

Sun wind water earth life living; legends for design

COLOFON

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Introduction

‘Building is cooperating with the Earth.’
Marguerite Yourcenar.

Motivation

Activating senses

Sun, wind, water, earth and life touch our living senses immediately, always, everywhere and without any intervention of reason. They simply *are* there in their unmatched variety, moving us, our moods, memories, imaginations, intentions and plans.

Mathematics next to senses

However, the designer transforming sun into light, air into space and water into life, touches pure mathematics next to senses. Mathematicians left alone destroy mathematics releasing it from senses, losing their unmatched beauty and relief, losing their sense for design. To restore that intimate relation, the most freeing part of our European cultural heritage my great examples are Feynman’s lectures on physics, D’Arcy Thomson’s ‘On Growth and Form’ and Minnaert’s ‘Natuurkunde van het vrije veld’ (‘Outdoor physics’). Minnaert elaborated the missing step from feeling to estimating.

I am sitting in the sun. How much energy do I receive, how much I send back into universe?

I am walking in wind. How much pressure do I receive and how much power my muscles have to overcome? It is the same pressure giving form to the sand I walk on or giving form and movement to the birds above me! I am swimming in the oldest landscape of all ages, the sea. How can I survive?

Re-constructing behaviours

No longer can I escape from reasoning, from looking for a formula, a behaviour that works. But this reasoning is next to senses and once I found a formula I can leave the reasoning behind going back into senses and sense. The formula takes its own path in my Excel sheet as a living thing. It ‘behaves’. Look! Does it take the same path as the sun, predicting my shadow? Put a pencil and a ruler in the sun. Measure, compare, lose or win your competition with the real sun as Copernicus did.

Mathematics have no longer much to do with boring calculations. Nowadays computers do the work, we do the learning. They sharpen our reasoning and senses. We see larger contexts and smaller details than ever before discovering scale. Discovering telescopic and microscopic scale we find the multiple universe we live in, freeing us from boredom forever, producing images no human can invent. We do not believe our eyes and ears, we discover them. It challenges our imagination in strange worlds no holiday can equal. Life math is a survival journey with excitement and suspense.

Science as design

But do we *understand* the sun? No, according to Kant (1976) we *design* a sun behaving like the sun we feel and see from our position and scale of time and space we live in. We never know for sure whether it will behave tomorrow in the same way as our sheet does now. But we have *made* something that works *here* and *now*.

‘Yes! It works.’ That is a designer’s joy.

How to use this book

This book is not a reader. It contains original texts by the authors from our school and one civil engineer to understand how specialists think, supporting our profession as urban designers.

Systematic encyclopaedia

It is ordered in an systematic encyclopaedic style. It is accessible by its table of contents (elaborated in more detail at the beginning of each chapter), and by a key word list containing some 6000 key words at the end of the book, including other authors we refer to. Full references to other authors are given on the end of every sub-chapter, to be found via the key word list. Direct references into publications and websites to look up immediately as a result of reading are given as foot notes indicated by letters in the text and listed at the bottom of the page. Questions for exercise are indicated as end notes by numbers in the text listed at the end of the book. However, these questions don not yet cover the whole content of the book.

Design related use

So, you do not have to read everything before you can use it making inventories for design (like a local atlas of thematic maps), while designing, or reflecting on your designs. Reflecting on your design work is what we ask in the assignments of the course accompanying this book: how did you apply Sun in

your earlier design work, what could you have done, how do you apply Sun in your actual design work and what could you do with it in the future? The same is asked for Wind, Water and so on. A growing number of computer programs for experiments and calculations per section is downloadable from <http://team.bk.tudelft.nl> publications 2006.

Non-disciplinary combinations like sun and plantation

The chapters Sun, Wind, Water, Earth, Life, Living and Legends for design are the same as the title of the book indicates. These subjects are ordered this way, because it is the conditional sequence we experience them directly outdoor and gradually can understand them best. However, the chapter 'Sun' contains sub-chapters on energy, entropy, temperature, light, the history of our territory dependent on solar fluctuations, man-made plantation (written by Prof.dr.ir.C.M. Steenbergen and Drs. M.J. Moens), shadow and vision as well, because these subjects are often related in design or better comprehensible in the offered context. Perhaps in your design you can connect things in another way than the usual scientific and specialist's distinction of disciplines suggests. For the same reason we did not aim for a distinction between natural and man-made phenomena in the sequence of chapters. It is rather a conditional sequence of growing complexity in cycles of inductive observing, deductive understanding and practical application. So, any chapter is better understood knowing something about the subject of the preceding chapter.

Wind and noise

The chapter 'Wind' contains noise as well, because both are movements of air. These flows are more complex than those of mere energy and light. This chapter shows another principle of ordering we aim for in any separate chapter: the level of scale. So, you can choose the sub-chapter concerning the level of scale you focus on in your study. We have tried to start every chapter on the highest level of scale. There are arguments to start with the lowest level, most directly related to our senses, but we chose the other way round, because lower levels of scale are better understood knowing their context. This way, you may get a feeling for contextual factors determining a particular environment and its mathematical modelling with parameters stemming from that context. In design practice you can reason the reverse way or both ways.

Water and traffic

The chapter 'Water' is primarily based on the lecture notes Prof.dr.ir. C. van den Akker offered us for use when he retired from the Faculty of Civil engineering. Drs. M.J. Moens added many subjects relevant for design. However, It contains traffic as well, because the combination of these different flows on the Earth's surface and their resulting networks are an important part of urban and regional design. So, we did not primarily make a distinction between natural and man-made networks. The comparison of their characteristics is interesting, instructive, and may be a source of new design ideas.

Earth and subterranean infrastructure

The chapter 'Earth', written by Drs. M.J. Moens, is better understood if you know something about wind and water. The division of its sub-chapters starts strictly with levels of scale, but then sub-chapters follow about soil pollution, preparing a site for development, cables and ducts, map analysis.

Life and demography, genius loci

The ecological chapter 'Life' supposes sun, wind, water and earth. These conditions are discussed earlier in the book, so the chapter can focus on the distribution and abundance of life itself. Biology is physics with numerous feed-back mechanisms, not to be modelled so easily in a mathematical sense. However, it introduces approaches of system-dynamics, demography, useful in human environments as well. Life contains human life. So, this chapter tries to consider man as a species between other species (syn-ecology), while the next chapter 'Human Living' concentrates on human species only (aut-ecology). However, there are sub-chapters on valuing and managing nature by man in your plan, and on the role of an urban ecologist.

The subject of this chapter is not very familiar to designers. So, you can think it is not very relevant. But in my opinion ecology, the science of distribution and abundance of species, is the very core of urban and regional design. Local vegetation and wild life clarifies much about what designers feel as a mysterious 'genius loci'. Ecology is a neglected source of local identity.

Evolution and design methods

Evolution of life has something in common with design thinking: its course of trial and error into diversity and order. The evolutionary taxonomy of plants and animals, types of life, their distribution and adaptation into different environments, accommodating and modifying them, give examples of the

same problems any design task stands for. Your typological repertoire of design solutions selects environments and the reverse different environments select different types of design.

Human living, habitat, density, economy, and environmental problems

The chapter 'Human living' shows the history of human occupation in general and in The Netherlands in particular. That piece of land in between France, Belgium, Germany and Great Britain contains both lower and higher grounds, combining many characteristics of its neighbours. Its delta gives an impression of a development known from many densely populated lowlands in the world, the spatial composition of ecological, technical, economic, cultural and administrative components. A sub-chapter is devoted to urban density on different levels of scale. The sub-chapter 'Environment' discusses some consequences of living in high densities like environmental problems, environmental norms, gains and losses.

Legends for design and composition

The chapter 'Legends for design' stimulates to consider these phenomena of urban physics as innovative components, legend units, spatial types given form in a design composition. It raises philosophical questions on unusual types, their suppositions, combinations and consequences.

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