

move
Architecture in Motion

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move

Architecture in Motion – Dynamic Components and Elements
Michael Schumacher Oliver Schaeffer Michael-Marcus Vogt

■ Contents

4	Preface	40	2.3 Scale and complexity of systems	B Applications and functions
8	Introduction The Poetics of Movement in Architecture Michael Schumacher	44	2.4 Typologies of movement	1 Changing and extending uses and functions
A Theory and planning		48	2.5 Choosing materials	102 1.1 Variable walls
1 Movement in space and the movement of objects		52	2.6 High-strength and flexible materials	106 1.2 Variable room elements
14 1.1 Exploring space – Creating space – Dancing space Isa Wortelkamp		56	2.7 Movable loadbearing structures Zoran Novacki, Andreas Kretzer	112 1.3 Opening the building envelope Michael Lange
18 1.2 The dynamics of nature Stefan Bernard		60	2.8 Movable connections	118 1.4 Mobile and movable building envelopes Michael Lange
22 1.3 Motion in photography and film Frank Möller		66	2.9 Actuators	B Applications and functions
26 1.4 On the relationship between robots and space Jan Zappe		72	2.10 Measuring, controlling, regulating Martin Becker	2 Conserving and generating energy
A Theory and planning		76	2.11 Planning guidelines and legal frameworks Kurt-Patrik Beckmann	124 2.1 Architecture, movement and energy Brian Cody
2 Movement and construction principles		A Theory and planning		130 2.2 The principle of efficiency York Ostermeyer
32 2.1 The principles of designing movement		3 Future movement strategies		132 2.3 Solar gain in context York Ostermeyer
36 2.2 The principles of mechanics		84 3.1 Making use of changing states of matter		136 2.4 Factor 1.4 – The potential of movement for solar gain York Ostermeyer
		88 3.2 Changing colours, forms and properties		140 2.5 Daylight direction using moving deflectors Roman Jakobiak, Andreas Schulz
		92 3.3 Smart structures Agnes Weilandt		
		96 3.4 Growth		

B Applications and functions

3 Interaction: Recognizing, controlling and representing movement

- 146** 3.1 Elevators and conveyors
- 152** 3.2 Recognizing and representing movement

C Buildings and building elements

Swivel

- 158** Church of the Sacred Heart
Allmann Sattler Wappner Architekten
- 160** BMW Training Academy
Ackermann und Partner
- 162** Ernsting's Family Distribution Depot
Schilling Architekten
- 164** Lakeside Stage
Werkraum Wien with Hans Kupelwieser
- 166** F House
Meixner Schlüter Wendt Architekten
- 168** Genzyme Headquarters
Behnisch, Behnisch und Partner
- 170** Wind Silos
Ned Kahn Studios

C Buildings and building elements

Rotate

- 172** Rotatable Housing Cube
Sturm und Wartzeck Architekten

- 174** Council House 2
DesignInc

- 176** Lakefront Supportive Housing
Murphy/Jahn Architects

C Buildings and building elements

Flap

- 178** Quadracci Pavilion
Santiago Calatrava

- 180** Leaf Chapel
Klein Dytham architecture

- 182** Palatine Cellar
Santiago Calatrava

- 184** BRAUN Headquarters
schneider+schumacher architekten

- 186** m.poli Kiosk
Brut Deluxe

- 188** Shop entrance
Nickel und Wachter Architekten

- 190** House No 19
Korteknie Stuhlmacher Architekten with
Bik Van der Pol

- 192** BDA Wechselraum Gallery
Bottega + Ehrhardt Architekten

C Buildings and building elements

Slide

- 194** EWE Arena
asp Architekten Stuttgart,
Arat – Siegel – Schust

- 196** Meridian Buildings, Astrophysical
Institute
Joachim Kleine Allekotte Architekten

- 198** Sliding House
dRMM Architects

- 200** Weekend House
Lacaton & Vassal Architectes

- 202** Metro Station Saint-Lazare
Arte Charpentier Architectes

- 204** Spielbudenplatz
Consortium Spielbude Fahrbetrieb Hamburg
and others

- 206** Living Room
Seifert.Stoeckmann@formalhaut

208 Theresienwiese Service Centre
Staab Architekten

Buildings and building elements

Fold

210 House at the Milsertor
Arch.Orgler

212 Horizon House
Shinichi Ogawa & Associates

214 St. Ingbert Town Hall
schneider + schumacher architekten

216 Kiefer Technik Showroom
Ernst Giselbrecht + Partner

218 Fabio's Restaurant
BEHF Architekten

220 Erika Mann Primary School
Susanne Hofmann Architekten and
the Baupiloten

Buildings and building elements

Expand and contract

222 Hoberman Arch
Hoberman Associates

224 Rolling Bridge
Heatherwick Studio

226 Rebgässli Housing Development
Amrein Giger Architekten

Buildings and building elements

Gather and roll up

228 Riva Waterfront Promenade
3LHD

230 Houses on Hohenbühlstrasse
agps.architecture

232 47°40'48"N/13°8'12"E House
Maria Flöckner and Hermann Schnöll

Buildings and building elements

Pneumatic

234 South Campus of the Art Center
College of Design
Daly Genik Architects

236 About the authors and contributors

237 Bibliography

238 Illustration credits

239 Sponsoring companies

240 Colophon

■ Preface

Eppur si muove – And yet it does move! Galileo Galilei uttered these words referring to the orbit of the Earth around the sun. In the early 17th century, what is now common knowledge was so revolutionary for our conception of the world that it was regarded as heresy and grounds for religious prosecution. Today the notion that we as humans live on a body that moves at high speed through an unimaginably large, seemingly limitless space seems self-evident.

Perhaps this is the origin of our fascination with movement in general. Our actual experience of standing on this body that is planet Earth is quite different, namely that it is stable and does not move. Given this perceived reality – and herein lies the essence of architecture – we erect our houses to be similarly immobile and hopefully stable. The architect's task is to erect a building on this apparently stable ground that is durable and lasting, both in terms of materials and construction as well as aesthetic quality, a building that in a broader sense is materially and culturally sustainable. But however stable and durable buildings may be as a whole, they also contain movable elements, not least so that we can use them. In fact in many cases these moving parts are a prerequisite for the building's durability. This book is concerned with such moving parts. It examines architectural elements that are movable in terms of their purpose, their composition, their form and their meaning.

As we know from windows and doors, escalators and elevators, shutters and sliding walls as well as from all manner of windbreaks or sun louvres, each of these elements has its own function and structural as well as aesthetic logic. As the title suggests, this book is not solely concerned with movement in itself but about movement in the context of architectural and aesthetic aspects: it examines movements and constructions that on the one hand help make our buildings more useful and more energy-efficient and on the other contribute towards richer, more aesthetic and more haptic experiences.

In film, the aesthetics of movement have always played an important role. In James Bond films, vast craters are made to open, not with the economy and efficiency an engineer might choose but in such a way that their drama and spectacle are heightened.

This book showcases successful examples of how movement can be practical, sensible and not least also “poetic”. In addition, it aims to serve as a practical reference by illustrating basic geometric principles and detailing key aspects for consideration when designing with materials, forces and dimensions. Its underlying intention is to communicate the guiding principles behind the conceptual approaches to this topic.

The creation of this book aroused a great deal of interest, moving many people to invest their valuable time and commitment. First and foremost we would like to thank the authors who have contributed essential chapters to this book. Likewise, our thanks go to the many members of the Institute of Design and Building Construction for their round-the-clock application in the meticulous production of drawings and crafting of precise formulations. The team at the publisher are to thank not only for their competent assistance but also for their supportive involvement, and naturally the realisation of this project would not have been possible without the vision and financial support of the sponsoring companies. Last but by no means least, thanks are due also to the architectural offices and engineering firms whose exemplary projects are shown in the pages of this book.

We hope that this book contributes to resolving some of the pressing problems facing “Spaceship Earth” and, alongside the seriousness of these issues, to promoting beauty and the concomitant sense of pleasure that good architecture can provide.

Michael Schumacher, Oliver Schaeffer, Michael-Marcus Vogt
Leibniz University Hanover, November 2009

■ The poetics of movement in architecture

Michael Schumacher

One's finger slides over the smooth, cool surface of the iPhone and finds the slight depression of the home button. A measured amount of pressure, a tactile response and the screen lights up. "Slide to unlock" appears within a graphic bar unmistakably designed to look like a slider. One's finger gently touches the glass surface and without any resistance or friction the virtual switch follows one's finger and slides to one side: the device is ready for use. The calendar appears and one can scroll through the day with one's thumb. If one scrolls too energetically, the list of 24 hours of the day hits the top or bottom and rebounds lightly. There is no actual need for this effect as there is no mechanical movement involved. A narrow black bar on the left-hand side moves gradually with the hours in the opposite direction to the scrolling movement, and appears to act like a counterweight.

When surfing the internet, this most wonderful 21st-century machine, everything appears tiny on the small screen. To get a closer view one "pulls open" a section of the so-called "window" between finger and thumb. The image or text expands until here too a rebound-effect marks the limits of the zoom, dispelling the momentary impression that one can zoom in ever closer into the molecular structure of the universe, as shown so evocatively by Ray and Charles Eames in their film *Powers of Ten*. While not everything is possible, this perfected product of the electronic age epitomises the poetics of movement – paradoxically a kind of movement whose "natural" environment is that of the physical world where things actually move and have mass and volume. So

why do we find this so fascinating? What makes movement beautiful and interesting and when is it clumsy and boring?

Movement and speed

An immanent part of movement is the speed at which movement takes place. Without speed, or a change between two different states, there is no movement. Movement results from a change in position from a stationary condition via acceleration and deceleration to a new stationary condition. The change in speed generally follows the laws of physics, increasing evenly in a linear pattern, then decreasing evenly again until it stops. This characterises how we open a door, pull out a drawer or close the window shutters of a house. This progression from the stationary via a more or less continuous increase in speed until a turning point is reached and speed decreases again can be designed. Perfectly even movement that starts and stops suddenly is for us unnatural. Such extremely controlled movement can be seen, for example, when a CD or DVD tray opens and closes. This aspect of movement is dramatised in Stanley Kubrick's world-famous science fiction film *2001 – A Space Odyssey*. The last surviving astronaut of the mission shuts down HAL, the all-powerful board computer, by removing its cognitive circuit modules. These entirely clear modules (with no circuit boards, just fascinating emptiness) slide silently and with the same slow evenness out of their sockets. HAL gradually starts to lose its memory, its voice becoming ever deeper until all it can remember is a children's song. The slow, even

regularity of the sliding movement lends it a magical quality and communicates powerfully the dramatic act taking place in the film.

Movement and form

Moving things like all things are characterised by specific forms. But the definition of form is more complex than with static objects as its form changes with movement. In architecture this has to do principally with the functional control and design of three states: closed, open and the state in-between. A door when closed fits perfectly in its frame. When it is opened, it often comes to rest at some arbitrary position that is rarely a "good" position. In a sense, the door is waiting to be closed, to be returned to its "good" position. Doors in the thick walls of old castles or manor houses often have an open position that is more aesthetically pleasing. The wonderful toy spheres devised by Chuck Hoberman enter into a different relationship between form and movement. In the initial state, one sees a complex articulated ball made of two colours, one of which dominates. If one moves the ball, for example by throwing it into the air, it changes colour. Through a complex inversion movement, the inward-facing colours swap position with the outward-facing elements. The phase in-between is not a sphere but a kind of star. Now the construction is revealed and we can see that the form is conditioned by its movement and could not be any other way. Although the form and the movement is in itself simple, it appears complex and unfathomable. Therein lies its poetry.



2001 – A Space Odyssey, MGM, 1968



Mercedes SLK-Class, 2004: the folding vario-roof opens and closes within 22 seconds

The upswing of the doors of a Lamborghini have the same intention. It surprises and fascinates us to see how the complex form of a car door can fit so seamlessly into the bodywork, so that when closed it becomes the very expression of elegance. Again, science-fiction films provide many examples for the relationship between form and movement over and above its practical function. Giant doors with matching wedged-shaped profiles clamp together, their interlocking form signifying clearly and unmistakably that passage is barred.

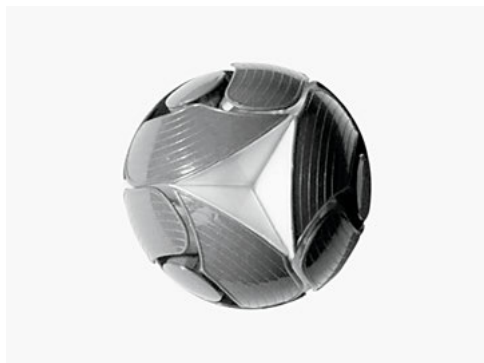
The wonderful elevator doors in the 1970s German TV production *Raumpatrouille* that did not meet in the middle like normal lift doors but closed diagonally

may have been impractical but certainly exerted a greater fascination. The advent of computer-aided design and production in the automobile industry has allowed manufacturers to develop cabriolets with a hard roof. Here one can clearly see the relationship between form and movement, the fascinating possibilities as well as the degree of complexity. The car needs to look good when the roof is open and when it is closed. The change between the two should take place quickly but nevertheless remain as simple as possible so that it is still realisable with mechanical means. Ideally, too, there should be room left over in the boot. Here, the technical possibilities and the serial production of

cars have led to concepts that are technically and formally more advanced than similar tasks in the architectural realm, for example skylights or stadium roofs.

Movement and mass

As a child I went to school by bus. The buses were articulated and the best place to stand as a child was at the bend. The round platform swivelled as the bus turned a corner (surprisingly, much less than expected). Much more exciting, however, was the ponderous but nevertheless pronounced bounce that resulted when the mass of the two halves of the bus rode over a bump in the road. The kind and



Switch Pitch, Hoberman Designs, 2004



beosound 3200, Bang & Olufsen, 2003

character of a movement is directly related to the mass that is moved. This is a product of basic physics: an elephant moves differently to a fly. Alongside being subject to the laws of nature, many other aspects play a role in the context of architecture. Large masses are more difficult to set in motion as well as to halt once moving. As ever in architecture, the mass of an element needs to be taken into account both in terms of construction as well as design. Excessively heavy doors in schools and children's nurseries are at best annoying and at worst render the building unusable. While motorised openers are, of course, available, they do not help in all situations and doors that suddenly open towards us we often find disconcerting. For architects, the need to consider the implications of mass in the design of moving architectural elements is comparatively new.

Movement and sound

Movements produce sounds. They result from vibrations caused by a movement which are transmitted through the air. These are so to speak the natural sounds of a movement. In comics such sounds are portrayed by words such as "groan", "creak", "screech" or "skid". In the case of cars, sound has always been an important aspect – even, or perhaps particularly, when not moving. The "docile thrum" of an eight-cylinder engine awakens very different associations to the aggressive purr of a six-cylinder. The solidity of the sound a car door makes as it closes conveys a sense of quality. The days in which the sound of a car was dependent on the geometry

of the exhaust manifold are long gone. Today almost as much time is spent on perfecting the sound as the form. Sound designers examine the sound when idle, when accelerating and at top speed. While without doubt much of this can be attributed to decadence, it shows how important the combination of movement and sound is and that one needs to be aware of the relationship between them. In the building sector, less attention has been paid to the sound of movement than in the automobile industry. The sound servomotors make as they open a window is usually left to chance, and the sound is more often than not correspondingly unpleasant. The thin profiles of the facade vibrate and transmit vibrations well, amplifying the sound of the small motors considerably. Other sounds in architecture include warning signals: to prevent people from getting trapped, the process of closure is often accompanied by a piercing sound that rapidly dispels all enjoyment of the movement itself. Sound always accompanies movement and one can exploit its dramatic potential to underline rather than disrupt the beauty of a movement.

This book is about the beauty of movement. Most movements have a practical purpose: either to effect a desired change of use or to adapt to external conditions such as weather, light and so on. Movements become poetic when they go beyond the purely practical, when they make more of the possibilities they hold and in turn heighten their potential. Investing movements with an element of beauty is a matter of conscious emphasis, a slight embellishment rather than the mechanical optimum.

This does not have to imply higher costs; on the contrary, the use of moving elements aims to increase the usefulness and therefore the long-term sustainability of buildings or to improve their energy efficiency. The systematic development of new materials in the industry will increase the potential for moving components in architecture.

The poetry of a movement is not automatically a by-product of its functional or economic optimisation. Making movements attractive increases the useful value of objects significantly so that they form part of our cultural identity. If we do things an interesting way, in a way that gives us lasting enjoyment, we appeal to our sense of being as a whole – and that includes our sense of poetry.





1

Movement in
space and the
movement of
objects

■ 1.1 Exploring space – Creating space – Dancing space

A choreographic conception of movement in architecture
Isa Wortelkamp

The terms exploring, creating and dancing describe practices that are essential for the choreographic conception of movement in space. All are integral to the work of the Swiss dancer and choreographer Anna Huber whose performances relate to specific spaces. Perhaps more than any of her contemporaries, Huber seeks a dialogue between the built elements and enclosure of architectural space and the immediate space of her body, changing the way they connect and interact through her movements. In direct contact with the architectural elements, their materials, structures and compositions, a vocabulary of movements emerges that she choreographs on site and for the specific architectural environment. The dialogue between dance and architecture, as characterised by Huber's choreographic works, began in the 1960s during the postmodern dance movement. As dance began to leave the realm of the theatre stage and started to take place in churches, sports halls, industrial buildings or galleries, an examination of the built context became a fundamental part of choreographic work. Characteristic for this development is the work of the American dancer and choreographer Trisha Brown. In her performance *Equipment Pieces* (1968–72), the dancers walk up-right down the side of a wall towards the spectators or parallel to the floor along the walls of the Whitney Museum in New York. In *Primary Accumulation* (1972) the performers line pathways or swim on the surface of Loring Park Lake in Minneapolis. Brown's choreographic works take place in locations that facilitate a different view of architecture and direct our attention away from the everyday and familiar pattern of

things. Walls, roofs and ceilings, rivers and roads become a space for dance, altering our perception of architecture: "I have in the past felt sorry for ceilings and walls. It's perfectly good space; why doesn't anyone use it?" (Brown, quoted in Stephano 1974)

Exploring space

In Anna Huber's series of works entitled *Umwege* (Detours), she focuses on apparently neglected spaces as the basis for her choreographic creation. Huber explores the corners and niches, walls and angles of spaces that are generally unused or at least are normally used differently to the way in which she explores them with the winding and agile movements of her supple body. A series of choreographies followed in buildings by architects such as Peter Zumthor, Jean Nouvel or Zaha Hadid, architecture that already embodies a sense of dynamism and mobilisation, as well as in various building sites. Together with the composer Fritz Hauser, Anna Huber develops movements that respond to specific architectural situations. The concept for *Umwege* came about in the thermal baths in Vals, Switzerland, and was followed by further performances in places such as Potsdamer Platz Underground Station and the Academy of Arts in Berlin (2002), the Maison des Arts in Créteil near Paris (2003), the Cultural and Congress Centre in Lucerne (2003), the former fire station at Vitra's works in Weil am Rhein (2003), the Art Museum in Stuttgart (2006) and the Pardini di Nervi in Genoa (2007).

Each choreographic creation follows an exploration of the architectural space. The choreographer de-

scribes this process of exploration as one that involves all the senses, a "feeling and sensing of different materials, surfaces and surface qualities" (Huber, 2009). Her inquiries into the nature of the space are manifold: "What does the room offer? How is it structured? Does it have a pre-existing structure or is it just an arbitrary, non-specific space? Does it or did it serve a particular function that may influence my research and perception? What is the history of the space? What is the energy and dynamism of the space?" (Huber, 2009). These lines of enquiry are her first means of approaching the space, her way of understanding and acquiring a feeling for the space. Huber practices being present in the space, occupying, moving around and residing in it, picking up all aspects of the space that the architecture has to offer in one form or another, allowing herself to enter into a relationship with the space, whether through her actions or in her imagination. Anna Huber describes this preoccupation as follows: "I'm interested in man's basic desire to settle somewhere, to find his place, to settle in and make himself comfortable." (Huber, 2009). In the process she traces the positions, actions, paths and patterns of movement that the different means of ordering the space suggest: the movements anticipated in the architect's design, which the choreography then updates and transforms.

Creating space

How can one describe the process of choreographic creation and how does it relate to the architect's creation? The choreographer assimilates and adapts



Umwege (Detours), Anna Huber, thermal baths, Vals, Switzerland, 2002





Eine Frage der Zeit (A Matter of Time), Anna Huber, premiere, Berlin, 2000



Umwege (Detours), Anna Huber, Potsdamer Platz, Berlin, 2002

an existing space, one that is not only based and builds on a pre-existing design but – and this is the point I wish to make – can also be read as a design for movement. It contains and defines different possibilities of moving through the space, of interacting with it, of being in it, of taking up occupancy and of traversing it. If architectural design aims to create a specific form for the buildings we live in (Hahn, 2008), dance transforms this form into movement which it in turn shapes and forms. In this sense, dance interacts with the architect's creation in the same way as it does with a choreographic script or rule, although reading it differently, as it were back to front.

Continuing this train of thought, Huber's dance can be understood as a – physical and moving – manner of reading that picks up and picks out the architectural creation and conveys it anew in and through its movements: not in the sense of translating and implementing a clear set of uniform movements but rather in the sense of accepting its invitation to dance. Dance creates something new in the space in which it takes place. This idea corresponds to Michel de Certeau's theory of walking in which the play of steps can itself be conceived as the "creation of spaces" (De Certeau, 1984).

In the same way that every creation embodies something of the designer, Huber choreographs with her understanding of dance and architecture, her knowledge of the movement, technology, anatomy and motor functions of her body. Her art of dancing interacts with the art of architecture by drawing on

its structures, materials, elements and compositions. Axes, views, directions and paths offer motivations for movements. Huber's particular interest is in the tension between macro- and micro-structures. "In the thermal baths in Vals, for example, strips of stone have been layered both indoors and outdoors. I could insert my body into the lines and spaces between them. While exploring one of these walls, I suddenly became aware of the small, almost playful drawings formed by the veins in the stone. The austere, clear structure of the building gives way to organic, almost archaic forms and figures. I found that inspiring: on the one hand there is the theoretical and abstract and then suddenly entirely different forms and directions are revealed. [...] My experience of these small drawings in the stone stimulated me to research how I could translate these into movement." (Huber, 2009). The performance brings about a change and shift in the relationship between body and space. When one sees Huber dance, the familiar becomes unfamiliar and the unfamiliar familiar. One's perception follows the detours and stray paths and correspondingly discovers that one's own position and point of view has in turn been set in motion.

Dancing space

Anna Huber creates spaces by turning what is down upwards and what is up downwards. She bypasses the order and arrangement of the space, reading it from right to left, turning it on its head: "I play with the balance of forces, for example with a wall.

I might support myself on the wall or press myself at an angle against it. I try and reverse the play of forces in my head by asking myself whether I am leaning against the wall or holding up the wall. I want to communicate this sense of inversion to the spectators so that they suddenly think: she has to hold up the wall otherwise it will fall over!"

Huber subverts perception, dancing architecture, not by following the rules, but by misreading them, her choreography interpreting movements "wrongly" or "incorrectly". This too corresponds to another of de Certeau's thoughts in which reading is seen as an activity that itself changes, forgets and invents (De Certeau, 1984). Here the choreographer breaks with the tradition of reading in the sense of a solely passive practice of consumption. De Certeau posited instead that reading is active and productive. "The reader invents in texts something different from what they 'intended'. He detaches them from the origin, now lost or incidental. He combines their fragments and creates something un-known in the space organized by their capacity for allowing an indefinite plurality of meanings." (De Certeau, 1984). When Huber dances the architectural "text", she reorders what is known and what is familiar and through her dance and her movements brings about another understanding of dance and architecture.

Through an inversion and reversal of prevailing paths and patterns, through a new coding and re-functioning of everyday spaces, dance refers to the potential of architectural spaces, which from a dance theory perspective can be seen as choreo-

graphic potential. Dance, which is able to turn this potential into a motor for movement is able to contribute towards sensitising the senses: that particular kinetic sense which allows us to perceive a space as a possibility for movement. It is at this

intersection where we should seek a dialogue between architecture theory and dance theory, a dialogue oriented around the architect's and the choreographer's practices of exploring, creating and dancing.



Timetraces, Anna Huber, performance for a specific place



Die anderen und die Gleichen (The Others and the Same), Anna Huber, premiere, Berlin, 1999

■ 1.2 The dynamics of nature

Stefan Bernard

It's something we all remember: that rush of light-heartedness that seizes us as we wander through woods in springtime. Winter has passed and light gently spills through the still-sparse canopy, setting in motion an impressive process: the ground, still dark from the leaves covering the woodland floor, absorbs the warmth of the sun, initiating metabolic processes that mark the beginning of an impressive natural spectacle. It is the hour of the spring-flowering plants, that now absorb their ration of the sun's energy for photosynthesis. Carpets of white wood anemones push through the leaves as if remains of snow from winter, the crimson blossoms of the corydalis, the blue of the liverwort or the yellow of the celandine providing patches of colour. The lightness of being and the force and dynamics of nature reveal themselves in their most

pleasant form. The blaze of colour is, however, short-lived and springtime quickly passes, not made to last. The leaves on the trees grow rapidly larger, filling out the woodland canopy visibly until it forms a roof. A space is created, dense and defined as if almost architecture. What was a Gothic cathedral is transformed into a medieval crypt. The little sunlight that penetrates the canopy and reaches the woodland floor is barely sufficient for many plants and the surviving herbaceous layer of vegetation is at best unremarkable.

Towards the end of summer, the pattern changes again. As the amount of sunshine gradually decreases, so too does the metabolic activity of the trees. The production of light-absorbing and energy-generating chlorophyll ceases, marking the end of the intense green of the leaves. The abscission begins –

the shedding of leaves and fruit – and yellows and reds begin to dominate, lending the autumnal woodland its own melancholic atmosphere. Until the first snow falls. Until the next spring arrives.

Nature as a cyclic system

Changeability is an immanent part of human existence, and of nature too: high and low tide; full and new moon; bud, blossom, fruit; mornings and evenings; day and night; the seasons of the year. The list of examples goes on and on.

What these all appear to share is the fact that the vast majority of natural processes that affect our daily lives reoccur at regular intervals: the larva becomes a chrysalis, then a butterfly, before spawning new larvae. They are regular, cyclic and self-contained processes within the larger order of





Garden in the monastery at Eberbach, Bernard und Sattler Landschaftsarchitekten, Rhinegau, Germany, 2008

things. A coming and going. Grandfather and grandson. What we see as human beings at a particular moment in time is a snapshot, a film-still as it were of a continuous, ongoing process. The time span, the duration, of these individual processes is likewise remarkably consistent. A day, a week, a year, the phases of the moon. The repetitive and regular recurrence of these processes is essential for their continued existence. Their cessation would be their end. This repeating pattern also makes it possible to eradicate “errors” in the system and to adapt to changing conditions. A kind of in-built fine-tuning, as we have learned from Charles Darwin.

This regularity, the certainty of recurrence, the knowledge that spring will follow winter offers mankind, without doubt, a sense of reassurance in its dealings with nature. Nature as the phoenix, an ever regenerating phenomenon. In fact, our very human existence is grounded precisely on this trust in regularity, in the confirmation of our habitual patterns and pre-judgements, in the expectation of fulfilment of our hopes. Anything else leads to “problems” that we have to then laboriously solve, as Karl Popper once put it.

Interestingly, it is precisely this aspect that also feeds our fear of the dynamics of nature. Alongside the regularity, predictability and reliability of natural recurring cycles – the fragrant flowers and pretty birdlife, the pleasant breeze in summer and the warmth of autumn sunshine – nature can also present an ugly face. The good, predictable, reassuring pattern of change is accompanied by a sinister, unpredictable and devastating dynamic that can

potentially have fatal or existential consequences. “Does the flap of a butterfly’s wings in Brazil set off a tornado in Texas?” Edward N. Lorenz’s phrase, although originally meant in a different context, is a fitting example. One need only recall the sun-drenched, romantic beauty of the South Seas shortly before the tsunami struck. Our comprehensible, safe and ordered world is constantly accompanied by a precipitous sense of uncertainty and chaos. Our relationship to nature is, therefore, characterised on the one hand by an awareness of its recurring, familiar and reliable character, and on the other by a residual risk of incalculability. This explains, perhaps, to a degree our love-hate relationship to nature, as well as our perpetual desire to tame nature, to control it, cultivate it and confer order on it.

The garden – nature tamed

The word paradise originates from the old Iranian word *pairi daēza* – which translates literally as “bounded area”. The word “garden” has its linguistic roots in Gothic times and denotes an enclosure bounded by a fence of twigs (*Gerte* in German). The enclosure was designed to protect the cultivated land and its inhabitants from the dangers of the surrounding wilderness. Gardens therefore represent “good” and pleasant natural environments from which dangers are banned: gardens are tamed, ordered and controlled nature. The characteristic dialectic between cyclic regularity (security) and danger (insecurity) is, for the most part, cancelled out. Only the dynamics of changeability cannot be conquered! This awareness is expressed most

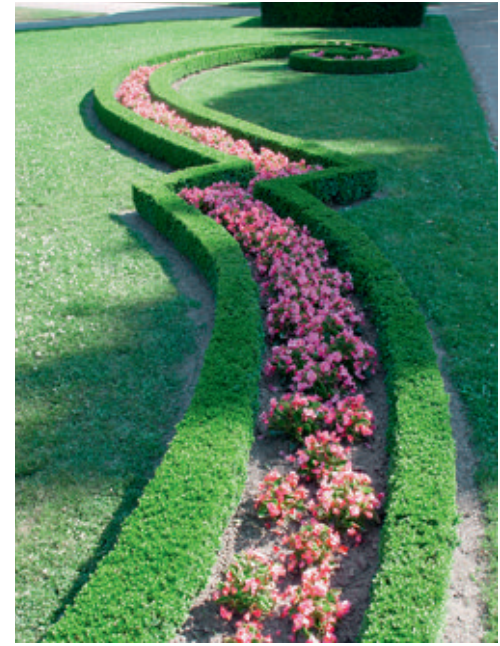
vividly in the medieval pomarium or orchard. Located within a monastery, this fulfilled the dual function of an orchard and a cemetery. The monks were buried in the pomarium while the trees – predominantly fruit trees – grew and withered in their rhythmic cycle of bloom, fruit and winter dormancy symbolising the pattern of creation, death and resurrection.

The garden as an expression of culture tries, therefore, to omit the aesthetic category of danger, of unpredictability. It lacks the simultaneity of beauty and ugliness, of creation and destruction, of order and chaos. This is the key difference to “real” nature, and what makes it so pleasant and attractive for us as human beings.

Change as a design principle

The aspect of changeability is ever present in garden and landscape architecture and a conscious and deliberate consideration of “the dynamics of nature” is a necessary and integral part of the design process. The world outdoors is far too complex and the vegetative material used so possessed by its own dynamics and conditioned by unpredictable factors that it is impossible to keep it in check over long periods of time. The same applies to the dynamics of the users of gardens and parks whose actions – even in civilised times – can only be predicted and controlled to a certain degree.

It is, perhaps, specifically this more natural (and somewhat relaxed) attitude to working with the unpredictability of nature that characterises the process of designing landscapes. Outdoor environments



and their perception are subject to constantly changing conditions: a sunny morning or a misty daybreak, the sweltering midday heat or a cool breeze, loutish adolescents or happily playful children. The changing seasons too result in changing structural hierarchies among the plants, for example the cherry blossom in springtime gives way to the resolute majesty of the plane trees in summer and autumn. Changes over long periods of time likewise alter the spatial appearance of a garden: what begins as an open, sunny garden with small, delicate young trees will over time develop into an imposing, shady, spatial agglomeration formed by a cluster of 100-year-old beech trees.

The design of gardens and landscapes always takes place with an awareness that the end result, in addition to the inability to control how others perceive it, can only be more or less governed – it is an approximate art. While much can be directed by design to develop in an orderly manner, other things will simply just happen. The composition and design of landscapes is, therefore, in its core always accompanied by a certain degree of fatalism. To a certain extent, it can be regarded as an aesthetic of incomplete control, though the spatial constellations that result are by no means less stimulating. Can then such a restrained approach to design that is sensitive to change, indeed that embraces (and expresses) change, offer an example for the architectural design of buildings? After all, architectural design typically aims to produce constructions that remain the same over longer periods of time, an

approach that in principle would seem to exclude the possibility of change. If one is nevertheless willing to consider the “dynamics of nature” as a conceptual basis for architectural design and construction, one must first ask oneself what kind of dynamics and what degree of change one wishes to strive for? Is it the notion of a tamed, orderly (built) environment accompanied by a controlled, carefully orchestrated dynamism? A notion of changeability that emphasises the pleasant, desirable effects of nature and attempts to minimise the dangerous side effects – a kind of “changeability lite”? Or is the aesthetic intention to express a “truthful” sense of nature, untamed and willing to accommodate consequences that one can only estimate? A form of nature that may at any time get out of hand.

While the question is perhaps rhetorical, it is one that, now as then, has lost nothing of its frightening attraction.



■ 1.3 Motion in photography and film

Frank Möller

To learn more about movement in space it can be instructive to take a look at the extensive fund of knowledge that photography and film have to offer, not least because these media relate closely to our own mode of visual perception.

Simplifying things somewhat, this topic can be approached from two different points of view.

Firstly, the movement of a viewer through (architectural) space and the representation of his or her subjective impressions: a room is crossed and then reassembled out of the viewer's individual impressions to form an experience of the space, or as Sigfried Giedion expressed it in his book *Space, Time and Architecture*:

"The essence of space as it is conceived today is its many-sidedness, the infinite potentiality for relations within it. An exhaustive description of an area from one point of reference is, accordingly, impossible; its character changes with the point from which it is viewed. In order to grasp the true nature of space the observer must project himself through it."

Secondly, the aesthetic representation of moving objects, of dynamically changing processes or structures that take place in full view of the viewer, affecting the space around them.

The flying eye

In the history of art and media, our individual, subjective view of space has become successively more dynamic. The invention of perspective in the Renaissance, the large panoramas and later film all test-

ify to an increasing desire to experience the dynamism of space.

Ever since a day in 1908, when a film camera was first detached from its tripod and hung from a gantry or placed on tracks, it has been made easier for the viewer to identify with the "point of view" of the camera and to enter into a relationship with photographed spaces. This dynamic interaction is also supported by the backdrop and scenery. An examination of sketches drawn by Ken Adam, the production designer for films such as *Dr Strangelove: or How I Learned to Stop Worrying and Love the Bomb*, *Barry Lyndon* or *Goldfinger*, reveals how the subjective view becomes the directive for the design of space. His sketches, made with a fat fibre-tip marker, clearly show where the camera stands and the focal length to be used. As such they already embody the dynamism of the moving picture.

This dynamism is heightened as soon as the camera starts moving, and with it the viewpoint of the viewer. Although camera movements generally take the viewer on a journey lasting only a few seconds, they immediately reveal through their representation of space, architecture and the city, which possibilities exist for perceiving space and the ways in which spaces can be portrayed through movement. The cameraman Michael Ballhaus relates his particular approach in the book *The Flying Eye* as follows:

"I like to move the camera, to narrate with the camera's movement, for example, to relate the emotions of the actors or what is happening in the story."

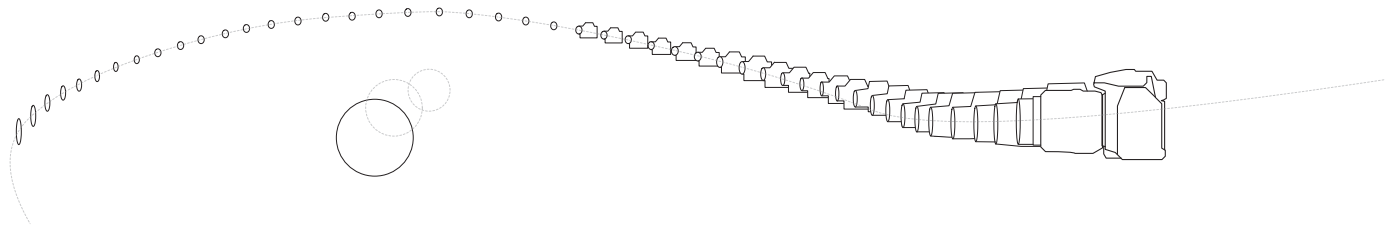
The 360° circle shot that Michael Ballhaus employed in Rainer Werner Fassbinder's film *Martha* and went on to utilise many times, or the related technique used by the Wachowski Brothers for the "bullet time" scene in the film *The Matrix* show just how influential dynamic perspective can be for the narrative. The "bullet time effect" differs slightly in that it is not realised using true camera movement. Instead, a succession of individual frames of a scene are taken by several different cameras and subsequently assembled to simulate camera movement. In general, the ongoing development of imaging technologies plays a not insignificant role in pushing forward our conception of time and space.

From the studies of movement undertaken by Eadweard Muybridge, one of the founders of serial photography, to modern-day film effects such as "bullet time" or the "time slice", imaging techniques have expanded our perception and our understanding of space and time. John Gaeta, one of the protagonists of the new film techniques, describes a central aim of this development as follows:

"The tension lies in reinterpreting the moment: we want to depict the moment in a way in which we cannot see it in real life."

The grace of turning

In the history of film there are many examples of the aesthetic representation of moving objects. One particularly monumental sequence is the initial depiction of outer space in Stanley Kubrick's *2001: A Space Odyssey* in which Space Station 5 slowly re-



Bullet time describes a special effect used in films in which the camera revolves around an object that appears to be “frozen in time”. The “bullet time effect” is not realised using true camera movement. Instead, a succession of individual frames of a scene are taken by a series of different cameras and subsequently assembled to simulate camera movement.



Shooting of the film *The Matrix*, 1999





#87 Shibuya, Tokihiro Sato, 1991

For his artworks the Japanese artist Tokihiro Sato uses extremely long exposures of one to two hours. The points of light in his photographs are created by reflecting sunlight into the camera using a mirror.

Right: #385 Kokuritsu-Soko 3, Tokihiro Sato, 1999, Haines Gallery, San Francisco

volves like a giant Ferris wheel. Kubrick underscores this scene with a passage from a famous waltz, remarking:

“It’s hard to find anything better than the ‘Blue Danube’ for depicting the grace and beauty in the turning.”

The expression of spaces in film can change dramatically when elements that define space are set in motion. Particularly where architectural constructions in film are concerned, filmmakers are comparatively free to turn such spatial experiments into filmic reality. Film sets do not have to be designed to support real loads or be made of real materials. They do not need to withstand years of use or carry a second storey and are not exposed to the elements over a long period of time. In film it is possible to realise spatial concepts that are not static but can appear movable and transient. It is rarely necessary to construct a solid, inhabitable space; in most cases film sets serve only to frame precise theatrical mechanisms.

Accordingly, large-scale transforming spaces have been the subject of countless sci-fi scenes and James Bond films. The sets of the early Bond films all appear to have an underlying agenda, that to this day lends them the aura of a dark, modern-day version of *Alice in Wonderland*: things are not what they at first seem to be and scenes abound with false floors and secret mechanisms. There are swimming pools that turn into shark tanks and vast, artificial crater lakes that shift to one side to make room for a rocket launching pad. As soon as the main room in Auric Goldfinger’s house changes first

from a Frank-Lloyd-Wrightesque living room to a lecture room, then to a deadly prison, there is no mistaking that James Bond is up against an adversary of equal stature.

A sculpture in time

In addition to the examples discussed here, there are an almost inexhaustible number of fascinating works in both film and photography from which one can learn about movement in space.

Among these are some that have managed to distil both of the aforementioned approaches to movement in space into a single film sequence or a single image.

The interiors of Space Station 5 in Stanley Kubrick’s *2001 – A Space Odyssey*, which was designed as a giant centrifuge that rotates around its centre to artificially create a sense of gravity, are among the most spectacular and beautiful moving spaces ever made in the history of film. The film sequences illustrate Stanley Kubrick’s meticulous capacity for invention, constructing a space that creates a different kind of gravitation and a form of movement that corresponds to these conditions.

With the help of the centrifuge, it was possible to unite both perspectives – movement through space as well as the representation of movement itself – in a single, brilliantly-conceived film set.

There are few more compelling examples of the combination of both phenomena in a single image than the beautiful photographs taken by the Japanese sculptor and photographer Tokihiro Sato. Whether

an urban square, interior or picturesque natural setting, the artist walks through the spaces, gauging their size, all the while photographing the scene with a long time exposure. Although the artist himself is not actually visible in the photo, the image contains an exact record of his changing position and with it his physical range.

“I only photograph landscapes, certain objects, and light. Nevertheless, these photos still have a distinctly human quality. The light becomes corporeal, while the traces of light that I create as I move embody passing time, creating a sculpture in time.”

Tokihiro Sato

1 Giedion, Sigfried: *Space, Time, Architecture*, 5th edition, Cambridge, Mass., 2003.

2 *Das fliegende Auge*, Michael Ballhaus in conversation with Tom Tykwer, Berlin 2002, cover text.

3 „Kino wird sich grundlegend verändern“, Interview with John Gaeta, *SPIEGEL Online*, 8.5.2008.

4 Castle, Alison (Ed.): *The Stanley Kubrick Archives*, Cologne 2008, p. 33.