

# **Morphological Analysis**



## Johann Wolfgang von Goethe

*"It is necessary to study 2 things:*

- morphology, to understand how things work*
- mathematics, to be able to think logically"*

**"Essay about the Metamorphosis of Plants", 1790**

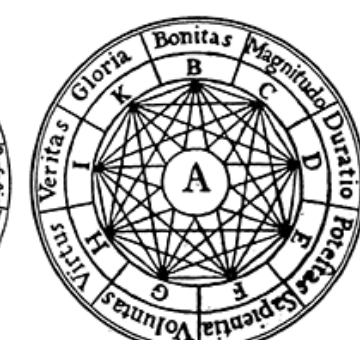
**"Questions of Morphology" 1820**



developed methods for combinatorial searching of new ideas  
and objectives trees



# 1235 - 1315





## **Peter Behrens**

14 April 1868 – 27 February 1940

German architect and designer

### **Total Synthesis:**

- 1. Object general idea**
- 2. Basic components of object**
- 3. Components: search of different forms / technique**
- 4. Synthesis of combinations**

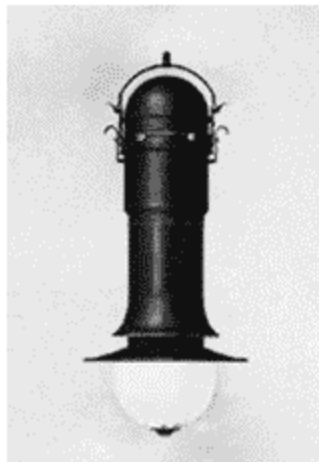


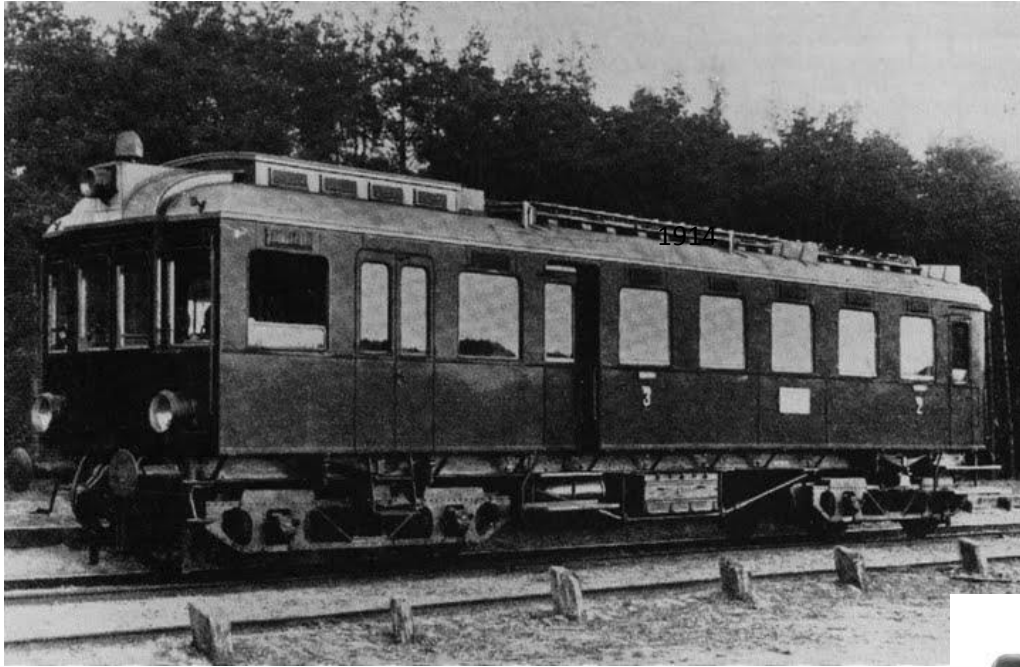
## Example: designing of the teapot

<b>Volume</b>	<b>1,5   2,5   5 L</b>
<b>Material</b>	<b>Copper, brass, galvanized iron, plastic</b>
<b>Form of bottom</b>	<b>Circle, Ellipse, Octagon</b>
<b>View of the teapot handle</b>	<b>Braided reeds, wooden</b>
<b>Method of heating</b>	<b>On an open fire, electric heating</b>

**Number of combinations:**



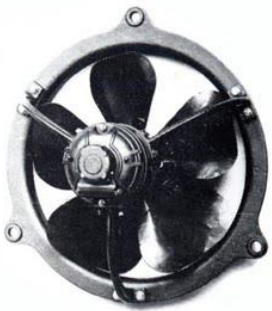
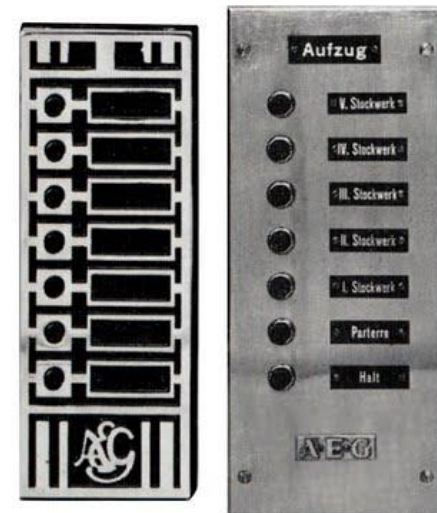




design of electric locomotive 1914



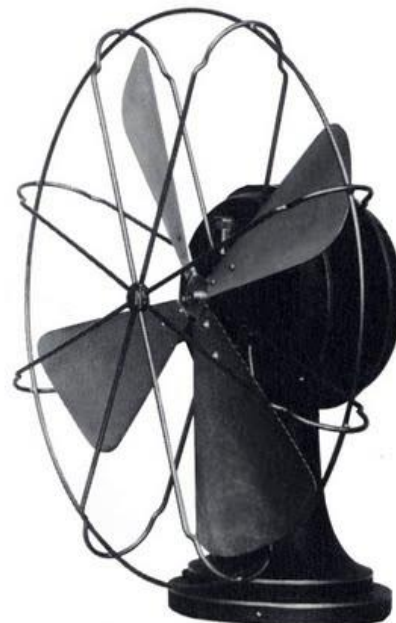
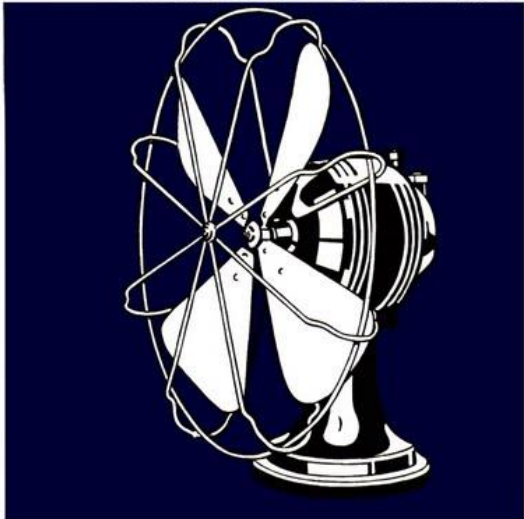
Intercom 1910



Kitchen fans 1911

# AEG

## VENTILATOREN







industrial clock  
designed by Behrens  
for AEG in 1909

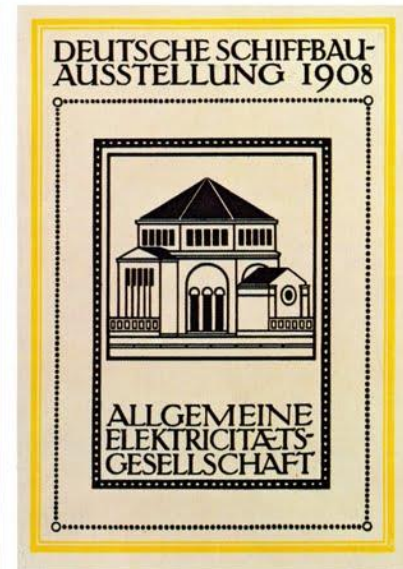
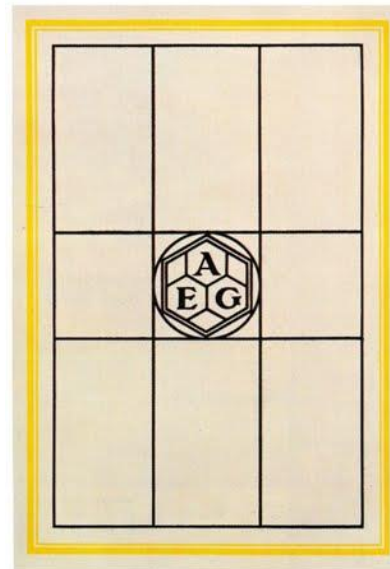


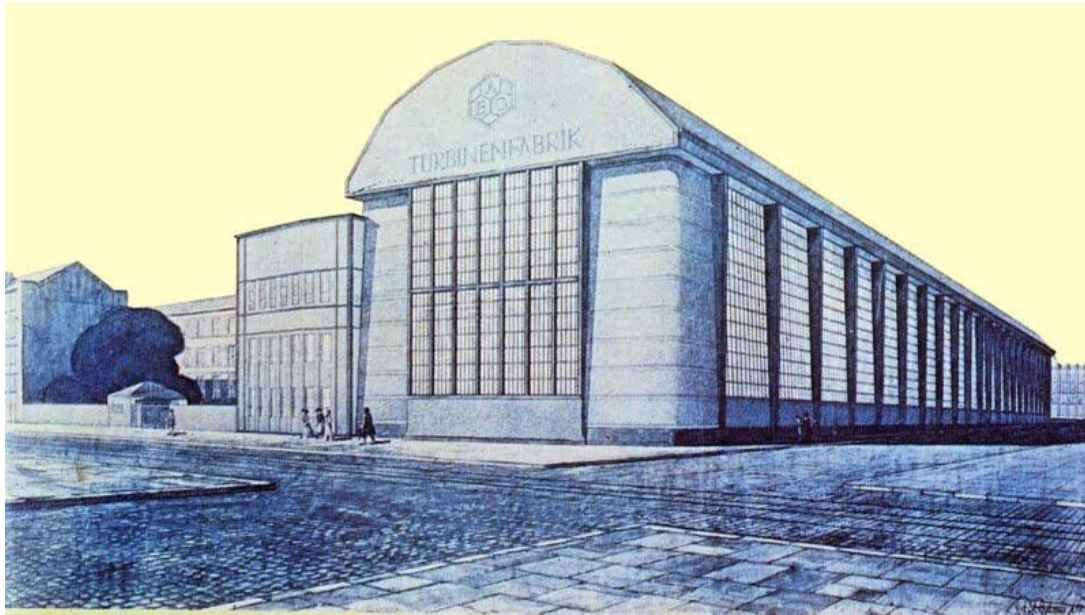
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MITTWOCH	1	8	15	22 29
DONNERSTAG	2	9	16	23 30
FREITAG	3	10	17	24 31

**A E G**  
**FABRIKEN BRUNNENSTRASSE**  
**B E R L I N**





**Turbine works:**

**Project of 1912  
and in real**







## **Fritz Zwicky (1898 – 1974)**

**Was born in Varna (Bulgaria)**

**Graduated from the Technical University in Zurich**

**From 1925 worked in USA**

- 1) Method of negative and construction**
- 2) Method of systematic covering of the field**
- 3) Method of morphological box**



# Method of morphological box:

1. To identify the problem
2. To identify and characterize all the parameters of system that might be used for decision of problem
3. To construct a morphological box or multidimensional matrix which contains all decisions for given problem
4. To analyze carefully all solutions in the morphological box for the goal to be achieved
5. To choose and realize the best solutions (if you have necessary funds)

<b>Peter Behrens</b> <b>Total Synthesis</b>	<b>Fritz Zwicky</b> <b>Morphological Analysis</b>
<b>Forming of object general idea</b>	<b>To identify the problem</b>
<b>Definition of the basic components of object</b>	<b>To identify and characterize all the parameters of system that might be used for decision of problem</b>
<b>Searching of different forms / technique for components</b>	<b>To construct a morphological box or multidimensional matrix which contains all decisions for given problem</b>
<b>Synthesis of combinations</b>	<b>To analyze carefully all solutions in the morphological box for the goal to be achieved</b>



## Basic works

1. Zwicky F. Morphological astronomy,- Berlin, 1957.
2. Zwicky F. Discovery, invention, research through the morphological approach.- Toronto, 1969.
3. Zwicky F. The morphological approach to discovery, invention, research and construction //New methods of thought and procedure.- Pasadena, 1967.- P.273-297.

**predicted the appearance of neutron stars**

### Areas of activity

Types of rockets

Methods of energy converting

System of stenography

Types of telescopes

Legal in outer space

Types of crystals

and so on