Long before "complexity" was a scientific term, human intelligence was tackling complex issues of the built environment. One of its tricks is metaphorical and analogical thinking.

Is it indeed an evolved mechanism that we do? What would that mean for our evaluation of intellectual works, our focus in education, and the way technology should support us?
We still know very little about its roles in real-world phenomena, esp. in urbanism.

**OBSERVATION IN DESIGN**

Creative strategy (Antoniades, 1990)

A way to grasp the essence (Ungers, 1982)

Origin of many theories, models and design methodologies (...)

**EXPLANATION IN DESIGN**

Heuristic reasoning for ill-defined problems (Rowe, 1982)

Displacement of concepts for innovation (Schön, 2001)

Cognitive strategy for morphological design (Tzonis, 1992)
Spatial metaphors for time

(a)

PAST

(b)

PAST

FUTURE

FUTURE

SCIENTIFIC THEORIES

- Prediction
- Analogy
- Associations
- Prediction

A'

Input

A

B

C

D

Evil

HQ

Cause

Marry

Lady-Macbeth

Macbeth

Weak

Marry

Woman-2

HQ

Greedy
Superficial appearances—can it be used for design?

Exploiting public sentiments?

Just a story—what scientific reasons does it have?
Maybe we have the wrong expectations for them …

Because we don’t know what roles they play and why.

What if it is indeed an evolved mechanism to handle what we do? What would that mean for our evaluation of intellectual works, our focus in education, and the way technology should support us?
Strategy

Research goals
Output format
Structure of communication
THE RESEARCH

RESEARCH GOALS

• A framework to structure M-A phenomena based on scientific theories

• Further demonstrate how complex M-As work

OUTPUT FORMAT

• Journal paper
  Single line of reasoning, for reporting and recording findings.

• Book
  Chapters afford building up more than one plot/perspective.
7 CHAPTERS, 3 PARTS
Design Framework

Theory construction as design.

Phenomena detection & structuring
Chap. 1  M-A IN RESEARCH AND PRACTICE

Traditional Design Studies

Influence of Science

Formalist studies: experiments, variables

Qualitative analysis: phenomena, isolated cases

Research

Practice
Research

Practice

Rotterdam South as a Fish
by Els Bet

The Carpet Metropolis
Willem-Jan Neutelings, 1989

A4 Corridor of Zuid-Holland
Italian square for Dutch city

Precedential reference
Amstelveen city centre design.
Paul Broekhuizen and Hans Ruijssenaars (Atelier Quadrat)

Building as Ship on Water
Amstelveen city centre library design
Hans Ruijssenaars (Atelier Quadrat)

Sand pile model for urban growth simulation
in complexity theories of cities
(Batty, 2005)
We need an overview that *connects* the formalist findings, the qualitative analyses, and practical processes.
Deriving own structure & data through interview: everyone’s opinion is a structure, cases they provide are data

*Different M-As play different roles to support different processes.*
Different M-As play different roles to support different processes

Differentiating Characteristics

Mechanism (in context)

Cognitive processes in design & planning
Mental representation

Representing complex phenomena with the thinker’s own knowledge, to achieve certain reasoning.

Information, scale, novel nature, etc.

The highway is a barrier between the two areas. The shoreline is not a monolithic whole, but a thread with beads. The highway experience is like that of music.

The Carpet Metropolis
Willem-Jan Neutelings, 1989
Mental representation
Representing complex phenomena with the thinker’s own knowledge, to achieve certain reasoning.

Schema* designation
Applying procedural knowledge to translate abstract needs into material objects (or the reverse).

*schema is procedural knowledge: something does something to achieve something

(For spatial design) variation, non-verbal, acquisition, organising & retrieval of knowledge

Unite d'Habitation
Le Corbusier
Mental representation
Representing complex phenomena with the thinker’s own knowledge, to achieve certain reasoning.

Schema* designation
Applying procedural knowledge to translate abstract needs into material objects (or the reverse).

Communication
Conveying the essence of design/planning in common terms; interpreting cross-disciplinary ideas.

Making explicit, synthesising: implications, limits

The Green Heart of West Holland

Sandpile model
Metabolism
Mental representation
Representing complex phenomena with the thinker’s own knowledge, to achieve certain reasoning.

Schema* designation
Applying procedural knowledge to translate abstract needs into material objects (or the reverse).

Communication
Conveying the essence of design/planning in common terms; interpreting cross-disciplinary ideas.

Collective process
Through which the collective imposes control and plans on its large-scale environment.

The Green Heart of West Holland

The Finger Plan of the Greater Copenhagen

A “vessel” concept for collective interaction

conscious agents, individual reasoning, organised action, collective reflection
Categories are inter-connected: M-A mode exits into other modes. Looking from the outside at a distance reveals how parts fit together as a whole; but looking inside reveals how it works.
Design Dynamics

Theory construction as design.
Mechanisms
Patterns
Dynamics of phenomena
Chap. 3  COGNITIVE PATTERNS IN M-A THINKING

The Green Heart
Building as Ship on Water
Amstelveen city centre library design by Hans Ruijsenaars (Atelier Quadrat)

Rotterdam South as a Fish
from cultural-historical survey of pre-war neighbourhoods in Rotterdam South by Els Bet
Three **cognitive patterns** that build up complex M-As from basic building blocks.

- Accounts for the different characteristics of M-As, and how one thinking mechanism fits into various situations.
- Reveals the manoeuvrability—or, the window for creativity—in making M-As.
1. BASIC FORM

Simultaneously involving two concepts, one better known than the other:

Contents of the better known one is transferred to the other, creating inferences or reasoning possibilities;

The transference is guided by similarities between them.
2. PATTERNS

Multi-level

Multiple levels of meanings regarding the same objects are superposed.
2. PATTERNS

Multi-level
Multiple levels of meaning regarding the same objects are superposed.

Multi-layer
Objects take up different roles in a logical hierarchy to form one narrative.
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Multi-level
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Multi-unit
Units are relatively independent M-As and have complementary relationships.
2. PATTERNS

Multi-level
Multiple levels of meaning regarding the same objects are superposed.

Multi-layer
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Multi-unit
Units are relatively independent M-As and have complementary relationships.

3. TRANSFORMATION

Schematising
The context–response relationships among objects are identified so that a matched context can prompt the transfer of the response.

Developing verbal narrative
The narrative is made more prominent as a relatively independent unit (often by naming).
4. INSTANTIATING LINKS through case studies
LONG-TERM
Transformations of the Green Heart
DESIGN CYCLE
Capelse Put by Frits Palmboom, 1981
Design creativity is not just about generating ideas from our own direct experiences, but also appropriating and transforming existing ideas.
Experience

Addressing practical perspectives as experience of theoretical work.
Interpretation

Find out the implications and opportunities of M-As by giving them context.

- **Islands**—isolation: design for accessibility
- **Floes**—homogeneous, segregated parts: modify the dividing structure
- **Archipelago**—diverse, complementary parts: harmonious interaction
Chap. 4  WORKING WITH M-A

Interpretation
Find out the implications and opportunities of M-As by giving them context.

Analysis
Dealing with complex cases: a series of paradigms for reflection on & in action.
Interpretation
Find out the implications and opportunities of M-As by giving them context.

Analysis
Dealing with complex cases: a series of paradigms for reflection on & in action.

Making
Reference patterns for inspiration and self-reflection.

What source analogues does each designer tend to use?
One way or another, we all have to deal with M-A thinking.

Education should not just *teach*, but *teach about*. It needs to explain the phenomena, and present the possibilities.

What questions can be answered by a course in M-A, based on this research?

<table>
<thead>
<tr>
<th>Why is M-A thinking practised in urbanism?</th>
</tr>
</thead>
<tbody>
<tr>
<td>How does it meet the various needs in urbanism?</td>
</tr>
<tr>
<td>What characteristics do the M-As of different roles have?</td>
</tr>
</tbody>
</table>

| How to synthesise knowledge in correspondence to phenomena with M-A? |
| How to interpret descriptive M-As and develop them into design intentions? |

| What are the general focuses in schemas of urban designers/planners? |
| How do they develop and use them? |

| How to interpret cross-disciplinary concepts critically and find out their limits of validity? |
| How to synthesise information in correspondence to design/planning intention? |

| What historical lessons do we have on (un)anticipated societal outcome caused by M-A interpretation? |

| How are M-As transformed to support various cognitive processes? |
Why is M-A thinking practised in urbanism?
How does it support design, planning and theorisation?
What characteristics do M-As have?
What cognitive patterns underlie their differences?

Implications for our evaluation of intellectual works, our focus in education, and the way technology should support us.