

FREI OTTO COMPLETE WORKS LIGHTWEIGHT CONSTRUCTION NATURAL DESIGN

**EDITED BY
WINFRIED NERDINGER**

**IN COLLABORATION WITH
IRENE MEISSNER
EBERHARD MÖLLER
MIRJANA GRDANJSKI**

**ARCHITEKTURMUSEUM
DER TECHNISCHEN UNIVERSITÄT
MÜNCHEN**

**BIRKHÄUSER – PUBLISHERS FOR ARCHITECTURE
BASEL · BOSTON · BERLIN**

CONTENT

Foreword	6	WORKSHOP OF IDEAS DRAWINGS AND SKETCHES	130
Frei Otto	8	CATALOGUE OF WORKS	168
Working for a Better "Earth for Mankind" Winfried Nerdinger		Buildings and Projects 1951–2004 Irene Meissner, Eberhard Möller	
Natural Forms – Architectural Forms Rainer Barthel	16	Appendix	
The Lightweight Principle Eberhard Möller	32	Frei Otto and Projects in the Orient	360
Frei Otto and Biology Ulrich Kull	44	A Personal Account Bodo Rasch	
In Harmony with Nature and Technology On Frei Otto's Architecture and Work Method Irene Meissner	56	Homage to Frei Otto	362
MODELS AND EXPERIMENTS	64	Biography	368
Where Architecture	70	Bibliography	370
and Civil Engineering Meet Rainer Graefe		Contributors	383
Institute for Development of Lightweight Construction and Atelier Warmbronn Ewald Bubner	80	Glossary	384
The Institute for Lightweight Structures University Institute and Spinners' Centre Berthold Burkhardt	90	Index of Names	386
Frei Otto and Ove Arup	102	Index of Locations	388
A Case of Mutual Inspiration Christian Brensing		Thanks	389
Frei Otto and Ted Happold	110	Illustration Credits	390
1967–1996 and Beyond Michael Dickson			
Ethics, Aesthetics and Innovation	124		
A Speech by Frei Otto			

This book is published on the occasion of the exhibition
„Frei Otto – Lightweight Construction, Natural Design“
at the Architekturmuseum der Technischen Universität
München in der Pinakothek der Moderne from 26 May
to 28 August 2005.

Edited by Winfried Nerdinger
In collaboration with: Irene Meissner, Eberhard Möller,
Mirjana Grdanjski

Authors: Rainer Barthel, Christian Brensing, Ewald
Bubner, Berthold Burkhardt, Michael Dickson, Rainer
Graefe, Ulrich Kull, Irene Meissner, Eberhard Möller,
Winfried Nerdinger, Frei Otto, Bodo Rasch

Photographs: Gabriele Winter, Barbara Schulze,
Architekturmuseum der TU München

Research assistants: Michael Bacherl, Florian Bartoschek

Translations from German into English:

Christian Brensing, Berlin and London: pp. 102–108
Laura Bruce, Berlin: project nos. 1, 2, 7–10, 12, 16,
18–26, 30, 32, 37, 39–40, 43, 45, 47, 50, 55, 83
Eva Jaksch, St. Konrad (A): pp. 16–55, pp. 70–89,
pp. 125–128, p. 361; project nos. 3–6, 11, 13–15, 17,
27–29, 31, 33–36, 38, 41–42, 44, 46, 48–49, 51–54,
58–63, 66–68, 70–73, 77–82, 84–86, 88–89, 91,
93–96, 102–103, 105–111, 114, 116–121, 124, 129,
131, 133, 135, 137, 140, 142–145, 147, 151–152,
154, 160–162, 167, 169, 171–173, 175–177, 181,
183–184, 188, 191–194

William Martin, Berlin: pp. 56–63

Joe O'Donnell, Berlin: pp. 362–369, pp. 383–385

Michael Robinson, London: pp. 6–15, pp. 64–69,
pp. 90–101, pp. 130–171, p. 386; project nos. 56–57,
64–65, 69, 74–76, 87, 90, 92, 97–101, 104, 112–113,
122–123, 125–128, 130, 132, 134, 136, 138–139,
141, 146, 148–150, 153, 155–159, 163–166, 168, 170,
174, 178–180, 182, 185–187, 189–190, 195–196

Cover: Project study of a convertible roof covering
the Multimedia Stadium of Farbwerke Hoechst, multi-
ple exposure of the roof in motion, Photo: Atelier
Frei Otto Warmbronn

Frontispiece: Frei Otto, around 1972, Photo: Fritz
Dressler, Worpswede

Illustration on this page: Atelier Warmbronn, Archi-
tekturmuseum der Technischen Universität München

Illustration credits on p. 390

Bibliographic information published by Die Deutsche
Bibliothek

Die Deutsche Bibliothek lists this publication in the
Deutsche Nationalbibliographie; detailed bibliographic
data is available in the internet at <http://dnb.ddb.de>.

This work is subject to copyright. All rights are reserved,
whether the whole or part of the material is con-
cerned, specifically the rights of translation, reprinting,
re-use of illustrations, recitation, broadcasting, repro-
duction on microfilms or in other ways, and storage in
data banks. For any kind of use, permission of the
copyright owner must be obtained.

© 2005 Birkhäuser – Publishers for Architecture,
P.O. Box 133, CH-4010 Basel, Switzerland
www.birkhauser.ch
Part of Springer Science+Business Media

This book is also available in a German language
edition (ISBN-10: 3-7643-7233-8
ISBN-13: 978-3-7643-7233-0)

Printed on acid-free paper produced from
chlorine-free pulp. TCF ∞
Printed in Germany

ISBN-10: 3-7643-7231-1
ISBN-13: 978-3-7643-7231-6



Atelier Warmbronn

Baumplattlauerwerk 1988 für das Friedensmal
 in Leobenberg dachte ich an schillernde Werke
 fahren, die nicht im Lichte stehen, sondern
 krümmen. Als Alternative zum vor-
 gesehenen Standort
 schlug ich einen gut
 sichtbaren Hügel
 am neuen Autobahn-
 kreuz vor

Friedens- fahrer für Leobenberg



Das Leobenberger Friedensmal
 wird inzwischen ganz
 Hi-Tech-Materialien ausgetauscht
 Es handelt sich um ein Friedensmal, das
 aber auch eine Mahnung ist, an den
 Menschen dieser Stadt und an die
 die völkervereinende, friedliche Zukunft
 zu denken.

(Name des Künstlers)

(Name des Künstlers)

FREI OTTO

WORKING FOR A BETTER "EARTH FOR MANKIND"

Winfried Nerdinger

It is the gait of a free man
that leads to the freedom of others
Michel Foucault

Peace flags for Leonberg,
drawing November 27, 1997

1 "Der Herr des Augenblicks. Seine Liebe gilt dem Leichten und Beweglichen: Ein Zeit-Gespräch mit Frei Otto". *Die Zeit*, February 2, 2003

2 "Terre des Hommes" was the motto of Expo '67 in Montreal, quoting the title of a book by Antoine de Saint-Exupéry; following quotation: Frei Otto. "Umwelt von morgen – Baukunst im Wandel". *Wie werden wir weiterleben?* Documentation of the talks and discussions. 42. Bundestag of BDA Hanover 1967, quoted from Berthold Burkhardt. *Frei Otto. Schriften und Reden 1951–1983*. Braunschweig and Wiesbaden 1984, pp. 73–74

3 "Im Dialog mit der Natur. Frei Otto im Gespräch". Wolfgang Pehnt. *Die Erfindung der Geschichte*. Munich 1989, p. 161

4 Bruno Taut. *Die Auflösung der Städte oder die Erde eine gute Wohnung*. Hagen 1920

5 Frei Otto. "Die Zeit der vielen Architekturen". *Allgemeine Bauzeitung*, 1972, quoted from Burkhardt. 1984 (note 2), p. 123

6 Frei Otto. "Subjektives und Kritisches zu dem, was andere als mein Werk bezeichnen". Karin Wilhelm. *Architekten heute. Portrait Frei Otto*. Berlin 1985, pp. 132–133

7 Frei Otto. "Stuttgarter Architektur – gestern, heute und morgen". Städtebauliches Institut der Universität Stuttgart (Ed.). *Zehn Vorträge*. Stuttgart 1979, pp. 75–100, quoted from Burkhardt. 1984 (note 2), p. 156

8 Frei Otto. "Subjektives und Kritisches zu dem, was andere als mein Werk bezeichnen". Wilhelm. 1985 (note 6), pp. 131–170

9 Frei Otto. "Stuttgarter Architektur – gestern, heute und morgen", 1979, quoted from Burkhardt, 1984 (note 2), p. 157

10 Frei Otto. "Stuttgarter Architektur – gestern, heute und morgen". 1979, quoted from Burkhardt. 1984 (note 2), p. 157

11 "Mir wird speiübel. Frei Otto über die westdeutsche Nachkriegsarchitektur". *Der Spiegel*, 13, 1977, pp. 223–226; Frei Otto. "Hört endlich auf, weiter so widernatürlich zu bauen!". *Schriftenreihe des Architekten- und Ingenieur-Vereins zu Berlin*, issue 29, Berlin 1977, quoted from Burkhardt. 1984 (note 2), pp. 140–149, the following quotations are also there; for Frei Otto's open letters cf. the bibliography.

12 Frei Otto. "Die Stadt von morgen und das Einfamilienhaus". *Baukunst und Werkform* 1956, quoted from Burkhardt. 1984 (note 2), p. 37

13 Frei Otto. "Hühnerlegfabriken für Menschen – und kein Architekt, der dagegen streikt". *Iai*, 1, 1979, pp. 26–28

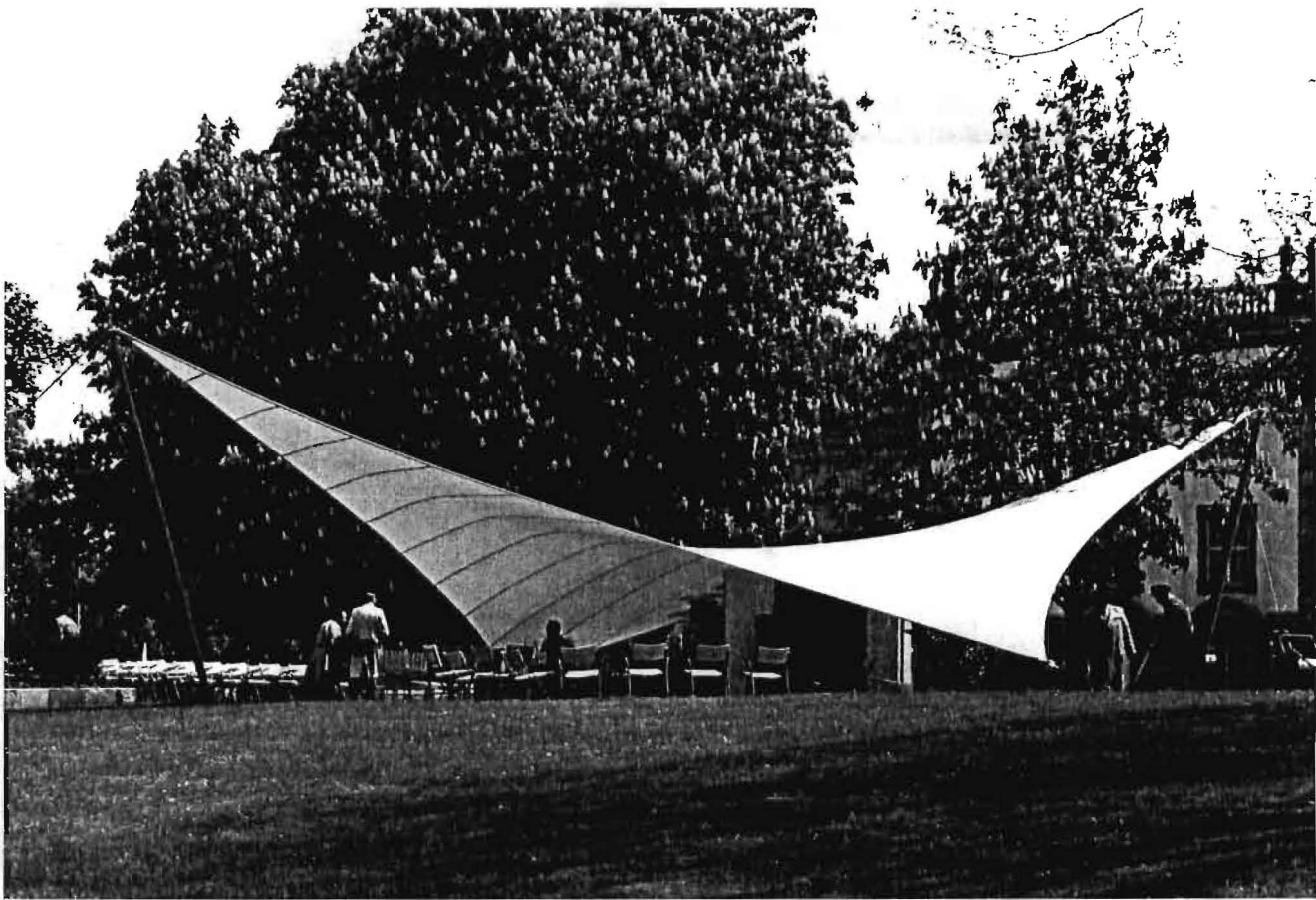
14 Frei Otto. "Stoppt endlich die Verfälschung. Weißenhof-Resolution". *Allgemeine Bauzeitung*, 51, 1980, p. 44

Architecture is an existential matter for Frei Otto. He is not interested in creating a piece just for an individual client, or in self-presentation, he wants his buildings to contribute to improving everyone's living conditions. He is not interested in constructing individual works, but in conducting a process that is directed at a vision, at creating architecture for a peaceful society in harmony with nature: "My hope is that light, flexible architecture might bring about a new and open society."¹ This higher aim makes Frei Otto different from most people who create buildings and, at the same time, it identifies his towering significance as an architect who is aware of his responsibility for working on the "terre des hommes",² an earth for mankind: "An earth for mankind, that sums up man's earthly habitat". It is the architect's job to work on "sustaining a habitat"³ that includes all the realms of man and nature: "I am constantly amazed that even colleagues cannot see the wonderful image of this earth." Only Bruno Taut, shortly after the First World War, formulated a similar vision of the earth, calling it a "good dwelling" for all mankind.⁴

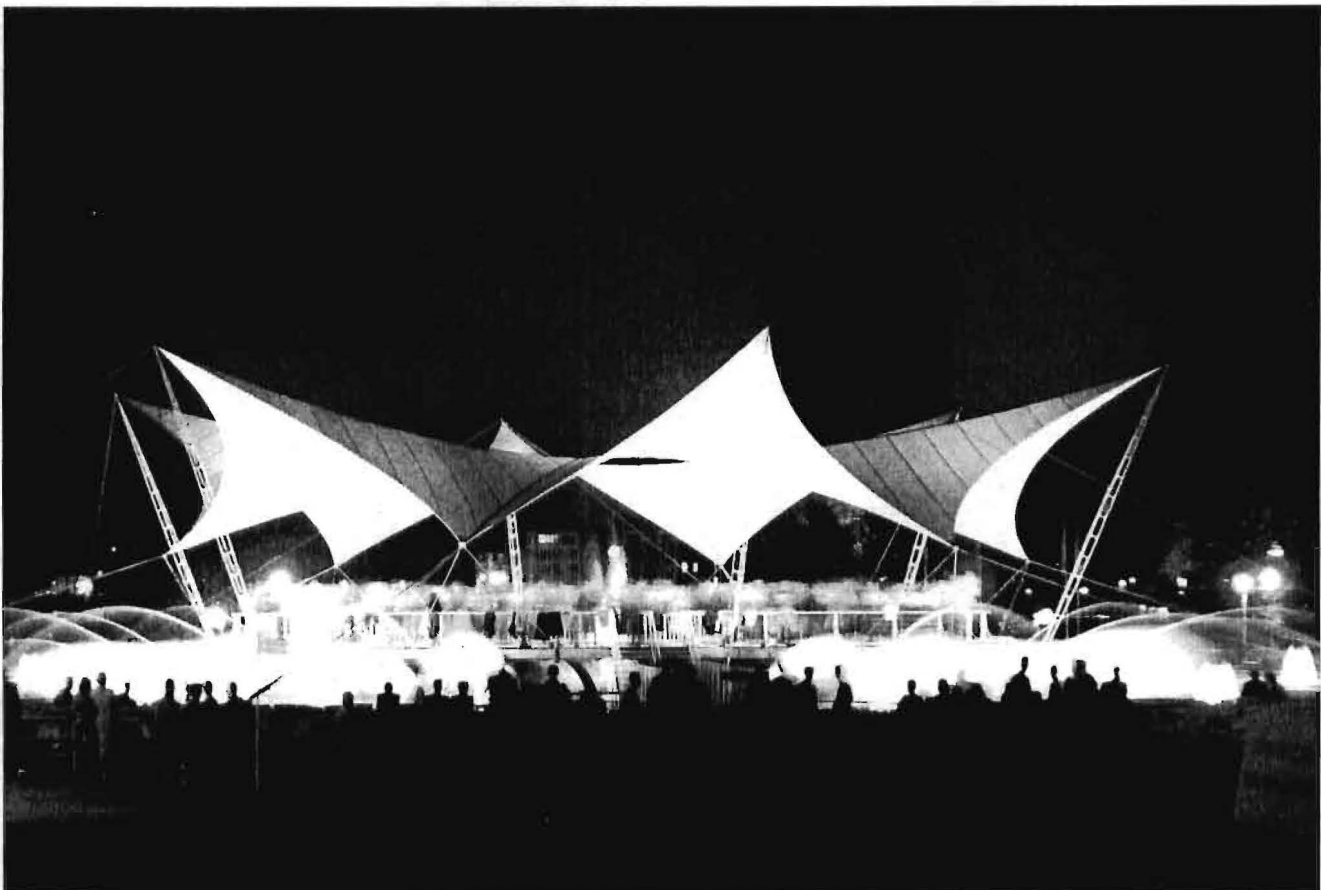
Shot into adulthood in the war

Social commitment was one of the characteristics of Neues Bauen in the twenties. Frei Otto is one of the few people who took up this approach after the Second World War, and also drew a radical conclusion from twelve years of Nazism, crime and an "architecture of killing".⁵ "We, my generation, who were shot into adulthood in the war, wanted to help with rebuilding, wanted to get over the war, the megalomania, the cult of the Führer and of personality, wanted to be allowed to live – but to remain modest while doing so."⁶ Even today, Frei Otto's key ideas and work can be traced back to some influential experiences during the National Socialist period: for him, "liberation from the yoke of the thirties" was possible only if "this period is recognized, and people act accordingly".⁷ He himself unreservedly admits that as a young person he succumbed in a very few, comparatively harmless cases to NS propaganda,⁸ and so he was able all the more clearly to express his contempt for the many architects, lawyers, teachers or politicians who were supposed to be building up a democracy but kept quiet about what they did in the NS period, or did not even regret it, like the "dreadful lawyer" Filbinger.⁹

"Burning cities are a hard introductory course for young architects",¹⁰ Frei Otto pronounced in retrospect. It was from this appraisal of his experiences and influential events in the NS period that he drew the moral force to keep involving himself in building events in West Germany and to point out mistaken developments more clearly than scarcely anyone else; such developments were often symptoms of a past with which the country had not yet come to terms. But his angry appeals against "unnatural"¹¹ building, his call to tear down the "sinful mountain" with which "the surface of the earth" had been "encrusted (...) in the last 30 years", or his cry that "our modern housing make me sick" rang out just as ineffectively as his protests and open letters railing against the "destruction of the European culture landscape with state-driven, barracks-like dwellings",¹² against "chicken batteries for human beings"¹³ or the "re-nazification" of Stuttgart's Weissenhofsiedlung in the post-war period.¹⁴



Federal Garden Exhibition Kassel 1955, music pavilion



Federal Garden Exhibition Cologne 1957, dance pavilion



"A gentle roof like a cloudscape", drawing, 1980



German Pavilion at Expo '67, Montreal, model



German Pavilion at Expo '67, Montreal

15 Otto Bartning (Ed.). *Darmstädter Gespräch: Mensch und Raum*. Darmstadt 1952, p. 137

16 Ibid., p. 86

17 Bruno Taut. "Nieder mit dem Seriosismus". *Frühlicht* 1920, issue 1, p. 11; cf. Winfried Nerdinger. "Ein großer Baum muß tiefe Wurzeln haben".

Tradition und Moderne bei Bruno Taut. Idem (Ed.). Bruno Taut. *Architekt zwischen Tradition und Avantgarde*. Stuttgart and Munich 2001, pp. 9–19

18 Winfried Nerdinger. "Aufbrüche und Kontinuitäten. Positionen der Nachkriegsarchitektur in der Bundesrepublik". Idem (Ed.). *Architektur der Wunderkinder. Aufbruch und Verdrängung in Bayern 1945–1969*. Salzburg 2005, pp. 9–23

19 Frei Otto. "Mit Leichtigkeit gegen Brutalität". *Allgemeine Bauzeitung*, 1976, reprinted in: Burkhardt. 1984 (note 2), pp. 128–132

20 Frei Otto. "Gestaltwerdung. Zur Formentstehung in Natur, Technik und Baukunst". *arcus, Architektur und Naturwissenschaft*, 4. Cologne 1988, p. 73

21 Laszlo Moholy-Nagy. *Von Material zu Architektur. Bauhausbücher* 14. Munich 1929, where the development of art is described as continuing dematerialization; Marcel Breuer sketched the dematerialization of a chair to the point of sitting on a column of air; cf. also Winfried Nerdinger. "Walter Gropius. Totale Architektur für eine demokratische Welt". *Jahrbuch des Zentralinstituts für Kunstgeschichte*. Vol. 2. Munich 1985, pp. 343–373; Andreas K. Vetter. *Die Befreiung des Wohnens*. Tübingen 2000

22

Build light and keep mobile

Frei Otto's determined rejection of any form of heavy, solid, earthbound building, which was associated, not just for him, with German sentimentality about the homeland and the Nazi-style cult of blood and soil, was also based on his experiences in the National Socialist period. When the German architectural élite met in Darmstadt in 1951 for a discussion on "man and space", Egon Eiermann declared that the old homeland with folk-songs did not exist any more, the new homeland was the whole world, and so it was his job to design "homelessness".¹⁵ And Hans Schwippert added: "Is it not remarkable that (...) good master-builders are building tents all over the world, light, open things."¹⁶ This plea for light, mobile architecture is not just reminiscent of the many connotations of the "international" modern architecture of the twenties with aeroplanes, ships and nomads' tents, but also of manifestos immediately after the First World War, when some architects, faced with destruction from the material battles, demanded dematerialisation of architecture, and thus its spiritualization. Just as the glass and tent fantasies from the group of friends around Bruno Taut ("The Crystal Chain") were a pacifist response to peoples "drinking blood"¹⁷ in the war, the appeal for lightweight building after the Second World War had a strong ideological tinge at first.¹⁸

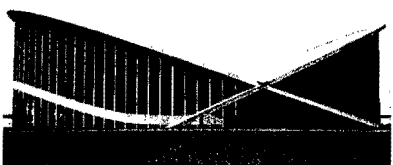
But it was only Frei Otto who developed a comprehensive, society-related idea of architecture according to the motto "with lightness against brutality"¹⁹ from these beginnings. Even his first tent structures, which brought him recognition and caused a stir, like the awnings for the Federal Garden Exhibitions in Kassel in 1955 (→ 13, 15) and Cologne in 1957 (→ 18–22) and the tent roofs at Interbau in Berlin in 1957 (→ 26–30) were signs of a hitherto unknown approach in German architecture: light, filigree structures, almost floating, and yet firmly braced, with no other function than to protect the people underneath them, and simply taken down again when the people go away. The tents seemed simple and modest, and yet they were signs of technical perfection. The open spaces with fluent transitions to the surrounding area drew visitors in and did not keep them captive. "A gentle roof like a cloudscape" was Frei Otto's poetic image for the vision of a peacefully cheerful harmony between protective roof, landscape and people, and at the same time invoked the mobility and transience of the tent structures. The German Pavilion in Montreal (→ 76) was his first opportunity to realise this vision on a larger scale; he aptly referred to it as a "light-hearted improvisation". It started a new era²⁰ of lightweight building using cable net constructions, after Vladimir Šuchov's tent in Nijni Novgorod and Matthew Nowicki's Raleigh Arena. The transparent German Pavilion at the Brussels World Fair by Egon Eiermann and Sep Ruf was intended to show the world a changed Germany, and Frei Otto's tent in Montreal brought international recognition for the transformation into a new, peaceful democracy.

Lightweight construction programme

Dematerialisation and lightweight construction had been under discussion, ever since industrialisation and the increased use of steel and glass in building, as indicators of modernisation and of construction that is calculated in terms of building statics and planned economically. Sigfried Giedion and other architectural historians have constructed a history of the development of modern architecture from the increasing dematerialisation that could be linked with the disappearance of historical forms. The dematerialisation of objects or equipment as a "liberation" of human beings was celebrated at the Bauhaus as well, and seen as parallel with the development of mobile, international human beings.²¹ Then after the war dematerialisation, understood as using a great deal of glass, and transparency, served as a usually vague statement resisting the heavy, massive architecture of the NS period. But other than Frei Otto, very few people developed a "philosophy" of lightweight construction with social connections. One who did was Buckminster Fuller, who defined the weight of buildings as a measure of the standard of development not just of industrialisation, but also of mankind.²²



Oval exhibition hall, Nijni Novgorod, Russia, 1896



Arena in Raleigh, North Carolina, 1950-1953

22 Cf. R. Buckminster Fuller, *Utopia or Oblivion: The Prospects of Humanity*. London 1970; Idem. *Operating Manual for Spaceship Earth*. New York 1963; Idem. *Konkrete Utopie*. Duesseldorf 1974, "the general principle finding ways of doing more with less".

23 Wilhelm. 1985 (note 6), p. 80

24 Frei Otto. "Stuttgarter Architektur – gestern, heute und morgen". 1979, quoted from Burkhardt. (note 2), p. 166; Frei Otto. "Die neue Pluralität und das Verhältnis zur Natur". *Systeme als Programm*, arcus, Architektur und Naturwissenschaft, 8.

Cologne 1989, pp. 30-33

25 Frei Otto. "Das Zeltdach. Subjektive Anmerkungen zum Olympiastadion". *Allgemeine Bauzeitung*, 1972, quoted from Burkhardt. 1984 (note 2), p. 98

26 "Ein Zeit-Gespräch" (note 1)

27 "Die Kongreßhallen-Debatte". *Bauwelt*, 1958, pp. 13-16, quoted from Burkhardt. 1984 (note 2), p. 45

28 Frei Otto. *Das hängende Dach*. Berlin 1954, pp. 88-93

29 Wilhelm. 1985 (note 6), p. 71; Frei Otto. "Moderne Architektur". Burkhardt. 1984 (note 2), pp. 62-63

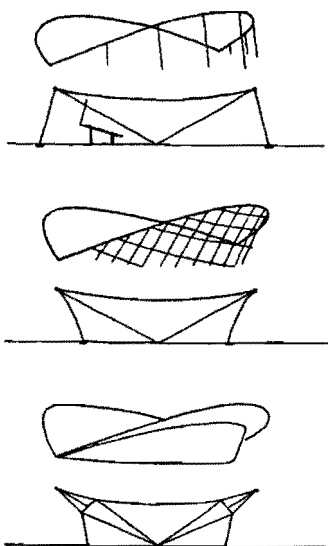
Lightweight building and "liberation" are linked for Frei Otto as well. But unlike many other advocates of programmatic Modernism he did not believe that transparent material or lightweight constructions alone can improve the world we live in, as "constructions are not bound to scale. They can be enlarged and reduced several times by the power of ten, they still work, (and so) we should be aware that constructions do not actually have anything to do with people."²³ So the crucial feature for him is the link with people and the quality of the structures for people. He does however strictly reject the woolly term "humane building", which is mostly applied to use, as he is not concerned with the well-being of individuals: "Buildings are 'humane' only when they promote peaceful human co-existence."²⁴ This ambitious claim is one of the reasons why Frei Otto is never content with a solution that has been found once, and why a certain form of lightweight construction never became a universal architectural solution for him: "I have never been satisfied with a piece of work I have been actively involved in, and would never want to be."²⁵

Do not build prestigiously, but ephemerally

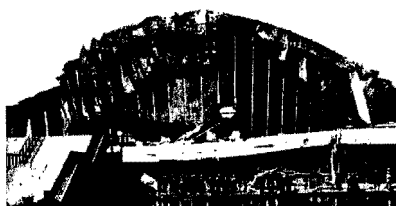
For Frei Otto, lightweight construction does not just mean minimising mass, materials and energy, but always building adaptably, changeably and thus "ephemerally". This attitude is also based on experiences with the "Nazis' whispers of eternity".²⁶ Official National Socialist architecture was intended to give an impression of eternity and permanence through its monumentality and mass, and to represent the state as a symbol of power. So throughout his life Frei Otto has rejected not just heavy architecture, but also any form of symbolic or prestigious architecture. The "thousand-year Reich's" claim to eternity, intended to be made visible and manifest in marble or granite buildings, has always been profoundly repugnant to him. Lightweight buildings, deliberately conceived to be changeable and removed, and that convey no claim to being prestigious or imposing, are his response to the leaden NS architecture, expressing contempt for people. He therefore reacted correspondingly violently to the return of the monumental after the Second World War.

The Berlin Kongresshalle was allegedly an architectural sign of "free discussion", financed by the USA and built by Hugh Stubbins in 1956. Frei Otto was the only person to turn against the new form of symbolic, prestigious architecture when he declared: "'Free discussion' cannot be built, but it can be made possible through building."²⁷ In a discussion with the architect and the engineer Fred N. Severud he criticised the luxurious materials, the pompous platform, the theatrical monumentality and the heavy pressure beam in the roof. As a counter-model, Frei Otto sketched Matthew Nowicki's suspended cable net construction between two paraboloid reinforced concrete arches for the Arena in Raleigh, whose light, unpretentious structure with its bright, completely column-free space had profoundly impressed him even at the design stage on the visit to the USA in 1950, and given important impetus to his own experiments with tents and cable nets.²⁸ Frei Otto's view was confirmed, late but sadly, when the peripheral beams of the Kongresshalle, excessively large for reasons of prestige, and which he had particularly criticised, collapsed in 1980.

Frei Otto subsequently always criticised buildings with a claim to being imposing or symbolic, even if they had been designed by the most famous architects, like Le Corbusier's concrete tent and the Atomium, which for him symbolised only the nuclear threat, at the 1958 Brussels World Fair, Eero Saarinen's bird-shaped TWA terminal in New York or the sails on Jörn Utzon's Sydney Opera House.²⁹ But he was particularly outraged when James Stirling's design for the Neue Staatsgalerie was chosen for realisation in "his" city of Stuttgart. He did note positively the fact that Stirling had outdone the Stuttgart architecture cliques, who he felt "shaped the face of the city in a petit-bourgeois fashion with the device of competitions, which look so democratic," as is the practice everywhere, but he saw the new building as nothing but "stone stage-set walls with gigantic cornices that do not support a roof. Fortress architecture with claims to eternity. A demonstration of power as a back-



Roof construction sketches for the Berlin Kongresshalle



Berlin Kongresshalle, partial collapse, May 21, 1980

30 Frei Otto. "Brutalismus in Stuttgart?". *Stuttgarter Zeitung*, 1977, quoted from Burkhardt. 1984 (note 2), pp. 152–153, following quotation also there.

31 Frei Otto. "Bauen für morgen?". 1962, quoted from Burkhardt. 1984 (note 2), p. 49; following quotation p. 60

32 Ibid., p. 53; cf. the Team X group's criticism of the Seagram Building: "a still born on a pedestal"

33 Ibid., p. 49

34 Frei Otto. "Mit Leichtigkeit gegen Brutalität", quoted from Burkhardt. 1984 (note 2), pp. 129–130

35 Bruno Taut. *Die neue Baukunst in Europa und Amerika*. Stuttgart 1929, p. 54; cf. Winfried Nerdinger (Ed.). *Bruno Taut*. Stuttgart and Munich 2001 (note 17), pp. 9–19

36 Frei Otto. "Stuttgarter Architektur – gestern, heute und morgen". 1979, quoted from Burkhardt. 1984 (note 2), p. 161

37 Frei Otto. *Gestaltwerdung. Zur Formentstehung in Natur, Technik und Baukunst*. arcus, Architektur und Naturwissenschaft, 4. Cologne 1988

38 Frei Otto. "Hört endlich auf". Burkhardt. 1984 (note 2), p. 142

39 Concepts. 29. *Architektur – Natur*; it would be interesting to study the connections between work at the IL and the research conducted by Ilya Prigogine and Manfred Eigen, who invented the term "self-organisation" for molecular chemical and biological processes, cf. Manfred Eigen. Ruthild Winkler. *Das Spiel. Naturgesetze steuern den Zufall*. Munich 1975; Ilya Prigogine. *Dialog mit der Natur*. Munich 1981

ground for art." But he did find the "model" for Stirling's design, Alexander von Branca's Neue Pinakothek in Munich, even more repugnant: "Here we have the perfect façades of the Speer epoch again, hanging in noble, alienated stone." The powerful experience of the NS period is the background for all this criticism of a development that Frei Otto fought at first and then just followed with resigned abhorrence: "Modern architecture is dead. The monument is back."

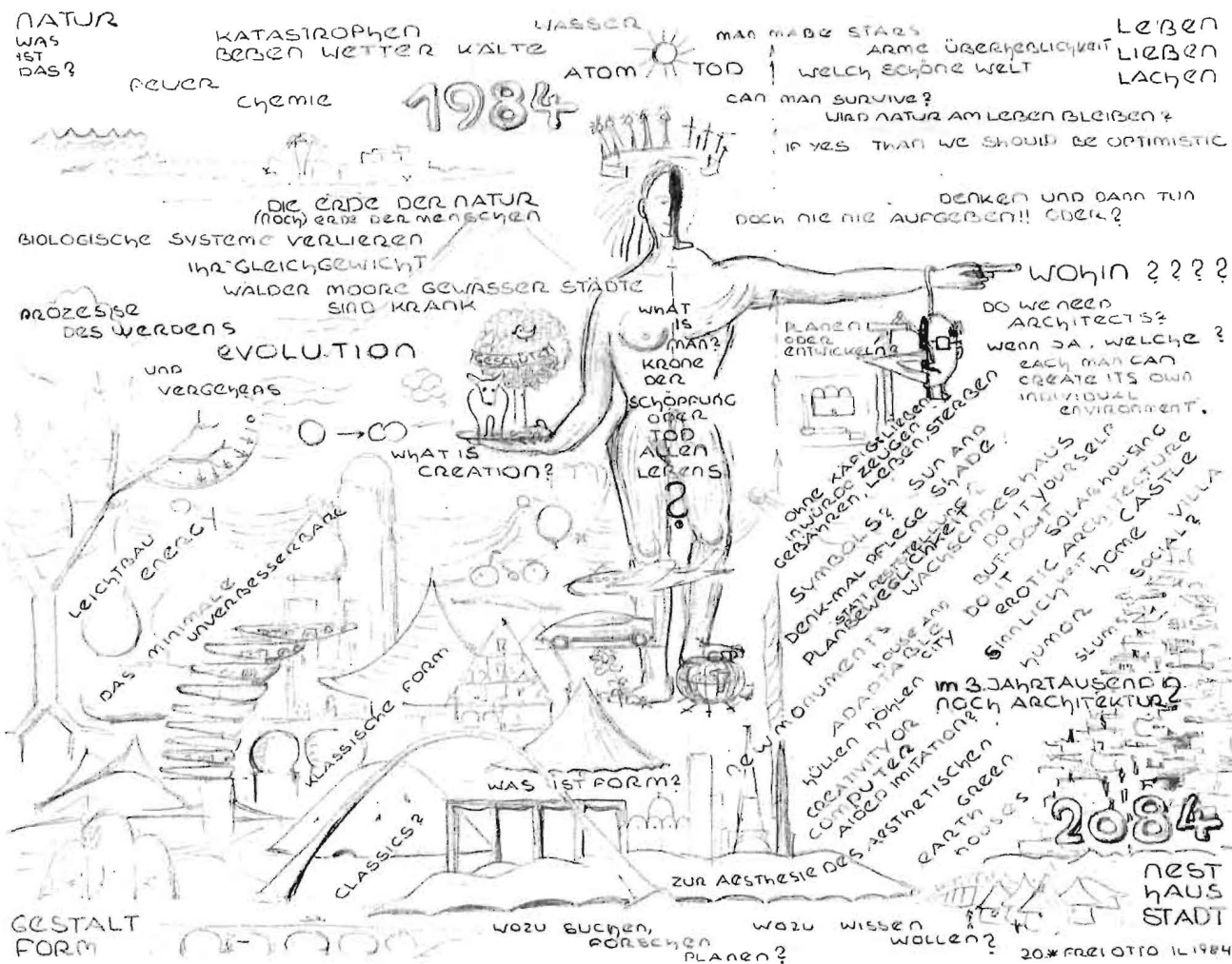
The uniform cannot be overcome with form

Better than most architecture critics, Frei Otto established with his own clarity and precision the reasons why modern architecture was in a state of crisis: even in the twenties there was no real functional building in many cases. Instead function was used as an expressive device, and thus ultimately served the formal ideas of the individual designer. The Neues Bauen architects' striving for new structural solutions remained trapped in a "style of emphatic functionality,"³¹ thus functionality had "become decoration", as people were still living in the world of Expressionist ideas, and so thought that architecture had to express something. Rebuilding then brought about the "traditionalism of modern architecture", as now the visions and experiments of the twenties were simply being translated formulaically into mass building. Instead of experimenting further and looking for solutions, people were content to cite formal elements. In Mies van der Rohe's case still produced crystalline rigidity,³² but in the hands of mediocre architects it led to the "tedium of gridded façades",³³ to "mass production in the stylistic garb of the threadbare functionalism"³⁴ or to the decoration of cubic forms, spreading all over the world as the international style. The development of an architecture that Bruno Taut had criticised as the "tedious schematics of international trash"³⁵ as early as 1929 led to the counter-movement of Postmodernism, which saw the return of historical forms, self-presentation by the architect and formal experiments for the sake of form alone. Frei Otto used his continuous interdisciplinary work for understanding the way in which forms and natural constructions emerge to resist this false insight that modern architecture's new-found uniformity could be overcome by "form": "The cry for form comes from those who have no idea of the origin and extent of the infinity of forms."³⁶

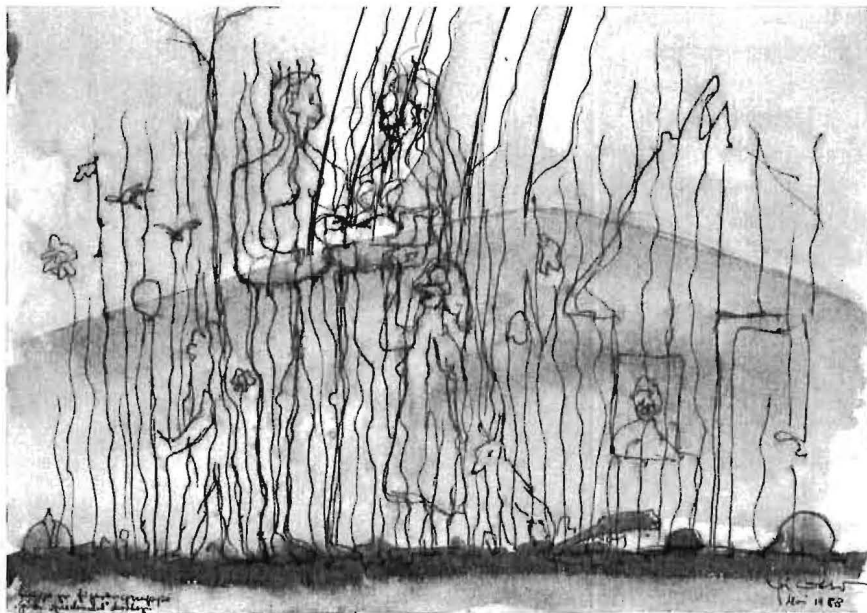
New building culture needs work on basics

Frei Otto has worked like no other 20th century architect on investigating "Gestaltwerdung"³⁷ – the emergence of form – in nature, technology and architecture, and on developing a new form of light and natural, adaptable and changeable building from the understanding that flows from research. The research institutions that he founded and directed, the Institute for Development of Lightweight Construction in Berlin and the Institute for Lightweight Structures in Stuttgart, were unique places for basic interdisciplinary research that was open to results, and its impulses and stimuli spread all over the world. This was not about isolated forms and constructions, but about their laws, and understanding them generally, not about individual achievements, but about a joint search for solutions. It is only this kind of basic research, which is seriously neglected in the field of architecture, that can produce new questions and solutions: "New building culture needs the broadest possible work on its basic principles."³⁸ Complaints about the lack of a building culture, which have been as effusive as they have been maudlin in recent years, will lead to nothing if this idea of Frei Otto's is not considered and implemented.

The fact that Frei Otto increasingly directed his research at understanding "natural constructions" from the fifties, and that he wanted to grasp the processes of self-organisation³⁹ and of the economy principle in nature, also fits in with his rejection of individual self-representation in designing and building. In contrast with the cult of personality pursued by many architects, which he has found suspicious and repugnant since the experiences of his youth, he supports an almost "anonymous" kind of building, intended to emerge from harmony with nature and its laws as a matter of course. And so his working medium is primarily the model, which can be used to



"Nature, what is that? - living, loving, laughing", drawing 1984



Sketches for the "Peace Monument" figure group, drawing May 1988

simulate form-finding and optimisation processes.⁴⁰ And understanding the processual character of natural constructions in its turn almost inevitably produces a position that runs completely counter to the individually fixed formal expression of the "artist architect", whose products Frei Otto feels are simply "show-off architecture"⁴¹, even though it dominates the architectural magazines. And so at best, he played the role of an outsider to the architecture scene, was rarely invited to take part in competitions, and never appointed to serve on judging panels.

Frei Otto's visions are aimed at tents with minimal surface areas, at grid shells stabilised by inverting traction lines, at pneumatic envelopes whose form is determined by pressure ratios and that sit on the landscape like a second skin, or at buildings that can be adapted to their particular needs by changing owners and can always be altered. For him, this work on natural constructions is part of a rational form-finding process following natural laws, but it is also part of a larger vision directed at a peaceful and free society in harmony with itself and nature. The ascetic architect falls into astonishing dreams of "sensual architecture"⁴² as part of these visions, of a "delicate, heavenly collage (...) on the theme of peace and love", or of building a kind of "love pavilion", as ultimately for Frei Otto work on mankind's earth leads to "peaceful love-architecture"⁴³ in a "happy cultural landscape". A dream that he does at least dream, unlike most architects, as for him "visionary imagination is never utopian".

40 Frei Otto. Bodo Rasch. *Gestalt finden. Auf dem Weg zu einer Baukunst des Minimalen*. Munich 1995

41 Frei Otto. "Die Zeit der vielen Architekturen". *Allgemeine Bauzeitung*, 1972, quoted from Burkhardt. 1984 (note 2), p. 122

42 Frei Otto. "Subjektives und Kritisches zu dem, was andere als mein Werk bezeichnen". Wilhelm. 1985 (note 6), pp. 162–163

43 Frei Otto. "Hört endlich auf". Burkhardt. 1984 (note 2), p. 147