air in a building that is in one of climatically-harshest locations in the world.

In short, by having fundamental necessities for great experiential quality such as access to fresh air, views to the outdoors, natural light, and calibrated acoustics, the building has created a greater feeling of health and well-being in the occupants. The result is that absenteeism due to illness is down by 1.5 days per employee and productivity has risen.

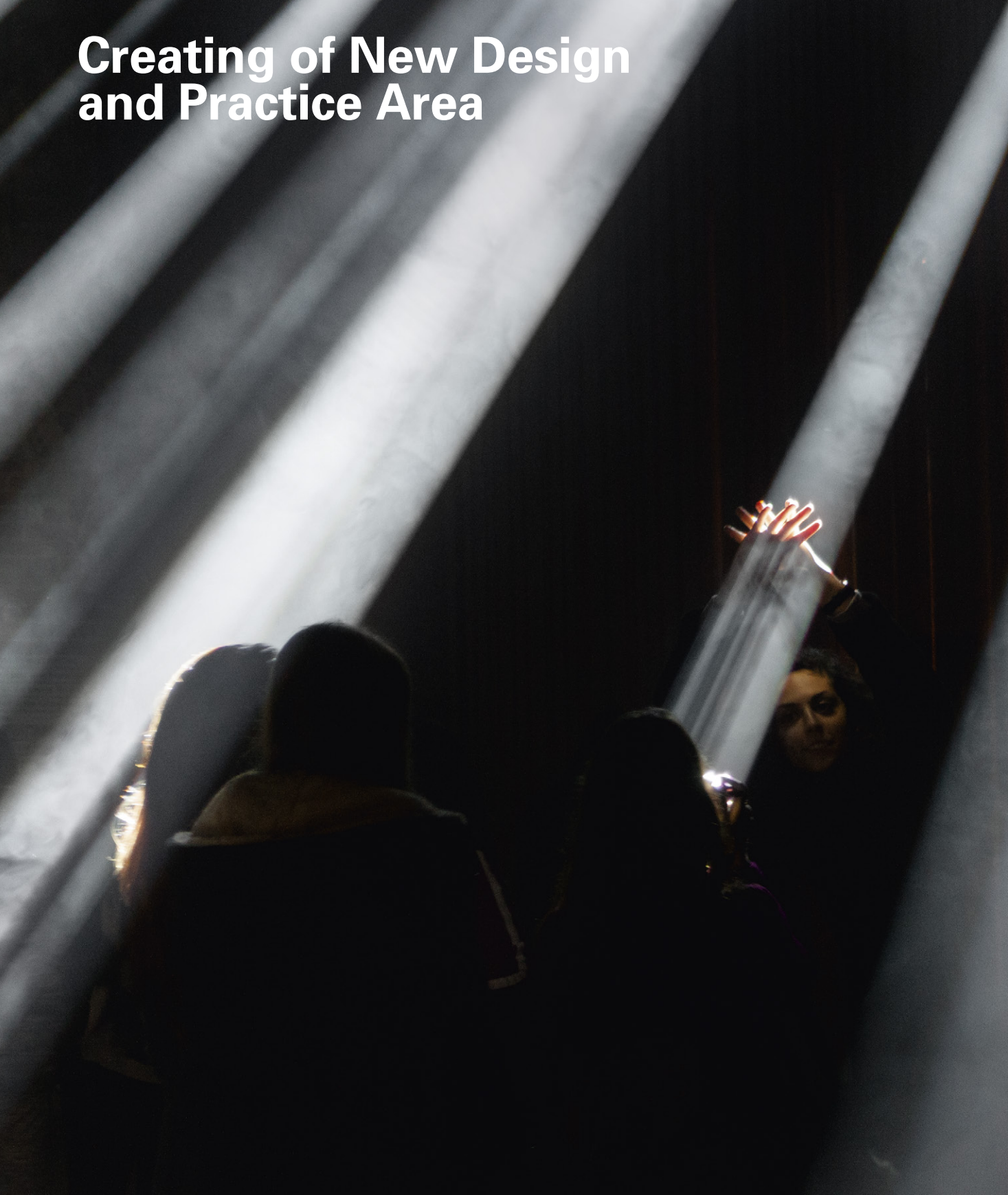


Manitoba Hydro, Climate control systems
© Brian Christie



Manitoba Hydro, Façade, © Tom Arban

Creating of New Design and Practice Area



Environmental Art

For the 12th Venice Architecture Biennale in 2012 we were invited by Kazuyo Sejima, curator of the exhibition to do an exciting installation: 'Cloudscapes' was designed in cooperation with Tetsuo Kondo and explores the poetic nature of clouds by controlling the microclimate of the space in the Arsenale Building. Transsolar employed its knowledge of physics to create a layer of artificial clouds which hovers above the ground level, remaining in balance above the heads of the viewers. To fully experience the immaterial lightness of clouds, a winding system of ramps allows the viewers to feel and touch the clouds by physically entering it, walking over it, and back down again. It was the first cloud installation of this scale and demonstrated the control that we could have over an interior space.

In 2016, for the 15th Venice Architecture Biennale, Transsolar collaborated with the German Architect Anja Thierfelder and participated with 'Lightscapes'.

'Lightscapes – local identity, exploring a forgotten resource' is not an esoteric exercise; in fact, it contains a message for all. With the installation, climate engineer Matthias Schuler and architect Anja Thierfelder wanted to inspire others to sharpen their senses: "Seek out and delve into the local identity of a place and let its potential help you define your buildings and cities!"

This is how bespoke, sustainable and aesthetically solutions can arise and distinguish themselves from global architectural trends. For architecture and comfort design this installation encourages the recollection to context sensitive design traditions, centered in the local climate and culture.

Both installations encourage environmental interaction. Instead of an 'untouchable' architectural art piece we encourage the design team to search for concepts that enable direct user interaction with the natural environment.



Outdoor Comfort

Transsolar has worked on developing design tools that quantitatively rate outdoor comfort. The first success of using these design tools was the winning concept for Masdar City Center with LAVA architects. Large, operable, solar-powered parasols expressed architecturally one of the key elements that dictates local outdoor comfort: shading during the day, exposure to the cold sky at night, which cools the central plaza. Another milestone was winning the competition for the FIFA World Cup Qatar in 2022. Transsolar was responsible for the sustainability concept and stadium comfort concepts included in the bid book.

Combining 3D modelling capabilities with outdoor comfort design tools allows detailed evaluation of outdoor comfort. In collaboration with Mossessian & Partners, Transsolar developed 'cool pools' for the Heart of Doha project, a revitalization of Qatar's capital. This design, like our others that incorporate active cooling of outdoor spaces, uses renewable energy (PV) to offset the electricity required for the cooling.

The Austrian pavilion at Expo Milano 2015 showed our latest effort to inform architecture by applying advanced outdoor comfort simulation tools. The pavilion addressed the visitor's awareness of outdoor conditions by a choreography of subtle adjustments of the outdoor environment in a miniature forest: increased humidity levels, air movement and evaporatively cooled air was used in landscaped areas to mimic the various Austrian forest climates.



EXPO Pavillon 2015 – BREATHE. AUSTRIA, © Transsolar

Master Planning

Transsolar's involvement with masterplan developments began in 2007 with Masdar City. The development is to house 50,000 people in accordance with WWF One Planet Living sustainability standards. As the first zero-carbon masterplan of this scale, Masdar City demanded a holistic approach.

Since then we have been invited to more large-scale masterplan developments and broadened our scope beyond minimizing energy use.

For a city expansion for 190,000 inhabitants in Abuja, Nigeria we were able to identify a reduction of carbon emissions by -96% over the existing city layout and infrastructure. This was achieved by optimizing city layout for daylight and solar potential. A deep exploration of building energy use and energy supply led to a highly efficient district energy supply system that extended the original scope of the masterplan.

Maidar EcoCity is a new city in Mongolia that challenges low energy design because of its harsh winter climate. Project goals to optimize the city layout for passive solar gains, to thoroughly insulate building skins and to shift from 100%-coal energy generation to renewable energy also required studies for new energy storage technologies.



Masdar City Masterplan, © Foster + Partners



Abuja City Expansion, © Albert Speer & Partner

Teaching

Our greatest impact in inspiring design results from inspiring future generations of architects through Transsolar's numerous teaching assignments. In 2016 our staff gave more than 90 lectures and spent approximately 2000 hours on inspiring and educating other people about our work. We have collected a few examples where this direct impact is visible.

Transsolar collaborated on the design for the Butaro Hospital in Rwanda with Harvard Graduate School of Design (GSD) students. The students started the MASS Design Group (building design firm) in response to their experience on this project. Elizabeth Timme, another GSD student, found great success on a studio project due to the integration of sustainability concepts with guidance from Transsolar. This success contributed to her decision to found LA-Más, a non-profit that looks critically at systemic problems in the Los Angeles area and provides solutions based on research and community engagement.

Transsolar Academy

Transsolar has brought teaching in-house. We annually invite six to seven young professionals from the 'majority world' on a full scholarship to partake in the Transsolar Academy. The goal of the program is to share knowledge on climate responsive design, so they can integrate it in their practice in their home countries where we believe this work will be needed most in the next 20 years. We also see a great richness in the learning we experience from interacting with people from all corners of the earth.



Butaro Hospital, © Iwan Baan

Teaching

Thomas Auer
Chair of Building Climatology and Building Services, Technical University of Munich, Germany (ongoing)

Visiting lecturer, School of Architecture at Yale University, Connecticut, USA (2001–2009)

Visiting professorships, Canada, France and Italy

Matthias Schuler
Adjunct Professor of Environmental Technology, Graduate School of Design Harvard University, USA

Volkmar Bleicher
Professor of Materials Science and Climate-Efficient Building, Faculty of Architecture at the Stuttgart University Of Applied Sciences, Germany (ongoing)

Dr. Wolfgang Kessling
Lecturer, Southern California Institute of Architecture, Los Angeles and National University of Singapore (ongoing)

Matthias Rudolph
Professor of Building Technology, Academy of Fine Arts, Stuttgart, Germany (ongoing)

Thomas Lechner
Professor of Materials Science, Building Physics and Climate-Compatible Building, Institute of Technology, Kaiserslautern, Germany (ongoing)

Publications

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Birkhaeuser 2003,
Editor: Anja Thierfelder,
ISBN 978-3-7643-0792-9

High Comfort Low Impact, Transsolar ClimateEngineering
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Editors: Nadir Abdessemed,
Matthias Schuler,
ISBN: 978-3-937934-03-7

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2013, Editor: Wolfgang Kessling,
<http://www.transsolar.com/blog/design-for-outdoor-comfort/index.html>

Connect Ideas, Maximize Impact, Transsolar KlimaEngineering
fmo-publishers 2014,
Editors: Monika Lauster, Anna Lermer, Joshua Monk Vanwyck,
ISBN: 978-3-937934-06-8

Lightscaapes, Transsolar KlimaEngineering + Anja Thierfelder
fmo-publishers 2016,
Editors: Anja Thierfelder, Monika Lauster,
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In 1992 Transsolar started out in a 24 m² office in Stuttgart, Germany and since then has grown to 45 engineers and 10 administrative staff with offices in Stuttgart, Munich, Paris and New York.

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OSNI.1 – Unidentified Scented Object,
Cartier, Paris, October 2017
Photo: Transsolar