

# 2<sup>ND</sup> TUTORIAL OF THE DESIGN THEORY SIG

31<sup>ST</sup> JAN – 2<sup>ND</sup> FEB, 2018 IN PARIS



Special Interest Group on  
**DESIGN THEORY**  
*of the International Design Society*

the **Design Society**  
a worldwide community

## BASIC COURSES

Design Theory:  
history, tradition & contemporary challenges

Generativity

Knowledge Structure

Social Spaces

## ADVANCED COURSES

Biomimetic with design theory

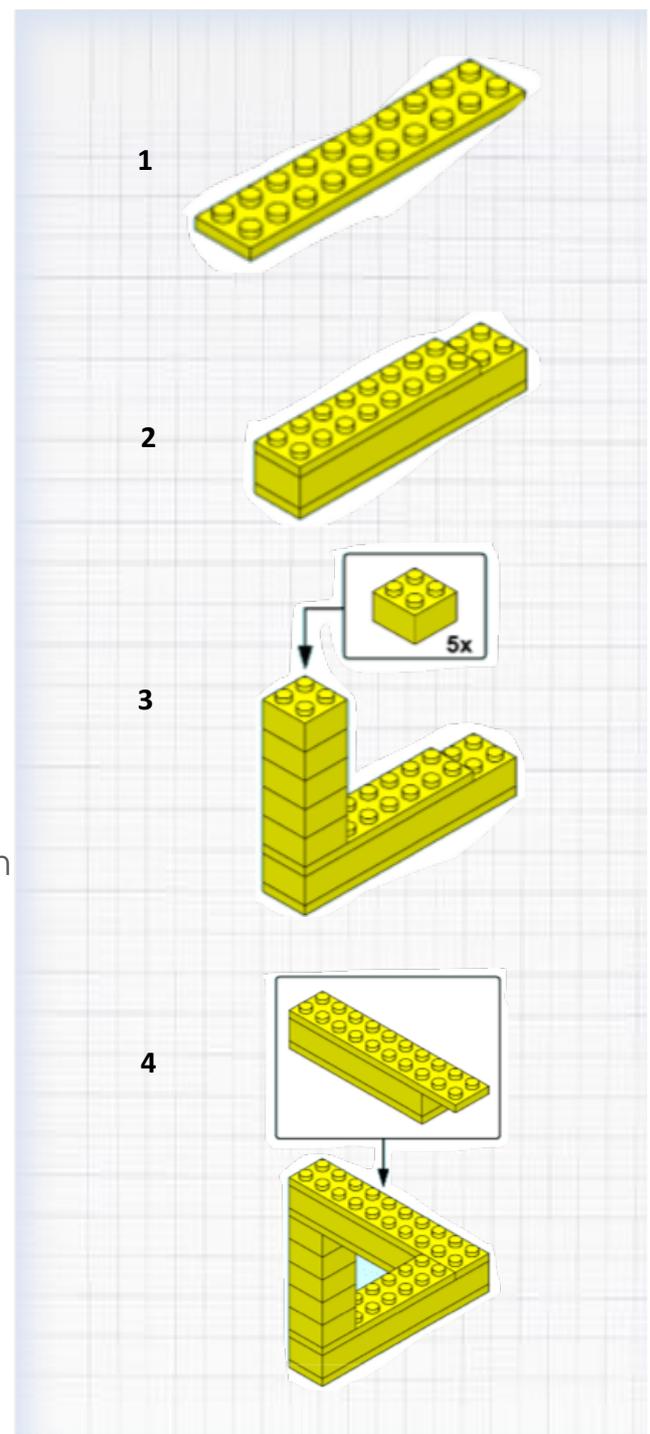
Parameter analysis method with design theory

Alternative interpretations of C-K theory in math

Progress in axiomatic design

New colleges in design

## MASTER CLASS & PUBLISHING IN DESIGN THEORY



MINES ParisTech  
60 boulevard Saint Michel Paris  
75006, FRANCE

**d**  
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design  
theory and  
methods for  
innovation

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institut  
interdisciplinaire  
de l'innovation

**MINES**  
ParisTech

**PSL**

## DESIGN THEORY TUTORIAL – 31<sup>ST</sup> JAN – 2<sup>ND</sup> FEB 2018

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### Professorial college:

Professorial College		
Name	Institution	Country, city
Hatchuel Armand	MINES ParisTech	France, Paris
Kazakci Akin	MINES ParisTech	France, Paris
Kroll Ehud	ORT Braude College	Israel, Karmiel
Le Masson Pascal	MINES ParisTech	France, Paris
Reich Yoram	Tel Aviv University	Israel, Tel Aviv
Subrahmanian Eswaran	Carnegie Mellon University	USA, Pittsburg
Vajna Sandor	Otto-von-Guericke University	Germany, Magdeburg
Weil Benoit	MINES ParisTech	France, Paris

**Organizer:** Benjamin Cabanes

### Speakers:

Speakers		
Name	Institution	Country, city
Brown Christopher	Worcester Polytechnic Institute	USA, Worcester
Cabanes Benjamin	MINES ParisTech	France, Paris
Hatchuel Armand	MINES ParisTech	France, Paris
Kazakci Akin	MINES ParisTech	France, Paris
Kroll Ehud	ORT Braude College	Israel, Karmiel
Le Masson Pascal	MINES ParisTech	France, Paris
Nagel Jacquelyn K.S.	James Madison University	USA, Harrisonburg
Reich Yoram	Tel Aviv University	Israel, Tel Aviv
Subrahmanian Eswaran	Carnegie Mellon University	USA, Pittsburg
Vajna Sandor	Otto-von-Guericke University	Germany, Magdeburg
Weil Benoit	MINES ParisTech	France, Paris

**Goal:** Diffuse the knowledge produced in the DT SIG community in the last ten years – in the spirit of the “ten years” SIG plenary:

*In recent years, the works on Design Theory (and particularly the works of the Design Theory SIG of the Design Society) have contributed to reconstruct a basic science, Design Theory, comparable in its structure, foundations and impact to Decision Theory, Optimization or Game Theory in their time. These works have reconstructed historical roots and the evolution of design theory, unified the field at a high level of generality and uncovered theoretical foundations, in particular the logic of generativity, the “design-oriented” structures of knowledge and the logic of design spaces that goes beyond the problem space complexity. These results give the academic field of engineering design a new consistent ecology of scientific objects and models, which allows for advanced courses and education. They have contributed to a paradigm shift in the organization of R&D departments, supporting the development of new methods and processes in innovation centres. Emerging from the field of engineering design, design theory development has now a growing impact in many disciplines and academic communities. The Design Society may play significant role in addressing contemporary challenges if it brings the insights and applicability of Design theory to open new ways of thinking in the developing and developed world.*

We don't claim a complete presentation of all that has been done in design but we focus on the recent works on design theory.

Participants can expect:

- 1- knowledge on the papers and results obtained in design theory
- 2- understand the logic “formal program / open program” of the SIG

*Contents:*

- Basic courses: 5 modules, made by professors of the Professorial college of the tutorial
- Master classes: interactive work sessions with (young or not...) researchers on their research topic and Design Theory in these research works.
- Advances: short presentation made by an expert on an advanced topic in design theory – typically: 20 minutes, based on a paper, presented by a professor. Topics to be covered are listed (see below)
- One session on “publishing in design theory”

## Day 1: Room L118

Basic Course	Advanced Course	Master Class
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Day 1 - 31 Jan 2018			
Timetable	Type of Course	Title Course	Speakers
9:00 - 10:00	<b>Workshop program + presentation of participants</b>		Armand Hatchuel & Yoram Reich
10:00 - 11:00	<b>Basic course:</b> DT History & Traditions	The simonian tradition in design (Economics, info, learning, decision, problem solving tradition)	Eswaran Subrahmanian
11:00 - 11:30	<b>Break</b>		
11:30 - 12:30	<b>Basic course:</b> DT History & Traditions	Machine/technical system tradition (German systematic)	Sandor Vajna
12:30 - 14:00	<b>Lunch</b>		
14:00 - 15:00	<b>Basic course:</b> DT History & Traditions	Artistic tradition in design: history and theoretical interpretation	Armand Hatchuel
15:00 - 16:00	<b>Basic course:</b> Challenges of DT research	Old problems and contemporary issues	Pascal Le Masson & Benoit Weil
16:00 - 16:30	<b>Break</b>		
16:30 - 17:15	<b>Advanced course 1</b>	Biomimetics with design theory	Jacquelyn K.S. Nagel
17:15 - 18:00	<b>Advanced course 1</b>	Enhanced parameter analysis method	Ehud Kroll

## Day 2: Room L226 or Salle Vendôme

Day 2 - 1st Fev 2018			
Timetable	Type of Course	Title Course	Speakers
9:00 - 10:00	Basic course: Generativity	Generativity & robustness in design: from GDT to C-K	Armand Hatchuel
10:00 - 11:00	Basic course: Knowledge structures I	Knowledge structure in design (n-dim, category theory, matroïd, sp splitting condition)	Eswaran Subrahmanian
11:00 - 11:30	Break		
11:30 - 12:30	Basic course: Knowledge structures II	Generative artificial intelligence	Akin Kazakci
12:30 - 14:00	Lunch		
14:00 - 14:45	Advanced course 2	Alternative interpretations of C-K theory in maths	Armand Hatchuel
14:45 - 15:30	Advanced course 2	Progress in axiomatic design	Christopher Brown
15:30 - 16:00	Break		
16:00 - 17:30	Master class 1	Room L226 or Salle Vendôme Room V111 Room V119	Benjamin Cabanes + Professorial College

## Day 3: Amphi Schlumberger – V107

Day 3 - 2nd Feb 2018			
Timetable	Type of Course	Title Course	Speakers
9:00 - 10:00	<b>Basic course:</b> Social spaces	An introduction to the PSI (Product - Social – Institutional) Framework	Yoram Reich
10:00 - 11:00	<b>Master Class 2</b>	Room V107 Room V115 Room V119	Benjamin Cabanes + Professorial College
11:00 - 11:30	<b>Break</b>		
11:30 - 12:30	<b>Master Class 3</b>	Room V107 Room V115 Room V119	Benjamin Cabanes + Professorial College
12:30 - 14:00	<b>Lunch</b>		
14:00 - 14:45	<b>Advanced course 3</b>	Rethinking knowledge management based on design theory	Benjamin Cabanes
14:45 – 16:00	<b>Publishing in design theory</b>	Room V107	Yoram Reich
16:00 - 17:30	<b>Cocktail</b>		



## Design theory Special Interest Group

*The general goal of the Design theory SIG is to organize, collect and support research work that contributes to the renewal of Design theory by benefiting from new scientific advances, and by adapting it to highly innovative design situations.*

*The SIG evolves along two main directions: the “hard program” (formal design theory) and the “open program” (design theory and design issues), that are closely interacting with each other: the “open program” uses the results of the hard program to deal with issues in many areas (including management, economics, art and, philosophy). This interaction has also lead to raise new questions for the “hard program”. This dual logic was used for instance to discuss design theory and methods (how methods use DT and imploring DT to ask new questions to enhance itself) or to discuss design enigma coming from art (how art and symbolic objects could raise interesting questions for DT).*

*The work has been divided into four axes:*

### **1. Design theory, Mathematics and formalized models**

*The SIG relies now on a large set of formalized theories and models. In the recent years the SIG has explored the mathematical foundations of design theory (forcing, splitting condition, category theory and Topos), design and possibility theory, design and constructivism, design and logic, design and matroid, generative functions, design and machine learning, design and algebraic extensions, design and generative data science, design and models of generative knowledge structures.*

### **2. Design theory and new approaches of flexible structures of knowledge**

*This second topic studies the relationship between, flexible knowledge structures and design theory. It developed through an elaboration of the concept of the interdisciplinary engineering knowledge genome as well as continuous work on n-dim and flat spaces as potential structures for design.*

*Several works discussed the relationship between design and specific “non-verbal” types of knowledge such as emotion, sensations, music, drawing...*

*Models of the generativity of knowledge structure have been presented and discussed (Topos structure and design, generativity of “patrimoine de creation”, autogenetic design theory, generativity in deep learning).*

### **3. Theory-driven experiments:**

*This third axis includes fundamentals from neuroscience, with discussion of design fixation and inhibitory control in the human brain.*

*Along this line of exploration many innovative design experiments were reported. Studies were reported on the use of design methods derived from design theory. In particular: works on KCP method and its improvement, and, on the use of design methods in different cultures*

*Experiments on “design of gestures”, and “design thinking” were also reported. In particular researchers are today improving techniques to measure the generativity of design methods such as “design thinking”.*

### **4. History of Design theories, contemporary context and identity of objects:**

*Building on the work on the history of design theory in several perspectives (Bauhaus, Gracian rhetoric, German systematic and, others), a new dimension of explorations led to the new theme “new critic in design and the identity of objects”.*

*The SIG dedicated several sessions and works to learn more and diffuse the Theory of Technical System of Hubka and Eder and on the Autogenetic Design Theory.*

Chairmen: Pascal Le Masson, Eswaran Subrahmanian;

Secretary : Akin Kazakçi

Founding chairmen : Armand Hatchuel, Yoram Reich

URL website: <http://tmci.mines-paristech.fr/design-theory/>



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