Materials of Fashion

From Analogue Principles to Hybrid Practices

Think Outside the Box: Using Textiles in Between the Dimensions of a Blouse and a House

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Short Bio of the Author: Katja Bernert is a Textile Architecture enthusiast. Trained as an architect at the University in Aachen and at the Bartlett School of Architecture in London she soon dived into fabric constructions when starting her professional career with gmp architects in Berlin and Frankfurt. With the planner's experience of designing textile roofs she joined the industry and now works as mediator between international architects and engineering offices and the R&D department of the weaving and coating company Mehler Texnologies. Katja is internationally invited for lectures, as workshop instructor and into the scientific committees of symposia. She is chair of the international industry association AMA, Architectural Membrane Association, member of the Institute for Membrane and Shell Technology, IMS, and of TensiNet. She is listed member of the Chamber of Architects.

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“Architects need to stop thinking exclusively in buildings” said designer Hans Hollein in his article “Everything is architecture!” in 1967. He noted that a space suit for example was a home, too. What exactly are the options for using textiles in between the dimensions of a shirt and a pneumatic house? It needs explaining if this is a question to be tackled by architects in general or by experts for tensile architecture only, that is to say constructions with fabrics and foils.
From the tensile architecture point of view it is absolutely clear that giving up on the rectangular approach is one means to solve today’s energy problems. Will lightweight structures with curved shapes replace what we still take for granted as our built environment – boxes all around the place?

The 1960s are a good starting point for this evaluation. Around 60 years ago, there were suggestions – more pieces of art than architecture – that tackled the society’s response to changing environmental conditions. That was about half a century before talk about imminent climate change became omnipresent in the daily discourse. The escapist notion of what the Viennese Group Haus-Rucker-Co did in 1971 when covering a whole villa with a huge pneumatic structure is an example for textile options if all other means stopping the climatic collapse fail. Taking the same artists’ proposal for the documenta 5 in Kassel in 1972 serves as a more optimistic example of what a tensioned structure can do for limiting energy consumption to the direct personal realm. Peter Cook and Archigram set examples when proposing the inhabited capsules as house models for the future – their future which is our present. Can these 60 year old ideas be transformed into a possible answer to current energy saving needs? Will they withstand today’s reality check?

Textiles in units between house and blouse

Our first association with fabrics relates to our second skin. The material for our clothes are textiles – mostly woven, sometimes knit or felted, only rarely extruded and virtually never tensioned. They prevent us from nakedness and keep us well-tempered. Today’s highly functionalised fabrics keep the cold out, allow water to transpire. Sometimes they are even smart when illuminating in the dark or highlighting body parts of patients in hospital that are threatened by too much pressure.
❑ FIGURE-01 ❑ FIGURE-02

There is yet another scope in which fabrics play a role as our second or rather third skin: a space suit for example houses the astronaut when exposed to outer space. The pop-up festival tent provides privacy in an environment that is focused on proximity and togetherness. Both are means to further limit our exposure to the environment – beyond the mere physical or visual protection. As in our direct intimate realm, fab-

rics and foils in structures like tents or canopies are additional means of protection, helping us to withstand environmental impacts.
It is in this scope as second or third skin that tension plays an important role. Air pressure in the space suit tensions the textile skin and it is the structural system supporting a tent, putting enough stress and ideally double curvature into the fabric that it seems to hold magically. These examples of textile and tensile units in between the size of a blouse and a house need further investigation when exploring sustainable options of lightweight tensile structures.

Tensile architecture is essentially the combination of this concept of tension and transparency – often merely translucency. In fashion this combination can result in beautiful schemes as shown in the SZ-Magazin in February 2023.
❏ FIGURE-SZ-01 ❏ FIGURE-SZ-02 ❏ FIGURE-SZ-03

Inspiration from the 1960s

The Viennese group of artists and architects Haus-Rucker-Co was founded in 1967. In many of their works they tackle the interrelation of human beings with their environment. Within their assessment the environment is often a harassing factor.
A climax of these thoughts is their proposal for an exhibition in Krefeld. The villas of the Verseidag founders Lange and Esters were only recently converted into exhibition spaces when the Haus-Rucker-Co exhibition took place in 1971. The title “Cover. Survival in a Polluted Environment” illustrates the artists’ dystopic view on the matter. The response to this life-threatening scenario is all the more utopian: a temporary pneumatic structure covering an entire villa. The translucent polyvinyl coated polyester fabric contrasting Mies van der Rohe’s Modernist architecture is a highlight of early fabric architecture.
❏ FIGURE-03

Only one year later, Haus-Rucker-Co installed a bubble on the front side of documenta’s main building Fridericianum. The unit was equipped with two artificial palm trees and a seating accommodation.
❏ FIGURE-04 ❏ FIGURE-05 ❏ FIGURE-ADD-01

Again, in 2010, they repeated this scheme in Hamburg, at the Museum für Kunst und Gewerbe. Both structures are based on the same idea: because the environment is increasingly stressful, mankind – in this case in the single unit of one person – needs to withdraw into protected spaces. The bubble unit becomes the direct personal realm. The airlock is not only a pneumatic device but mainly a gate meant to keep the dangerous environment outside so that the individual is protected against all odds in the secluded inside.

The work of Architect Peter Cook within the Archigram group is mainly characterised by ideas about modular living. Archigram imagined future forms of living as an addition of capsules housing the citizens or serving as cultural hubs with equipment for the city's social functions. Pneumatic spheres of fabrics and foils are one option for the single units, rectangular shapes – similar to state of the art schemes with container units as building parts of a stadium for example – are another option for structural units.
❏ FIGURE-ADD-02 ❏ FIGURE-06 ❏ FIGURE-07 ❏ FIGURE-08

Instant City, an Archigram project of the late 1960s, suggests an airship containing all the cultural resources of a metropolis. Moving from site to site, not restricted by a building, it redefined the city as a temporary event, much like a festival, rather than a location fixed in space. This is yet another sustainable notion which comes with the flexibility of such a modular scheme. It is obvious that this idea can only work when using fabric and foils as lightweight materials for these playful schemes.
Hans-Walter Müller designs and builds pneumatics since the 1960s. Already very early he experimented with air-supported fabrics and foils as dwellings. In contrast to what Archigram suggested, his proposals where very realistic, he actually lived and worked in one of his pneumatic structures and does so still.
❏ FIGURE-ADD-03 ❏ FIGURE-09

The Spanish architect and pioneer of pneumatic structures, José Miguel de Prada Poole, was in tune with Buckminster Fuller or Frei Otto when it comes to options for building with less material. Their resource-sensitive way of structural and architectural design is still state of the art and definitely pathbreaking when looking at today's challenges. De Prada Poole was particularly passionate about using air as the most available and hence most sustainable supporting material, respectively structural element.
❏ FIGURE-10

Of course, Frei Otto's work serves for relating fabrics to tangible ideas for the build environment – there are obviously many notions of sustainability in his work. He was the first to introduce lightweight structures for prominent buildings, as in the playful scheme he developed with Günther Behnisch for the Olympic Stadium in Munich. When celebrating Frei Otto's 90th birthday former German President Joachim Gauck said about the Munich stadium that we would love our state to have the same qualities as the roof: confident and swinging, protecting and transparent, securely based and full of lightness.
❏ FIGURE-11 ❏ FIGURE-12

When looking at Frei Otto's sketch books we find more in depth assessment of the interrelation of human beings with their (built) environment

– all hinting at the fact that there must be a sustainable, lightweight way of minimising people's input. Essentially these notes are early evaluations of the citizen's environmental footprint.
❏ FIGURE-13

From the material side there are surprisingly few up to date answers for a more sustainable use of fabrics and foils as building materials. The proposals from the fabric industry for example extend to declaring PVC/ Polyester Materials as recyclable – failing to put this option into reality most of the time and having failed in making this option feasible for Glass/PTEE fabrics altogether. Hinting at the options for recycling (which is essentially a downcycling) is definitely not enough to get away from raw oil-based material consumption. The concept of being lightweight in the first place and saving raw material by using recycled (upcycled!) PET bottles for the fabric are certainly important steps towards a more sustainable fabrics industry.
The concept of using lightweight materials is in itself a response to today's needs for downsizing. It helps to redefine the personal realm into a manageable, movable size. In essence the concept helps to overcome the "my Home is my Castle" habitus. The scheme might seem frightening – whether by questioning our traditional concept of living or by introducing new materials to shape our personal realm and essentially reshape our urban environments.

If we take serious what Hollein said in 1967: "Everything is architecture!" we must be frank enough to dwell in innovative tensile units between the dimensions of a blouse and a pneumatic house. That does not necessarily lead us into a bubble the size of what Haus-Rucker-Co suggested for documenta 5, imagining all of us in a matrix-like structure with the balloons that house us. It can be as simple as the single person using a thermal snoody when living in a 200 sqm villa instead of keeping the whole place in 21° condition. This is far from the escapist notion of what Haus-Rucker-Co suggested when covering the Lange villa with a pneumatic structure in order to withstand climate change. Rather transferring it into the hygge, that is to say cosy corner and hence giving the scheme of smaller units per person a more positive notion. That works in cold temperatures as well as in hot climates.
❏ FIGURE-14 ❏ FIGURE-15 ❏ FIGURE-16

A comparative look at individual mobility is an eye opener: here we are obviously one step ahead. The transformation from taking cars with the notion "the bigger the better" to accepting micro-cars for the new SUM, Sustainable Urban Mobility, is in full swing. Starting point here again was a very similar sized car from the late 1950s, as for example the original Fiat 500. The mobility example shows that downsizing is a key to making transportation more sustainable. The savings on energy can

easily be detected during production – using lightweight material is an important milestone in mobility.

This learning from mobility can easily be transformed into the built environment. It is more than obvious that tensile architecture holds the key to many of these transformation processes. The material is lightweight, modules are replicable and can be added within a matrix that holds the structure's service functions. The flexibility of these structures is a key to a quick response to changing demands. Whereas the design life can be prolonged to a far extend there still is an end-of-life scenario – either by recycling the components that can easily be separated or by using the parts yet again in another structure. Being lightweight is the integral advantage of fabric and foils as building materials. The drawback of having raw oil-based products as the base material can literally be diffused by using upcycled PET bottles as the raw material for the fabric.

Textiles are one of the oldest materials to serve as a second skin for human beings. While we accept a thermal blanket or even a foil as a cover to re-energise or keep energy close to our bodies, we would not necessarily accept a foil in a wider sense, giving us a bigger realm for deployment. There is great potential in exploring this realm in between house and blouse – particularly when looking at the units we need to heat respectively cool. Space is a luxury with eight billion people on earth, well-tempered space even more so. Establishing fabric and foils along the traditional building materials is one step, looking at the dimensions of the envelopes we build is yet another.
❏ FIGURE-17 ❏ FIGURE-18
Transforming this into fashion is not necessarily responding to energy saving needs in an immediate sense. Yet it is obviously more inspiring than the snoody or the mere thermal blanket.

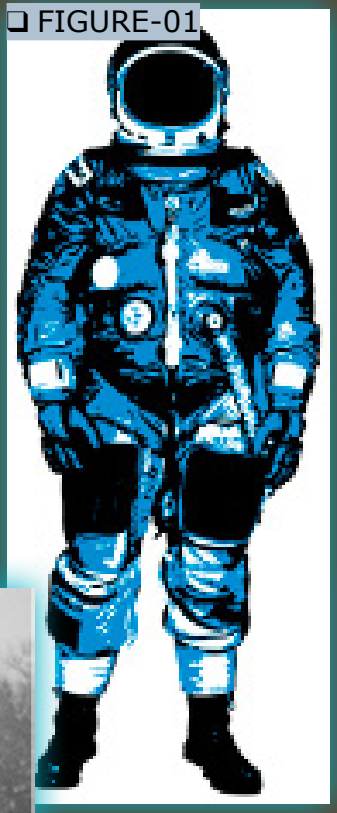
Many of the workshop participants in Bremen took this concept one step further: beyond fashion up to the scale of a shelter. In this realm between the dimension of blouse and house, tensile structures can make a real difference. Limiting the personal comfort zone, saving energy in terms of tempered space and in the consumption of raw material – essentially taking the lightweight ideas from the 1960s onto the next level.
❏ FIGURE-19 ❏ FIGURE-20 ❏ FIGURE-21 ❏ FIGURE-22 ❏ FIGURE-23 ❏ FIGURE-24

This illustrates that fabrics and foils are suitable means to downsize our personal realm to reasonable units. 60-year-old proposals show that this is not necessarily a limitation. It is important to communicate that these bubble ideas are no spleen of some hippy architects. They are part of the sustainable concepts that our built environment is so urgently

asking for. An ecological future in building technology is only possible with the contribution of lightweight materials like fabrics and foils, plus a reassessment or rather revalidation of our need for space. Hans-Walter Müller and José Miguel de Prada Poole have proofed the feasibility of living in a bubble.
❑ FIGURE-2X1 ❑ FIGURE-2X2

The general reality check for these concepts is now more robust than it was in the 1960s. There are now many more appropriate materials to put the 60-year-old bubble-ideas into the built environment. The effort for energising pneumatic structures is limited. However, the fact that there is not enough space to put the idea of 8 billion bubbles into reality is not the only reason that it mostly remains a visionary option to date. We ultimately do not want to eke out a more and more virtual living in lined-up units. The first pragmatic step is to dissolve the dictum “My Home is my Castle” – especially with regard to the size of our comfort zone. The second step is to look at our material choice for dwellings. Tensioned structures with fabrics and foils show that there is a built environment beyond concrete.

❑ FIGURE-01



space suit

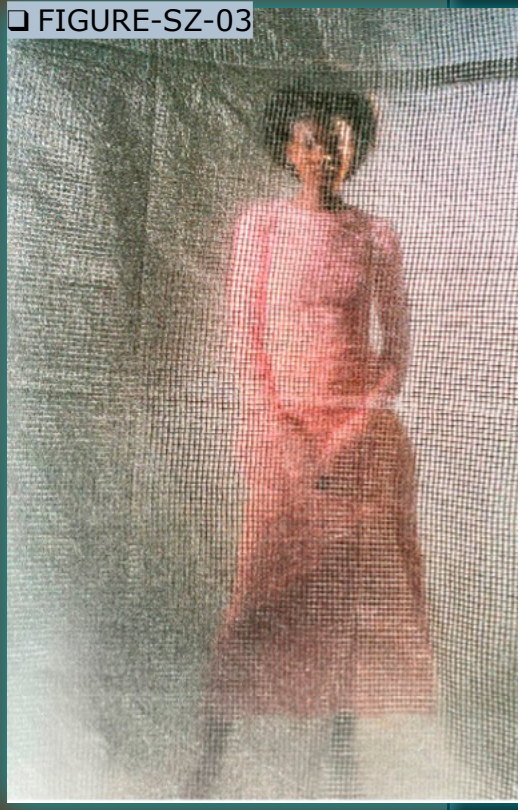
❑ FIGURE-02

James Vaughan, fashion model in a bubble

❑ FIGURE-SZ-01

❑ FIGURE-SZ-02

❑ FIGURE-SZ-03



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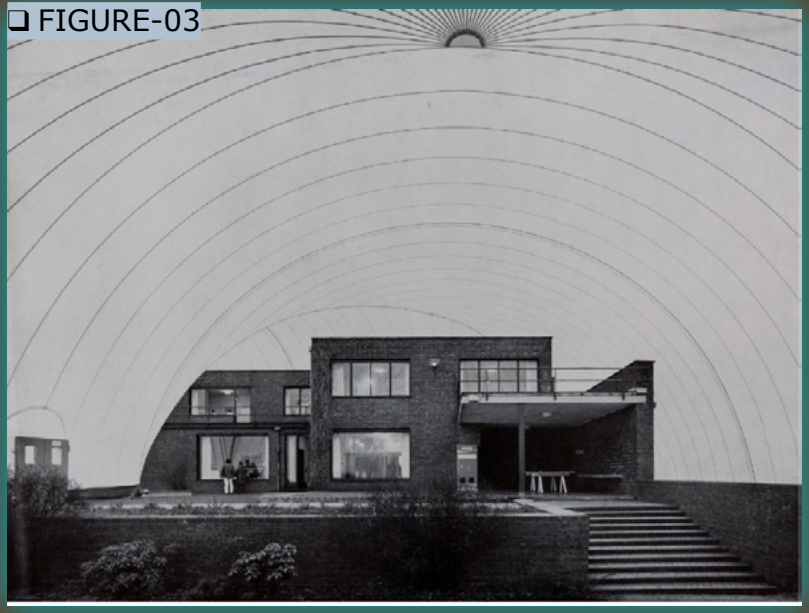
❑ FIGURE-03

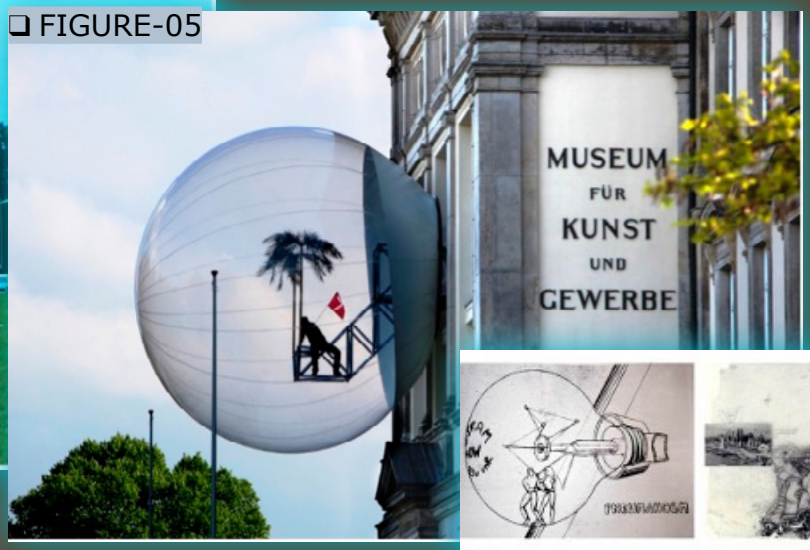


Haus-Rucker-Co, COVER installation project

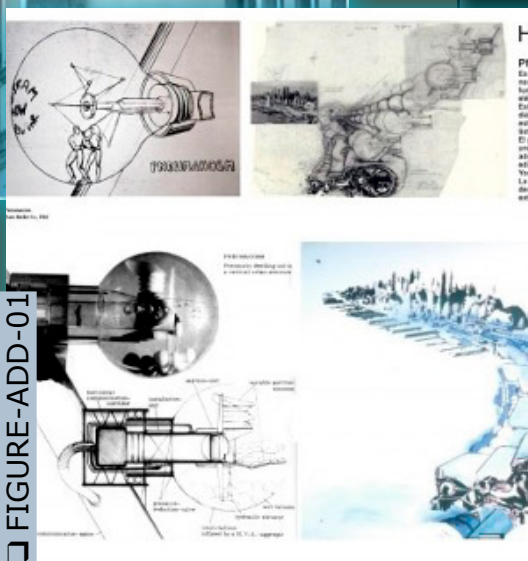
❑ FIGURE-04

Haus-Rucker-Co

❑ FIGURE-05



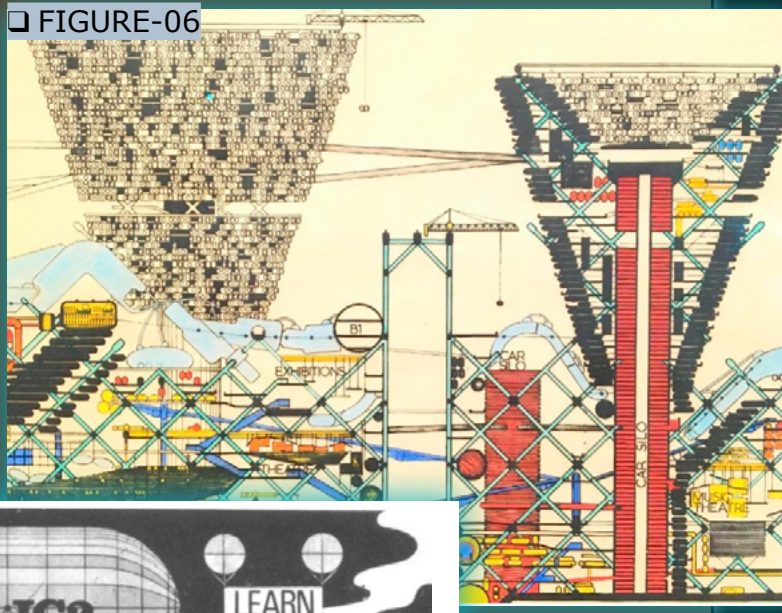
❑ FIGURE-ADD-01

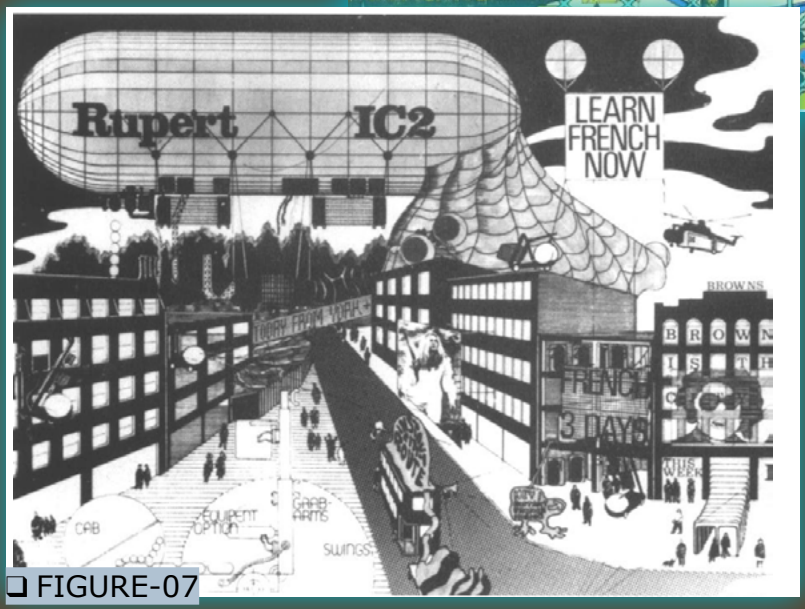


❑ FIGURE-ADD-02

Archigram / Peter Cook illustration

❑ FIGURE-06





Peter Cook

❑ FIGURE-07

❑ FIGURE-08

❑ FIGURE-ADD-03

Hans Walter Müller – book title/exhibition publication

❑ FIGURE-09

Hans-Walter Müller under one of his "Klangstruktur mit Resonanz-kugel"

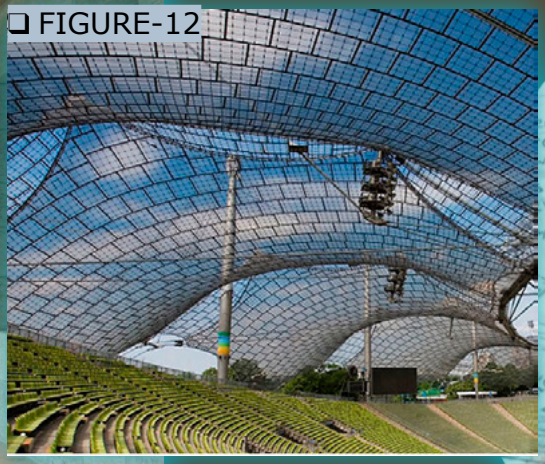
❑ FIGURE-10

Instant City by José Miguel de Prada Poole

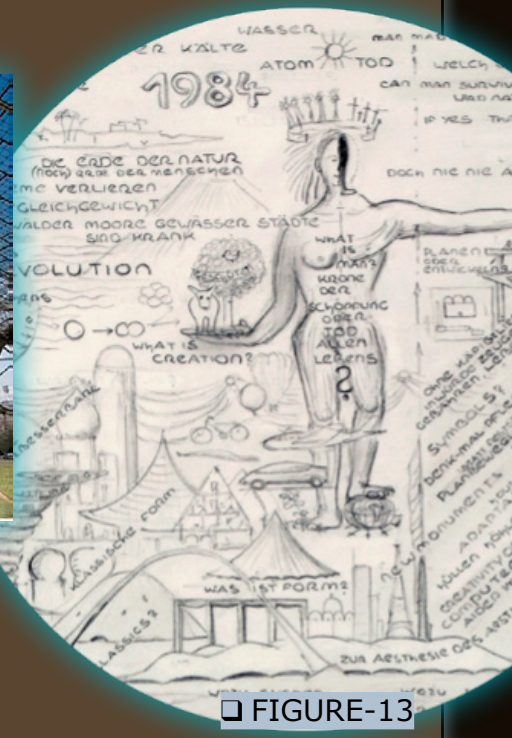
Werner March's Olympic Stadium Berlin for the Games 1936, as renovated in the early 21st century by gmp architects

URE-11

❑ FIGURE-12



Olympic Stadium in München, structural design Frei Otto



❑ FIGURE-13

Frei Otto sketchbook

❑ FIGURE-14

original
Fiat 500

❑ FIGURE-15

SUV car

☐ FIGURE-16

SUM,
Sustainable
Urban
Mobility.

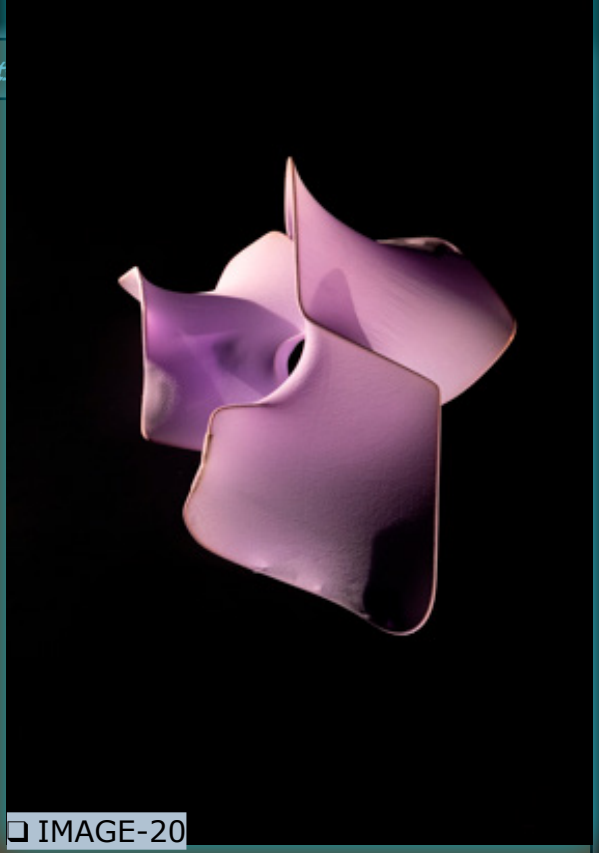
❑ FIGURE-18

Runner keeping warm under a thermal blanket

❑ FIGURE-17

Snoody for individual thermal comfort

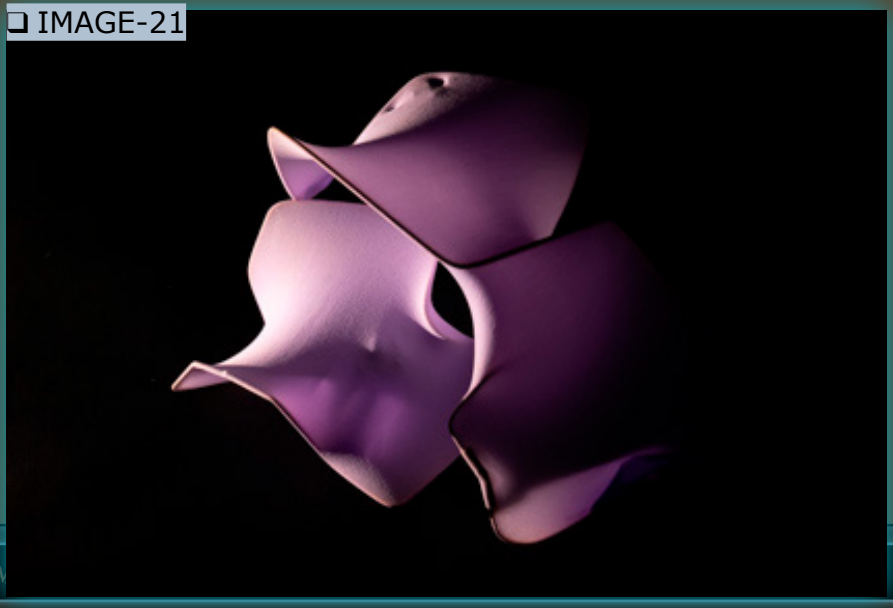
❑ IMAGE-19



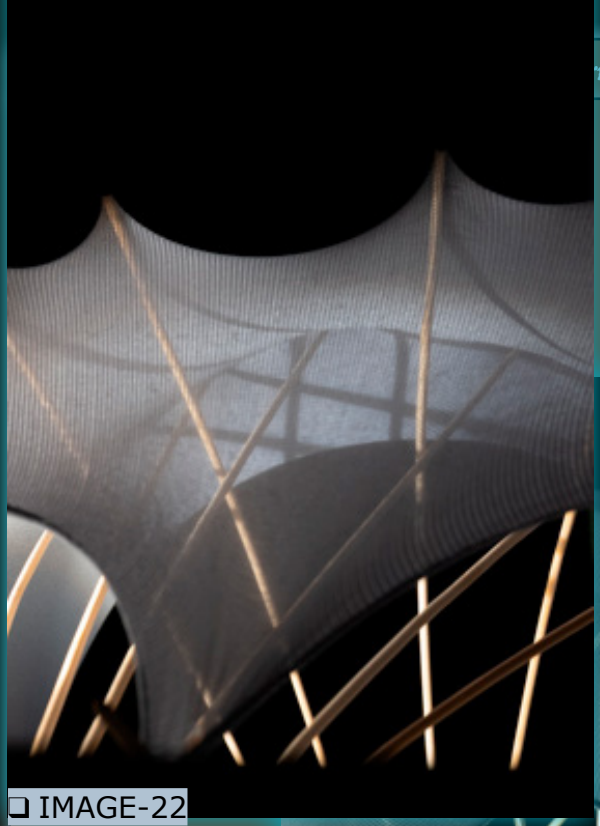
❑ IMAGE-20

workshop
documentation
Bremen

❑ IMAGE-21



workshop
documentation
Bremen



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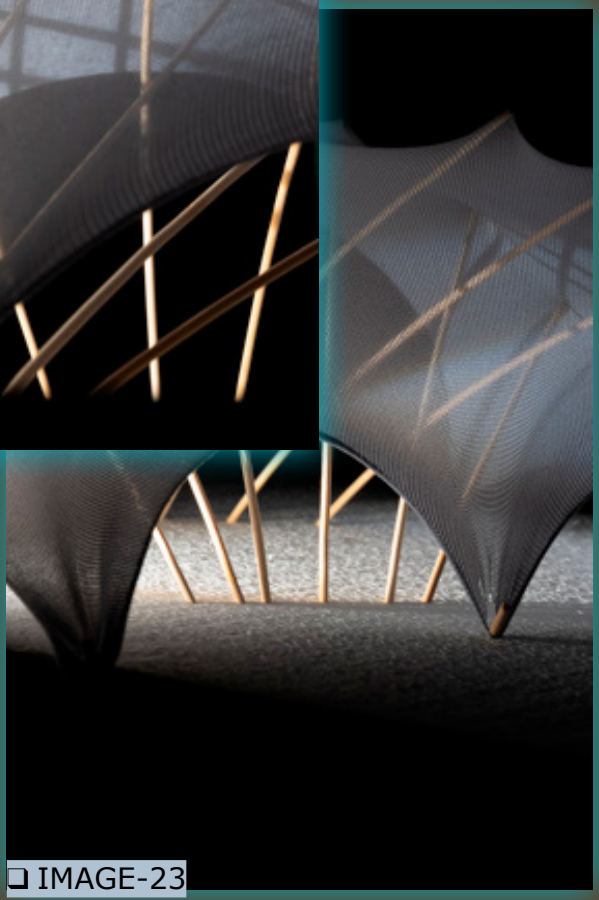

❑ IMAGE-23

❑ IMAGE-24

❑ FIGURE-2X1

José Miguel de Prada Poole "Smart Structure"

❑ FIGURE-2X2

Hans-Walter Müller's workshop

Image Credits

FIGURE-01
space suit, creative commence licensed

FIGURE-02
James Vaughan, fashion model in a bubble, photographer Melvin Sokolsky, creative commons licensed https://www.flickr.com/photos/40143737@N02/6346077837/

FIGURE-SZ-01 – -03
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FIGURE-03
Haus-Rucker-Co, 1971, COVER installation project, Haus Lange, Krefeld, © Kunstmuseen Krefeld, Manfred Vollmer, Artothek; licensed for a TensiNews edition by the TensiNet association

FIGURE-04
Haus-Rucker-Co at the documenta 5 art exhibition in Kassel, 1972, bubble on the outside of the Fridericianum building, Creative Commons Licencefigure-01

FIGURE-05
Haus-Rucker-Co, “Oase Nr. 7”, Museum für Kunst und Gewerbe, Hamburg, Creative Commons Licence

FIGURE-ADD-01
Alternative/additional illustration – unfortunately no information about copyright

FIGURE-ADD-02
Archigram/Peter Cook illustration

FIGURE-06
Peter Cook’s “Plug-In City”, Creative Commons licensed on: https://www.flickr.com/photos/wyliepoon/49224543288/in/photostream/
Thinking in modules was the key to making these schemes very flexible and hence sustainable. The adaptive building skins that we are talking about today are a direct link to what Archigram invented some 60 years ago.

FIGURE-07
Peter Cook (Archigram), Instant City (Rupert IC 2), 1969, drawing, © Philippe Magnon

FIGURE-08
Peter Cook (Archigram), Instant City, photo of mock-up, Creative Commons licenced on: https://www.flickr.com/photos/11561957@N06/46875988314

FIGURE-ADD-03
Hans Walter Müller – book title / exhibition publication

FIGURE-09
Hans-Walter Müller in August 2019, under one of his "Klangstruktur mit Resonanzkugel" (Structure sonore avec sphère de résonance). His inflatable house is in the background. https://commons.wikimedia.org/wiki/File:Hans-Walter_M%C3%BCller_Klangstruktur.jpg

FIGURE-10
Instant City by José Miguel de Prada Poole, photo credit courtesy of Josep Llorens

FIGURE-11
Werner March's Olympic Stadium Berlin for the Games 1936, as renovated in the early 21st century by gmp architects, https://de.wikipedia.org/wiki/Datei:IMG_Olympiastadion_Gang.JPG

FIGURE-12
Olympic Stadium in München, structural design Frei Otto, Wikimedia-licenced © Jorge Royan

FIGURE-13
Circular cut of a Frei Otto sketchbook page

FIGURE-14
original Fiat 500. https://pxhere.com/en/photo/657070

FIGURE-15
SUV car https://pxhere.com/de/photo/934553

FIGURE-16
SUM, Sustainable Urban Mobility.
https://www.opel.de/fahrzeuge/rocks-e/uebersicht.html

FIGURE-17
Snoody for individual thermal comfort

FIGURE-18
Runner keeping warm under a thermal blanket, photo by Marco Verch, creative commence licensed https://www.flickr.com/photos/149561324@N03/36880396074

FIGURE-19 – -24

from the workshop in Bremen, examples ©Kim Heintzen

FIGURE-2X1

José Miguel de Prada Poole, Smart Structure, 1968, https://www.tumblr.com/pradapoole/3091222826/smart-structure-1968-autor-jose-miguel-de-prada

FIGURE-2X2

Hans-Walter Müller's workshop

References

Becarelli P., Corne E. et alt. (eds.),
TensiNews, Newsletter No. 42 (2022), José Miguel de Prada Poole, article by Josep Llorens (pg. 6-9)

Becarelli P., Corne E. et alt. (eds.),
TensiNews, Newsletter No. 39 (2020), Bubbles to live and work in, article by Evi Corne (pg. 15)

Cook P.,
Archigram (1973) by Praeger Publishers

Documenta retrospective,
available online, accessed on January 18th 2023, https://www.documenta.de/de/retrospective/documenta_5#
Forster B., and Mollaert M. (eds.) (2004), European design guide for tensile surface structures: TensiNet, TensiNet.

Haus-Rucker-Co,
Oase Nr. 7, Documenta 5, 1972, accessed on January 18th 2023, https://elephant.art/iotd/haus-rucker-co-oase-nr-7-documenta-5-1972/

Hollein H. (1968),
"Everything is architecture", originally published in Bau: Schrift für Architektur und Städtebau 1/2 | 1968
Mehler Texnologies GmbH, Textile Architecture team records, 1960s-ongoing

Meyer F.,
Baunetzwoche 596, BauNetz, Heinze GmbH, 2022
Prieto Gonzáles N. 2013, La arquitectura de José Miguel de Prada Poole: teoría y obra, available on https://ruc.udc.es/dspace/handle/2183/11917, accessed on January 18th 2023

Stürzl R. (2022),
Hans-Walter Müller und das lebendige Haus.
Sustainable Urban Mobility, accessed on January 18th 2023, https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_6729 and https://www.eltis.org/it/mobility-plans/11-what-sustainable-urban-mobility-plan