Justus Schollmeyer

TRIZ, Paradigm Shifts, and the Challenge of Sustainability

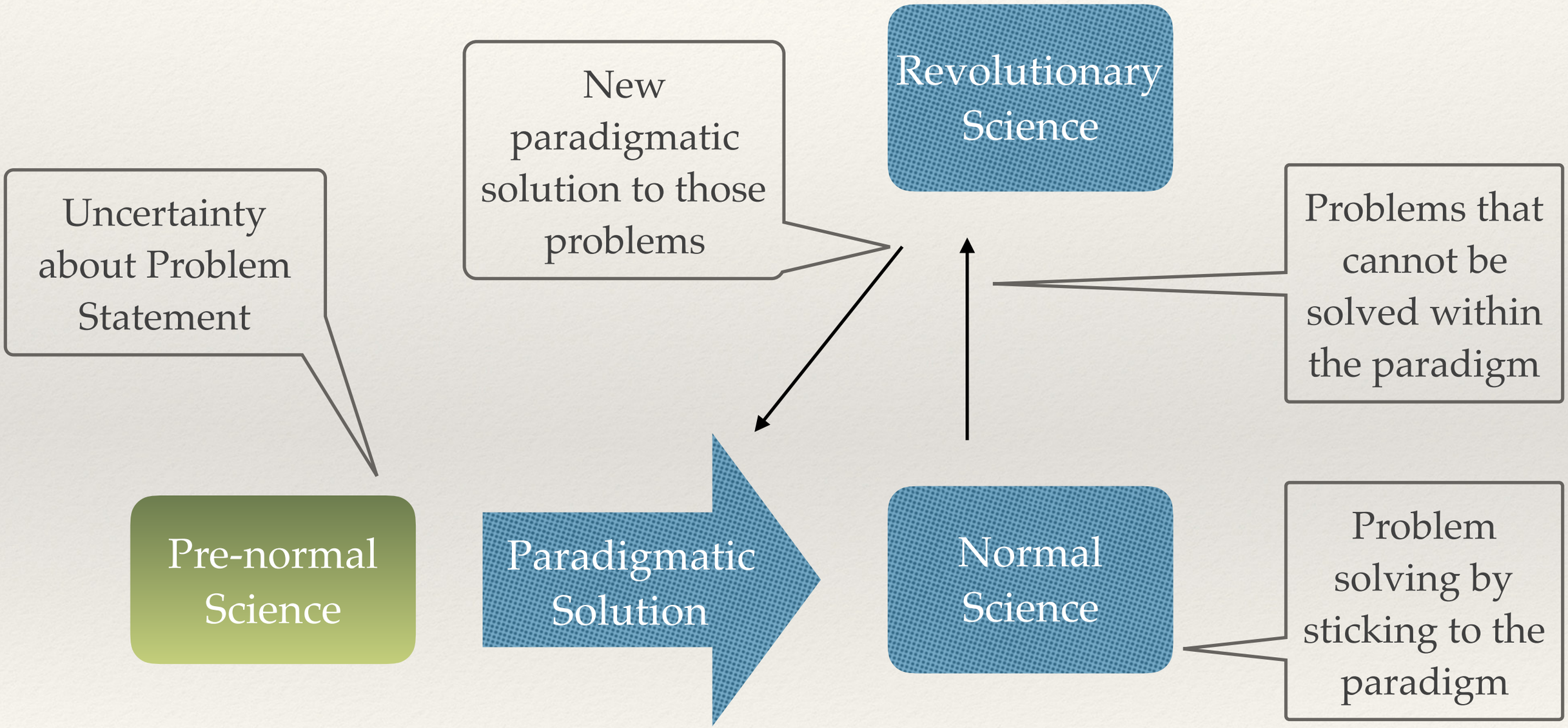
Pardigmenwechsel in Wissenschaft, Technik und Wirtschaft
27.-29.9.2017, Workshop in Großbothen

Content

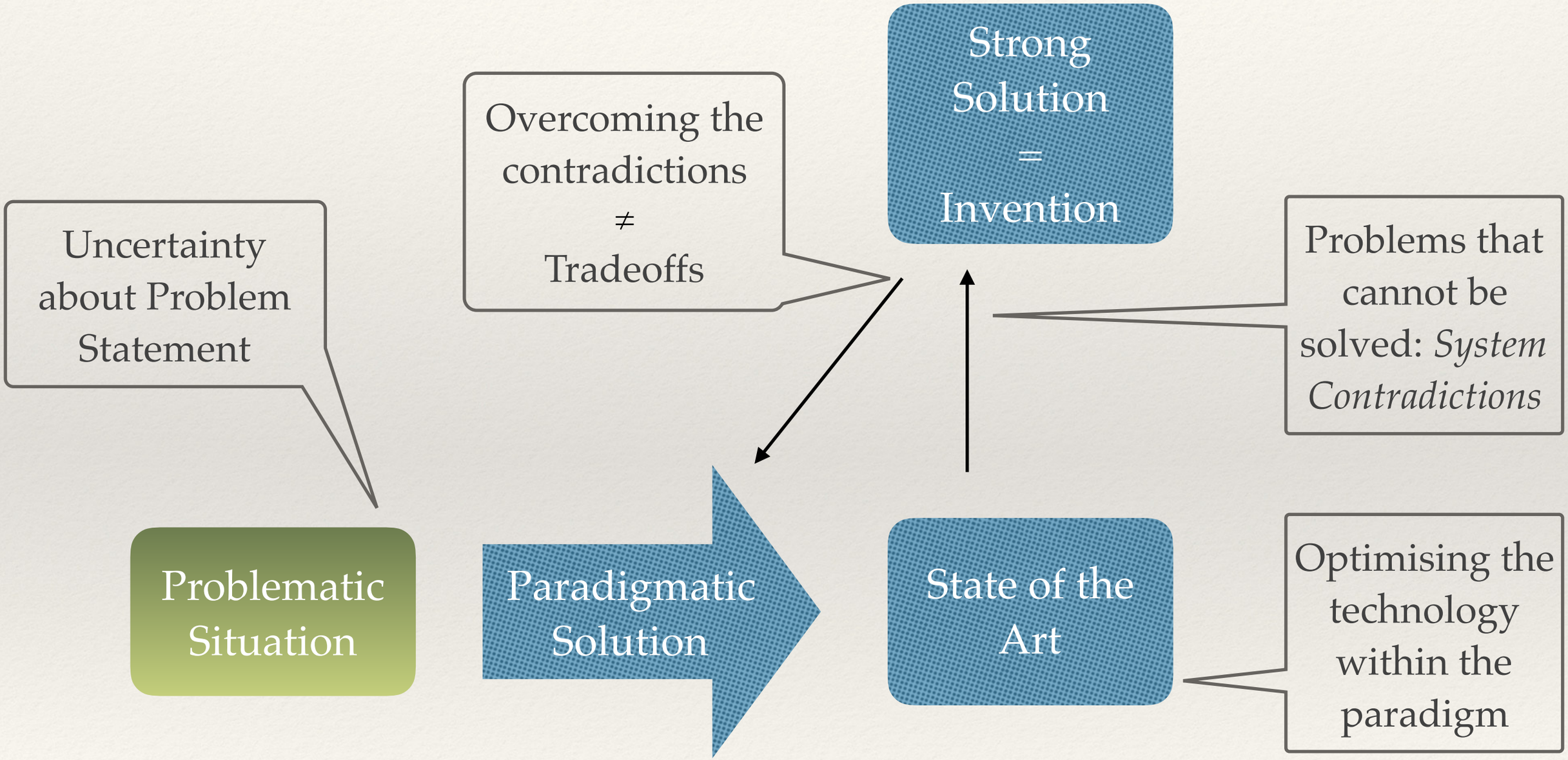
1. TRIZ and its potential to organise progressive interdisciplinary research
2. Interdisciplinarity and the challenge of sustainability
3. Towards an interdisciplinary multi-level-perspective based on the notion of system contradictions

1) TRIZ and its potential to organise progressive interdisciplinary research

Thomas Kuhn: The Structure of Scientific Revolutions (1962; 2nd ed. 1970)

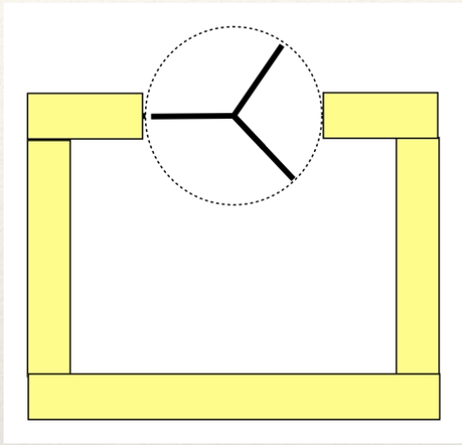


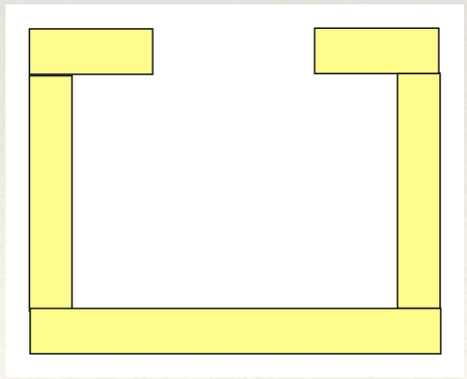
Genrich S. Altshuller: The Theory of Inventive Problem Solving



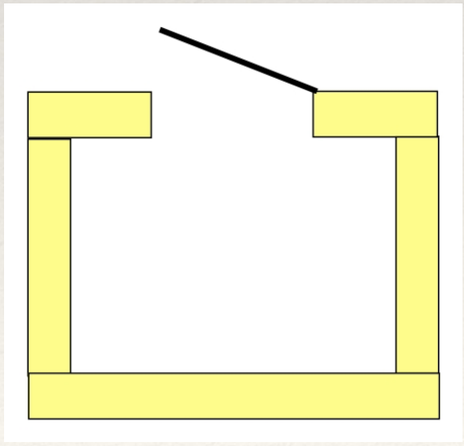
System Contradiction

H. Bockhacker (1881):
German Patent 18349
and
Theophilus Van Kannel
(1888): US Patent 387571





Paradigmatic Solution



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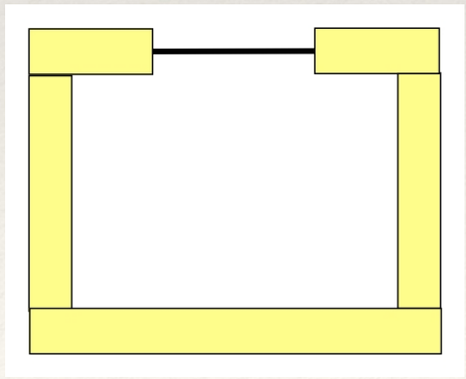
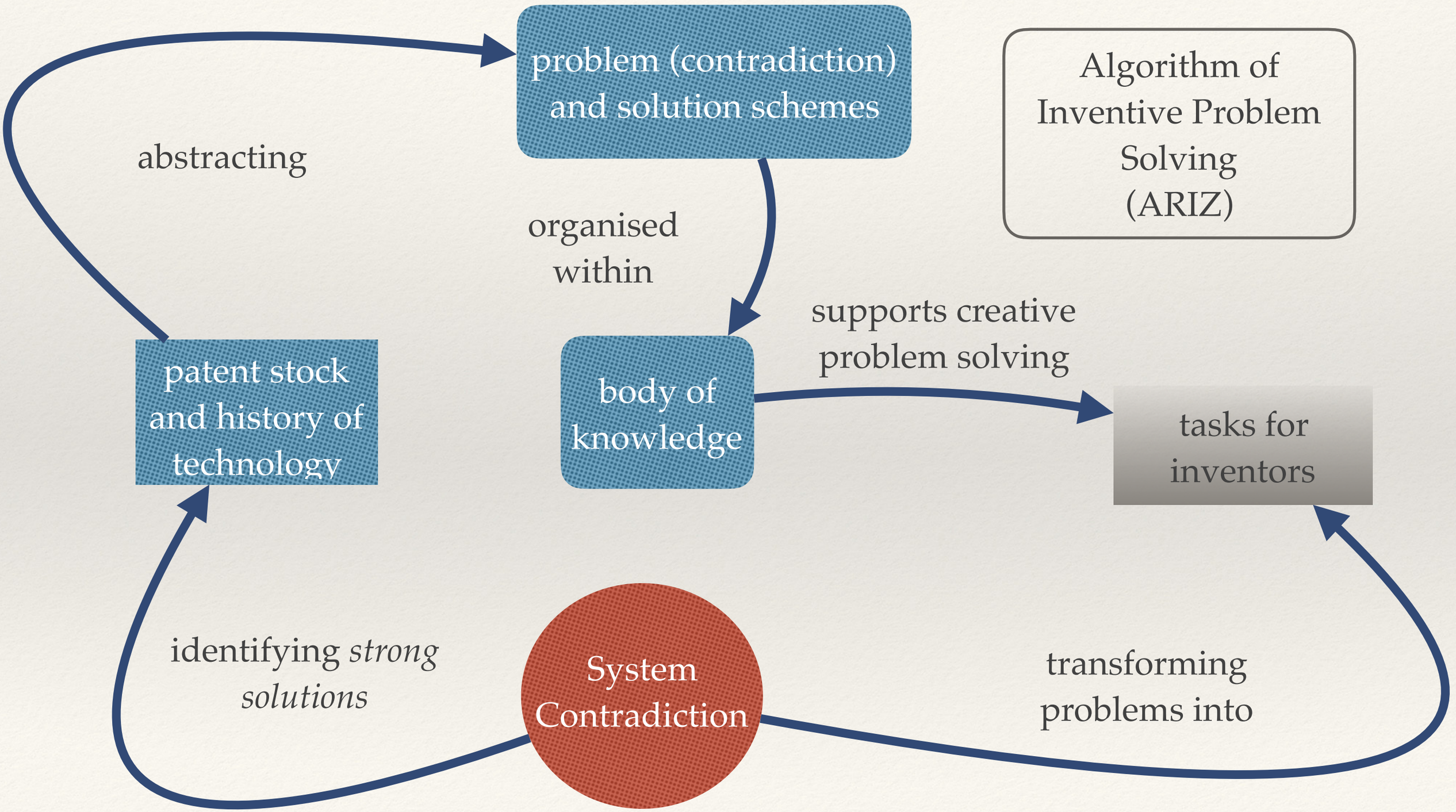
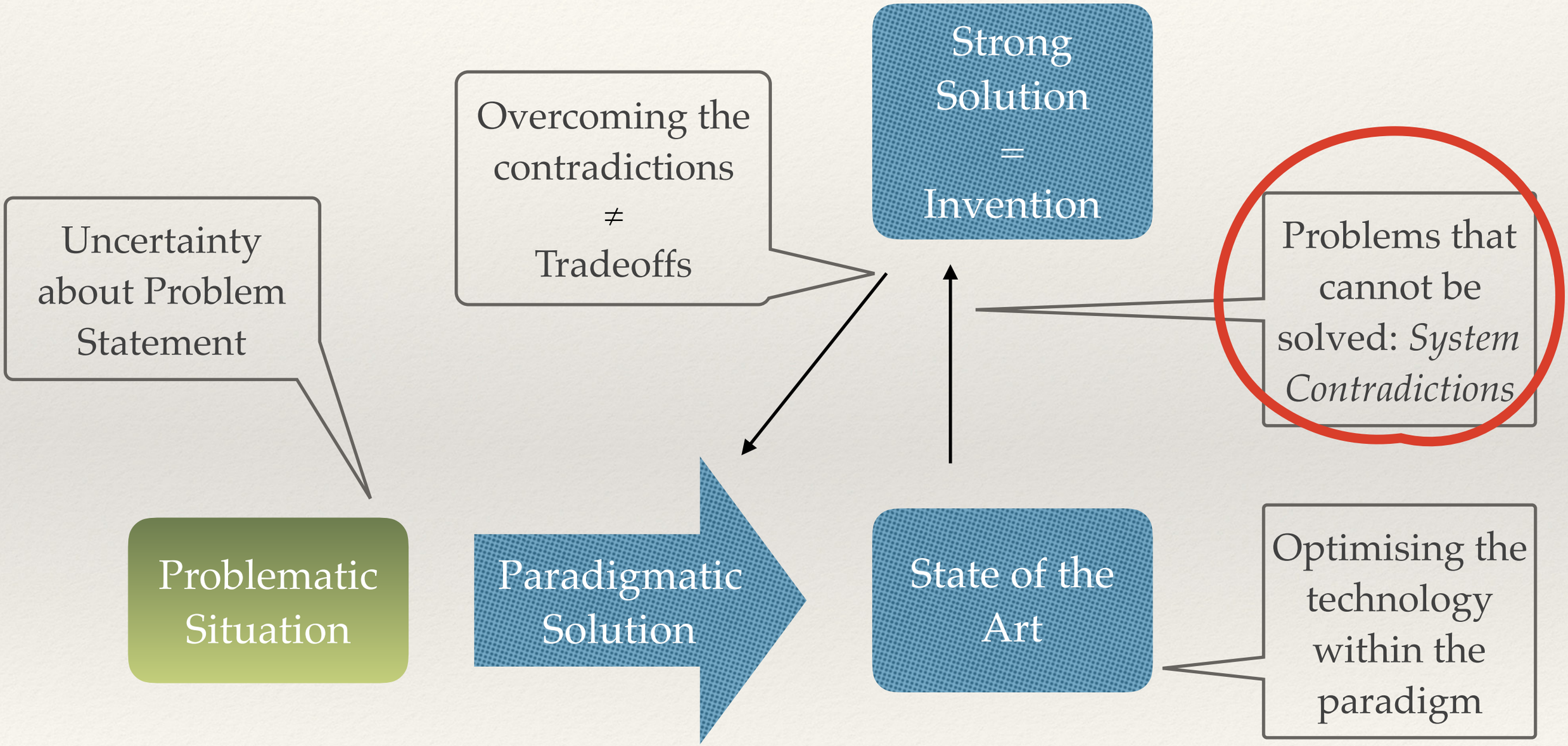


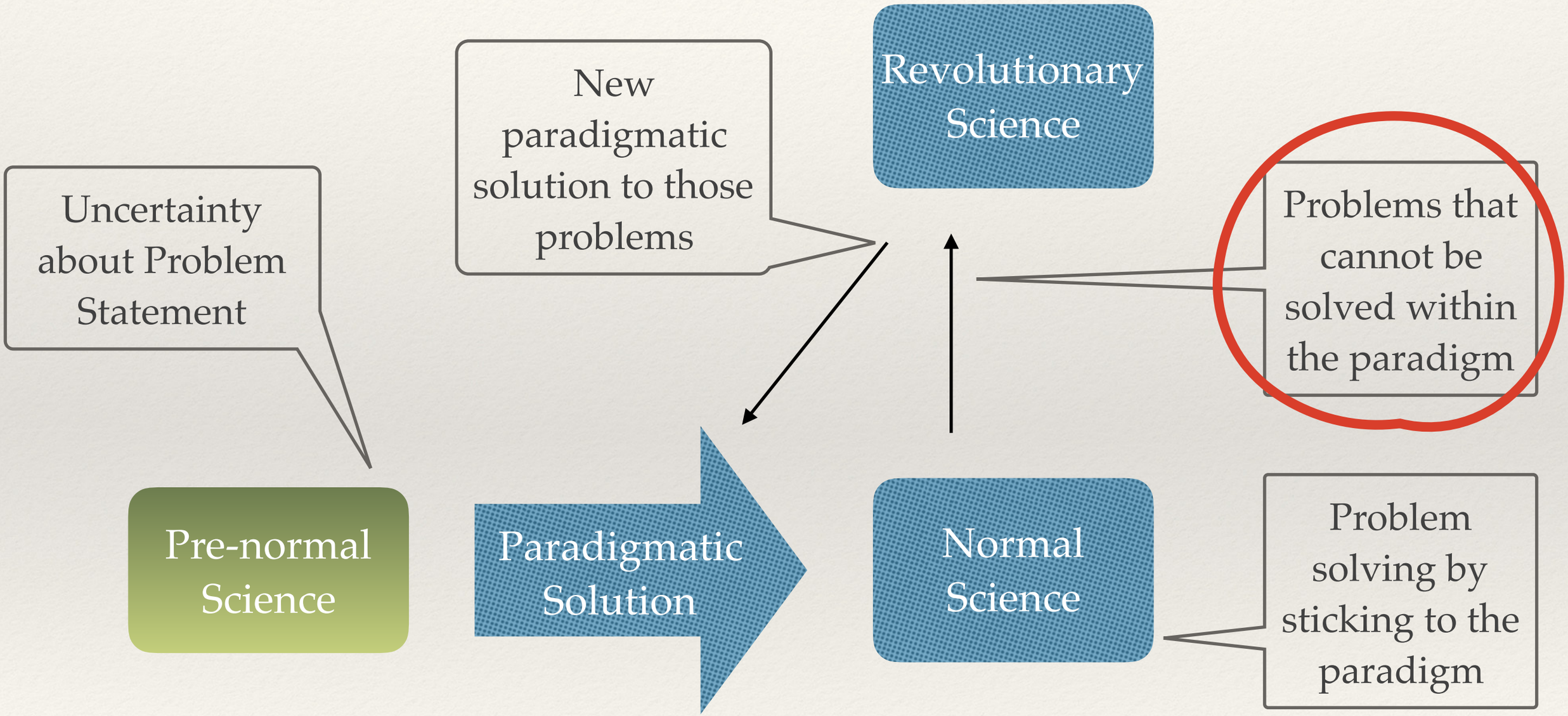
On the heuristic value of the concept of system contradictions in technology

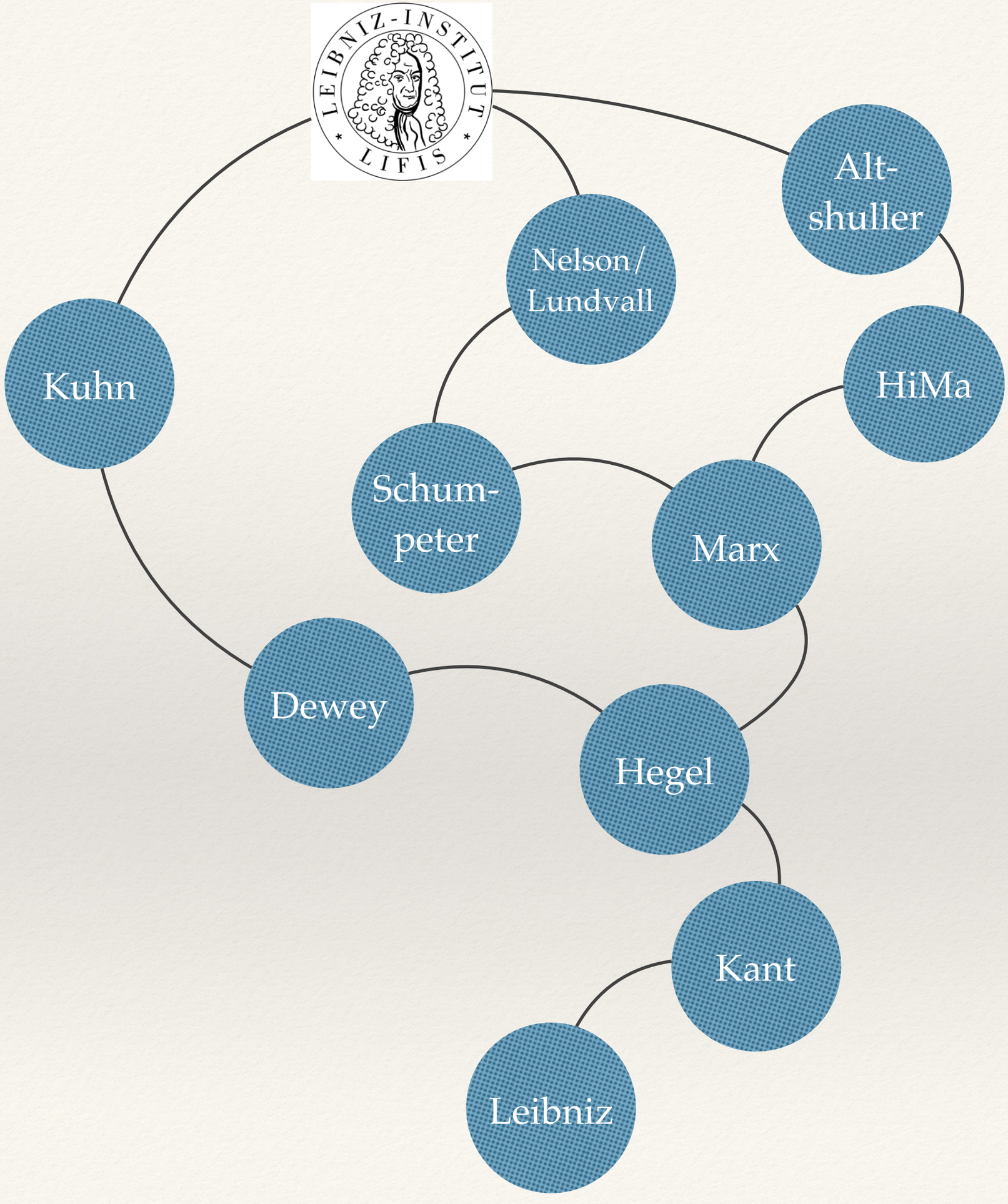


Genrich S. Altshuller: The Theory of Inventive Problem Solving



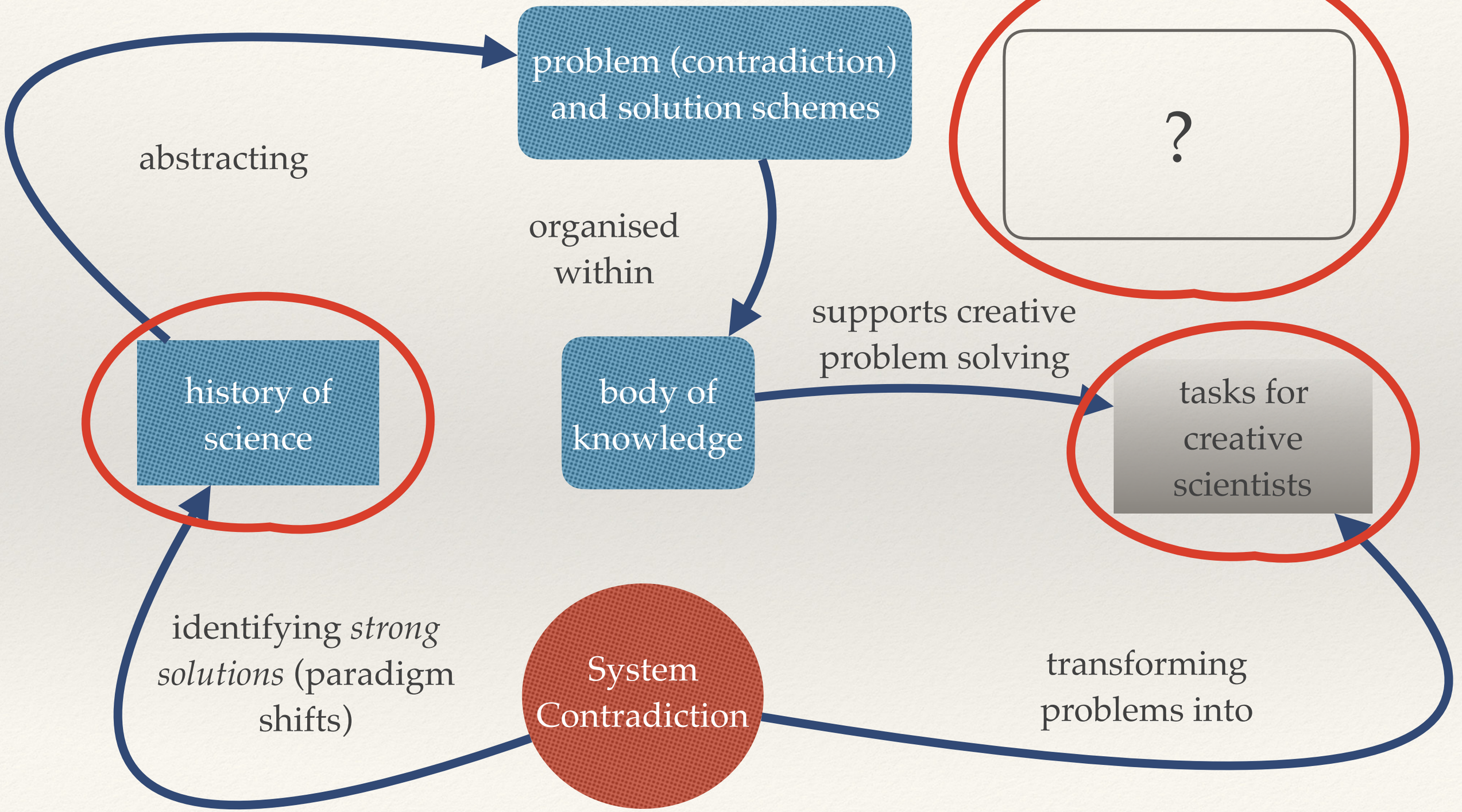
Thomas Kuhn: The Structure of Scientific Revolutions




LEIBNIZ-INSTITUT
LIFIS
Alt-
shuller
Nelson /
Lundvall
Kuhn
HiMa
Schum-
peter
Marx
Dewey
Hegel
Kant
Leibniz

© Carolin L. Prinn

On the potential heuristic value of the concept of system contradictions in science



Time (diachronic)

Super-System	Super-System	Super-System
System	System	System
Sub-Systems	Sub-Systems	Sub-Systems

Zoom out

Zoom in

Synchronic

History of …

TRIZ and Interdisciplinarity

- **Synchronic**: A solution that works in field A might also work in field B — knowing the state of the art in many disciplines helps.
- **Diachronic**: A solution type that induced a paradigm shift in Field A might also induce a paradigm shift in Field B: knowing the history of multiple disciplines helps.
- **System Thinking**: Some solutions can only be tackled from a higher or lower system level, while the different levels are studied by different disciplines: knowing the perspectives from multiple disciplines helps.

On the potential heuristic value of the concept of system contradictions in management and entrepreneurship

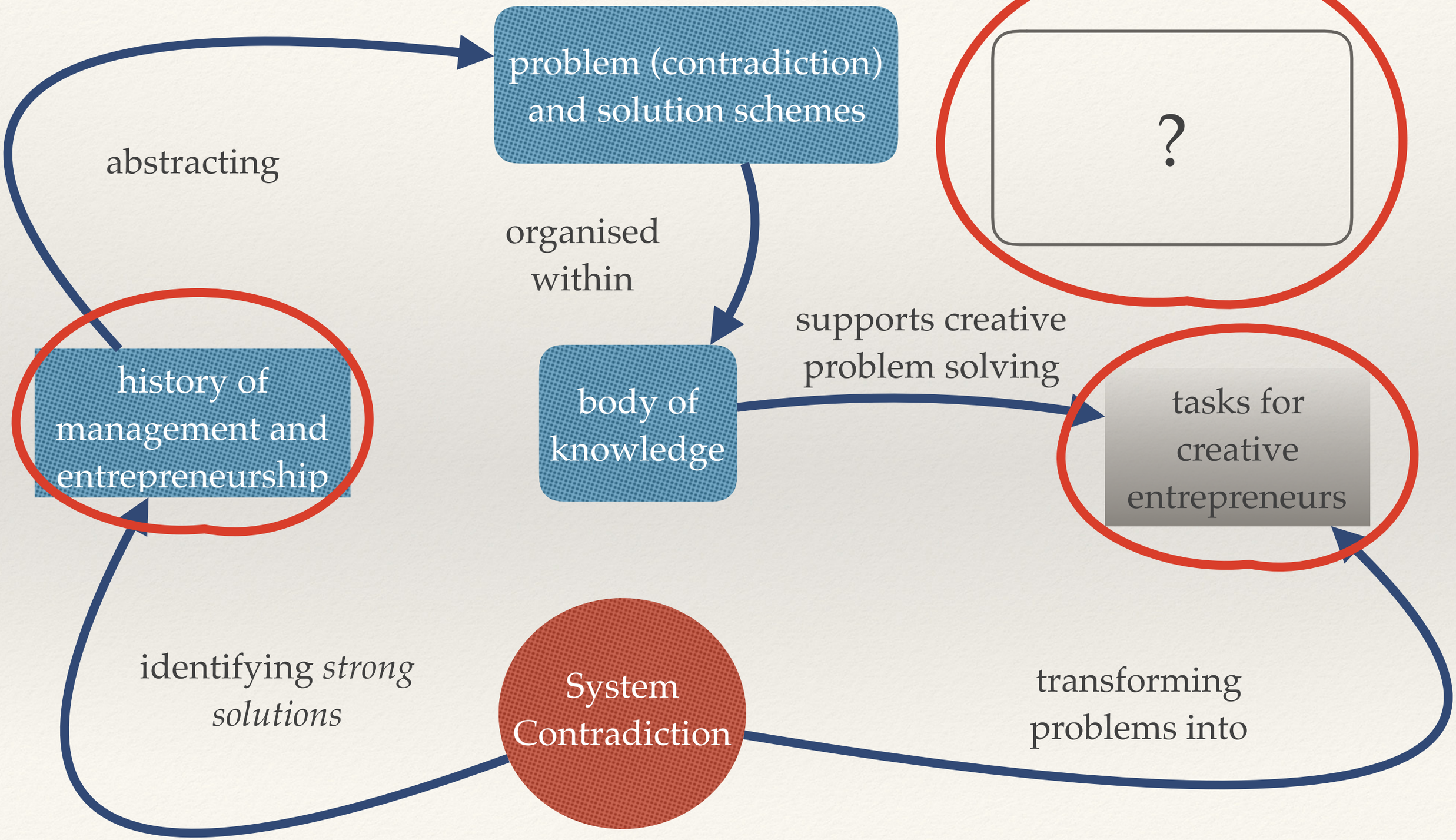
"In my opinion it is appropriate to say that a good entrepreneurial design has the character of a patent." (transl. by J.S.)

– Günter Faltin, Kopf schlägt Kapital, 2007, S. 57.

Management is basically always management of contradictions.

– Henry Mintzberg, Mintzberg on Management: Inside Our Strange World of Organizations, 1989.

On the potential heuristic value of the concept of system contradictions in management and entrepreneurship



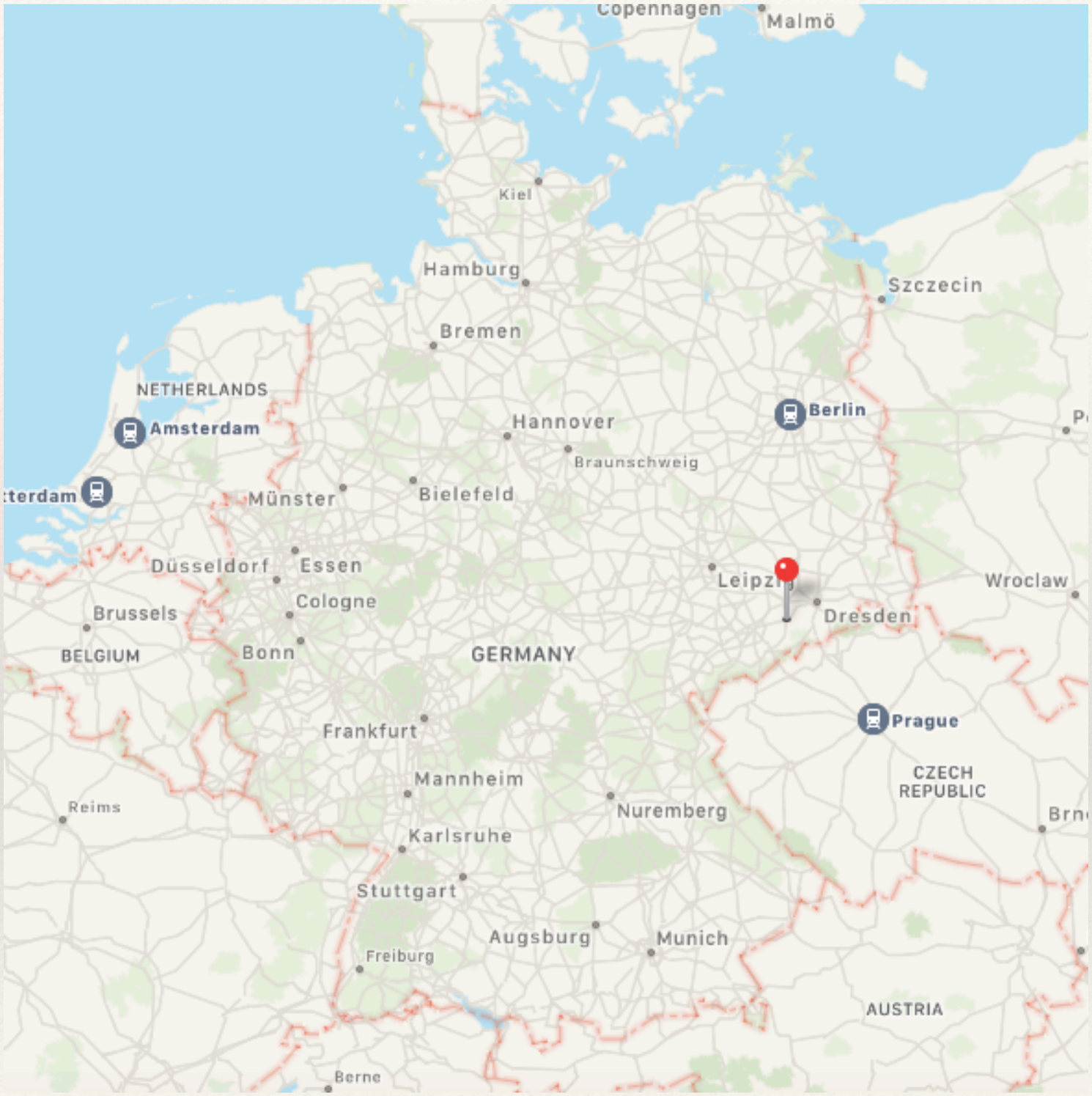
2) Interdisciplinarity and the challenge of sustainability

Hans Carl von Carlowitz

1645–1714

Photo: Technische Universität Freiberg.

- Mining administrator (at Freiberg) and son of a forest master
- 1700: Mining (ore) ↑ Timber ↓
- River system was engineered to import timber (postponed problem)
- Timber prices ↑ —> bankruptcies (10000 miners employed in the Erzgebirge)
- —> Formulated the concept of sustainability in forestry


Copennagen
Malmö
Kiel
Hamburg
Szczecin
Bremen
NETHERLANDS
Amsterdam
Berlin
Hannover
Braunschweig
Münster
Bielefeld
Düsseldorf
Essen
Cologne
Brussels
BELGIUM
Bonn
GERMANY
Leipzig
Dresden
Wroclaw
Prague
CZECH
REPUBLIC
Frankfurt
Mannheim
Nuremberg
Reims
Karlsruhe
Stuttgart
Augsburg
Munich
Freiburg
AUSTRIA
Berne

The Root Contradiction of Sustainability according to Georg Müller-Christ (2007 and 2014)

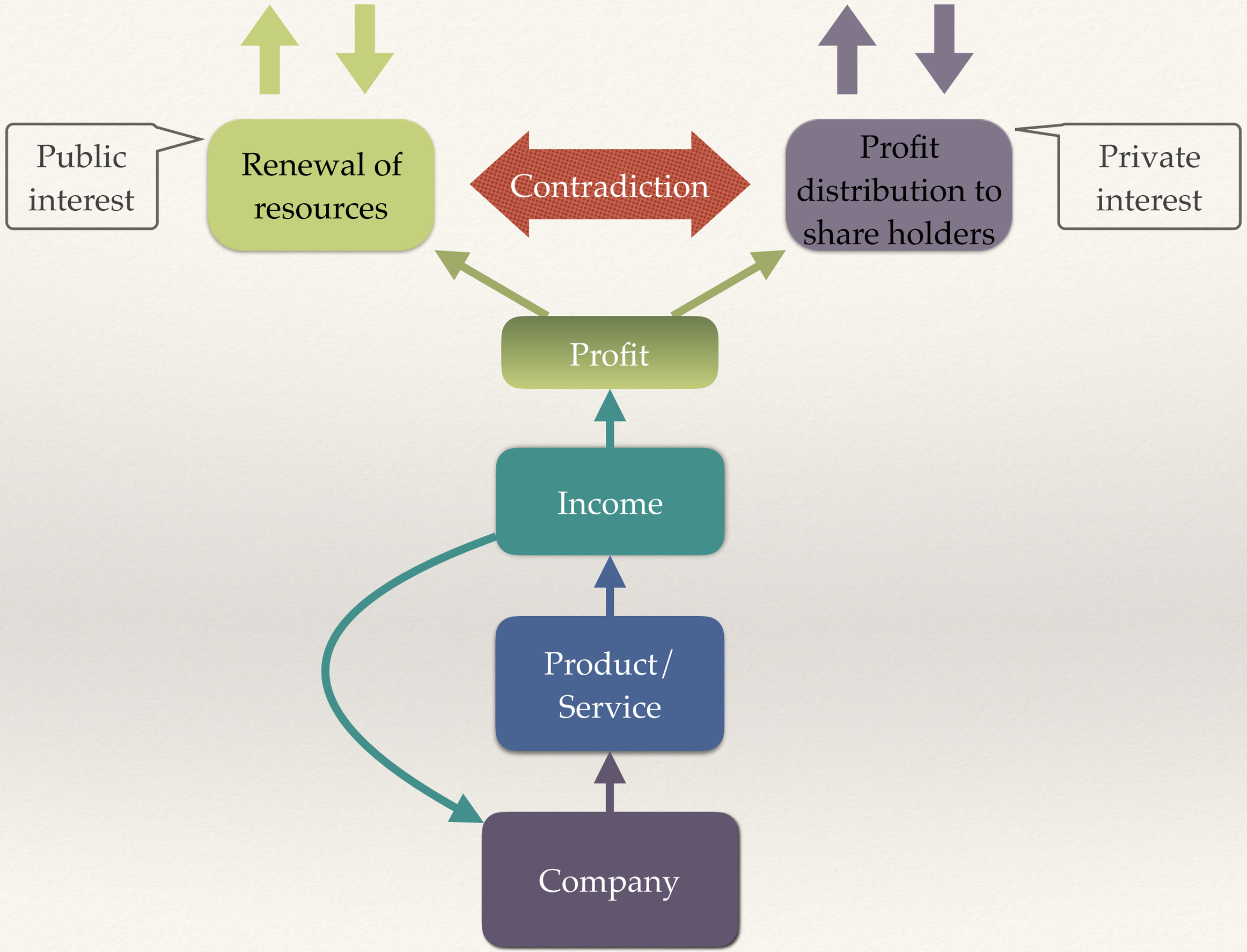
Meeting a set of goals to the lowest costs in order to increase profitability

A) Efficiency

Renewal of the resources on which our reproduction depends

B) Sustainability

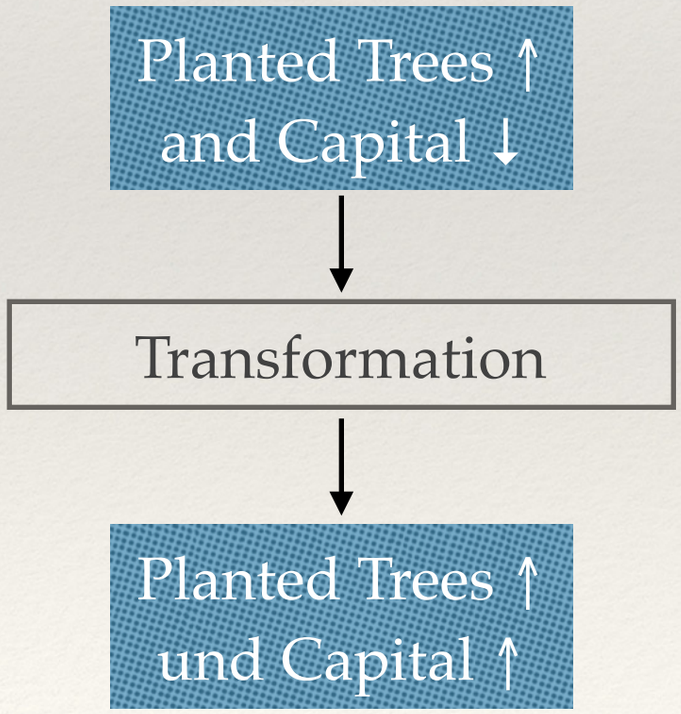
- Efficiency ↑ does not imply Sustainability
- Dilemma for managers: Spending a dollar for either A or B and thus either offending the shareholders or the public

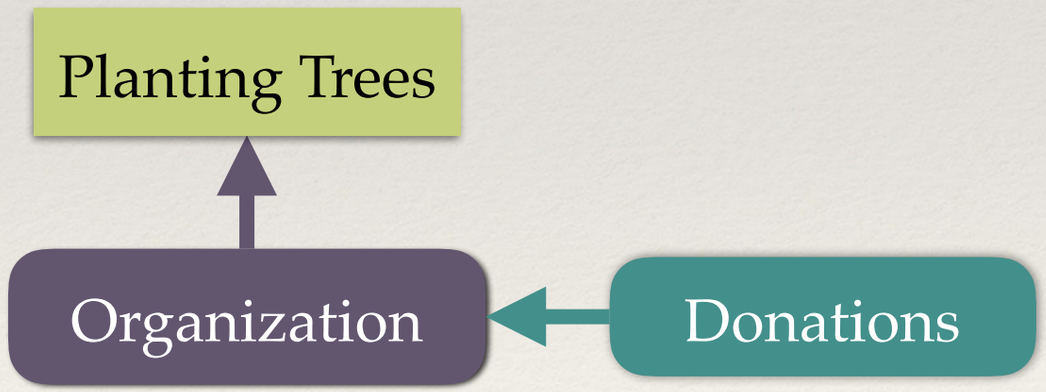

Public interest
Renewal of resources
Contradiction
Profit distribution to share holders
Private interest
Profit
Income
Product / Service
Company

First Solution Type

Ecosia

- Planting trees to act against climate change
- When investing capital into tree planting, the capital will be rapidly consumed

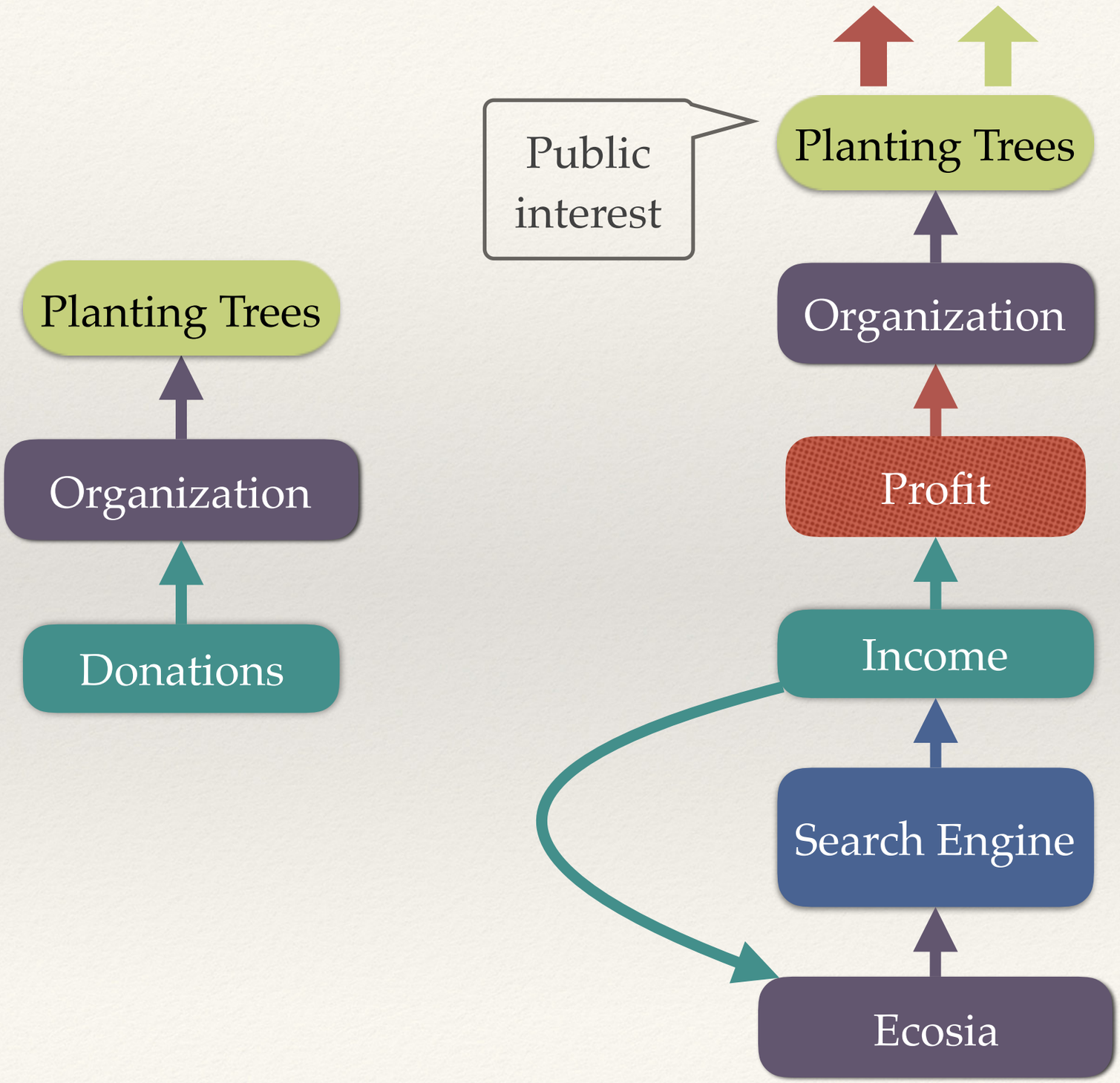


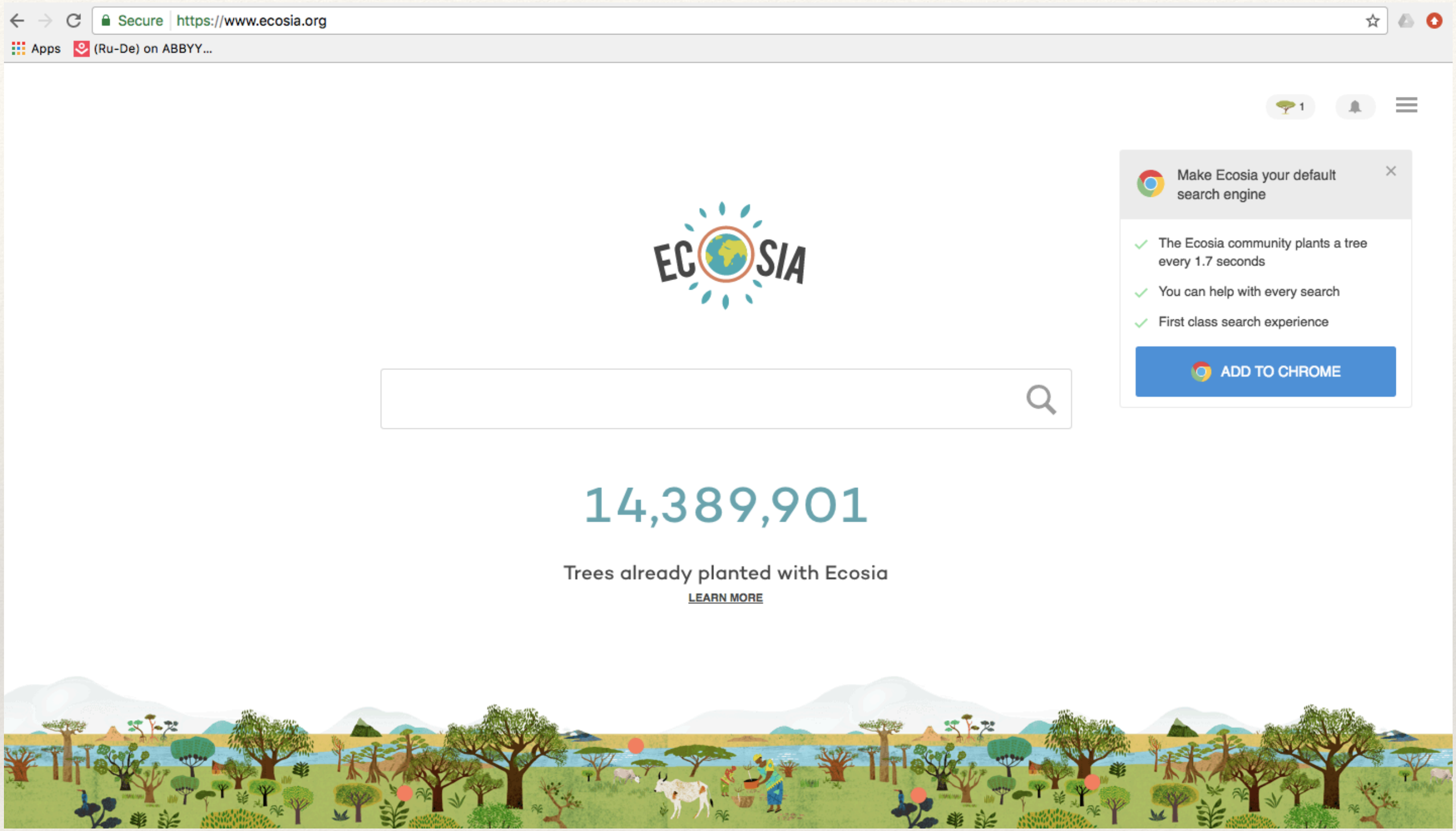


Christian Kroll

All photos on Ecosia taken from https://www.ecosia.org/

Ecosia


Planting Trees
Organization
Donations
Public interest
Planting Trees
Organization
Profit
Income
Search Engine
Ecosia



Screenshot of https://www.ecosia.org/ from October 4, 2017:

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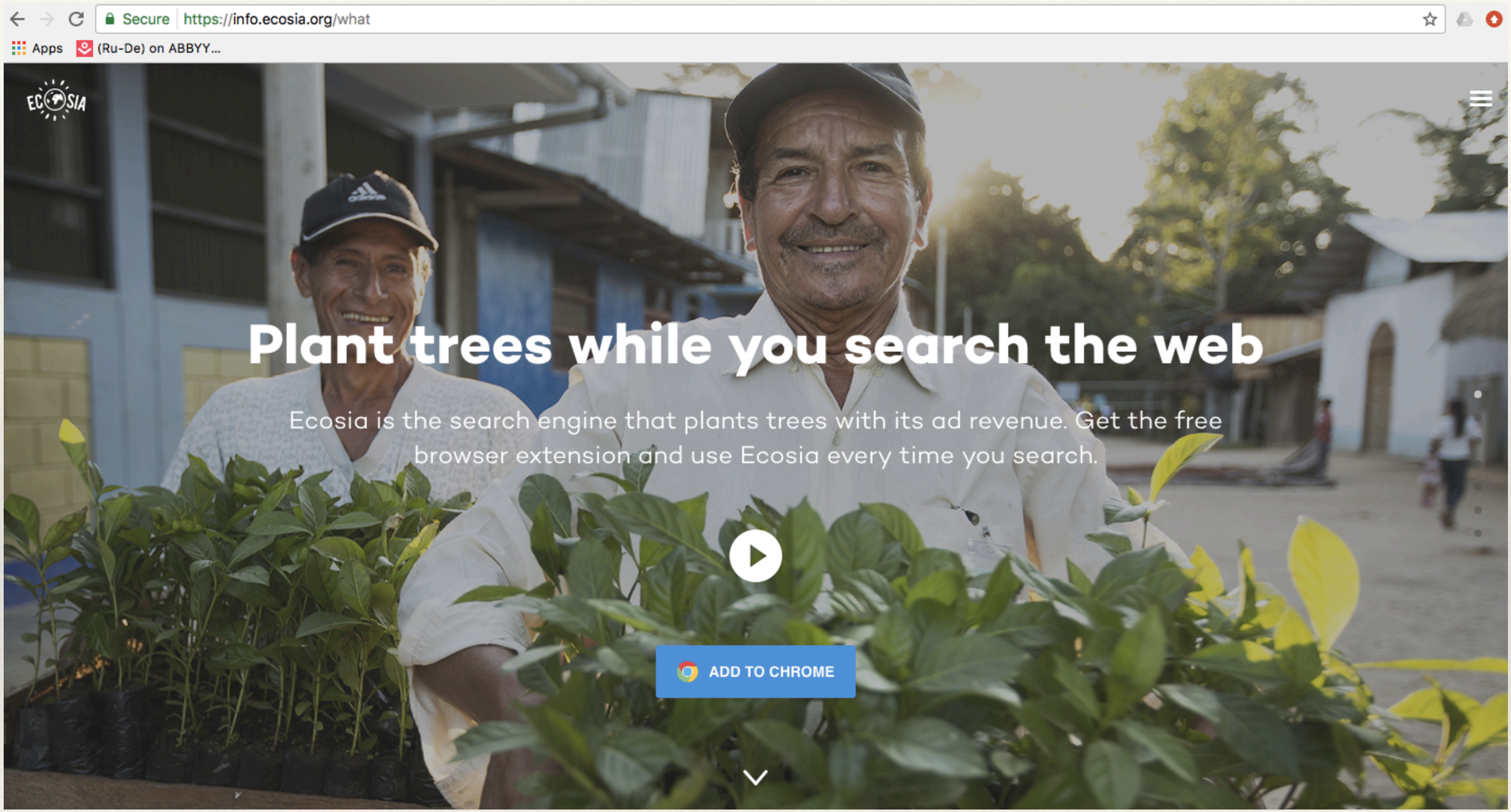

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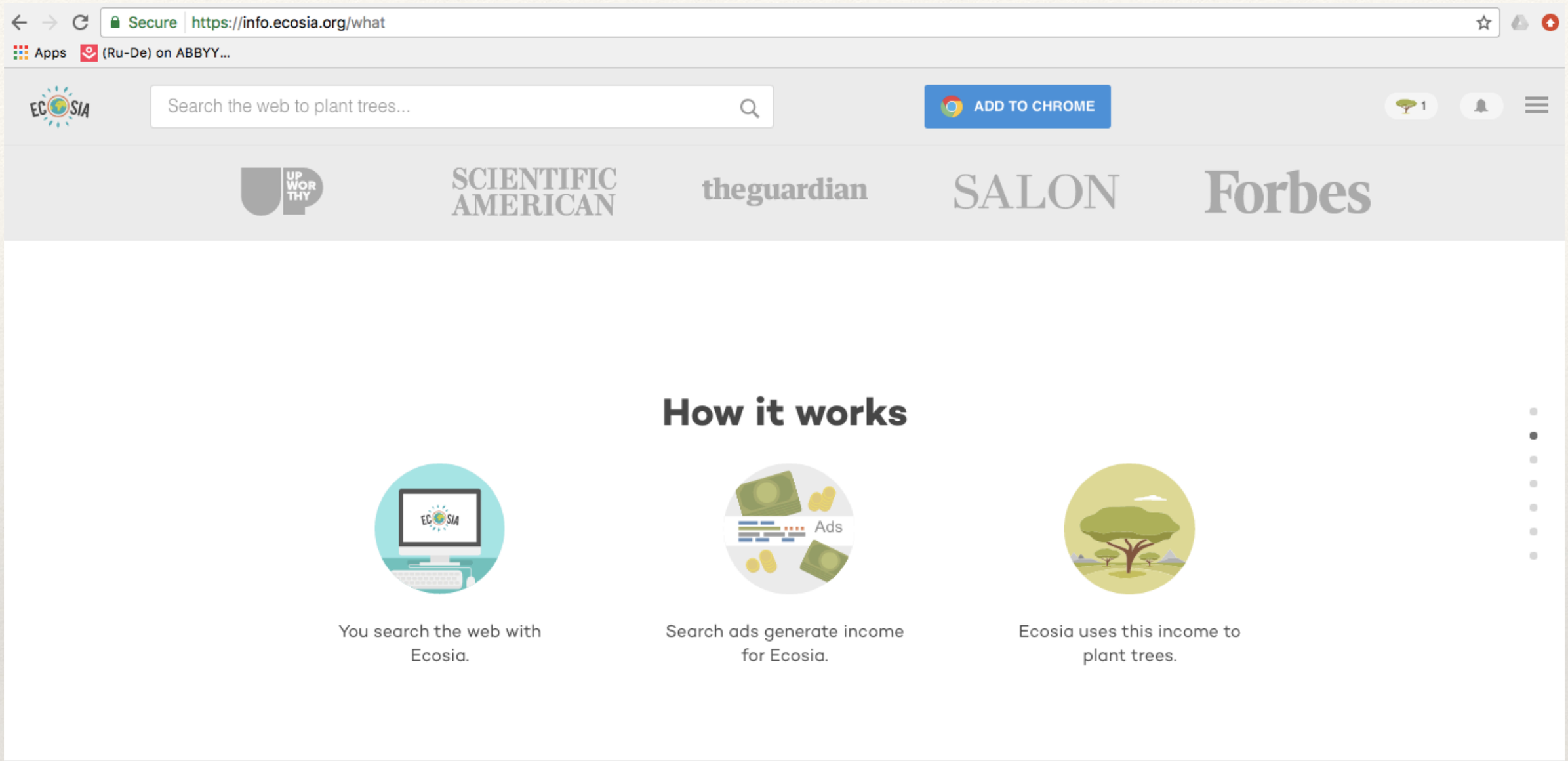

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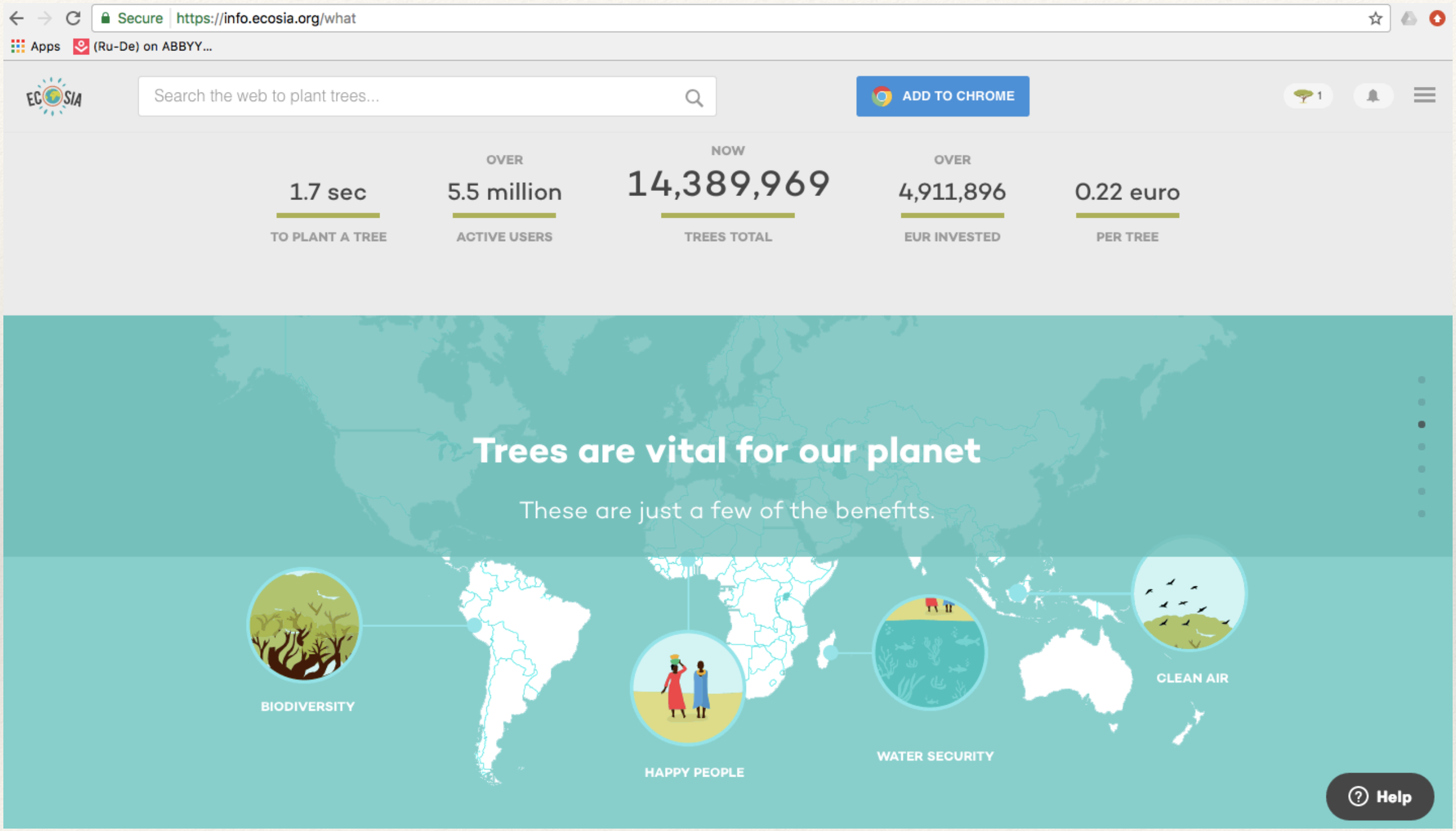


Screenshot of https://www.ecosia.org/ from October 4, 2017:

ecosia.dropmark.com/369415?page=1

Apps (Ru-De) on ABBYY...

Financial Reports & Tree Planting Receipts
by Ecosia

32 items

July 2017

June 2017

May 2017

April 2017

March 2017

February 2017

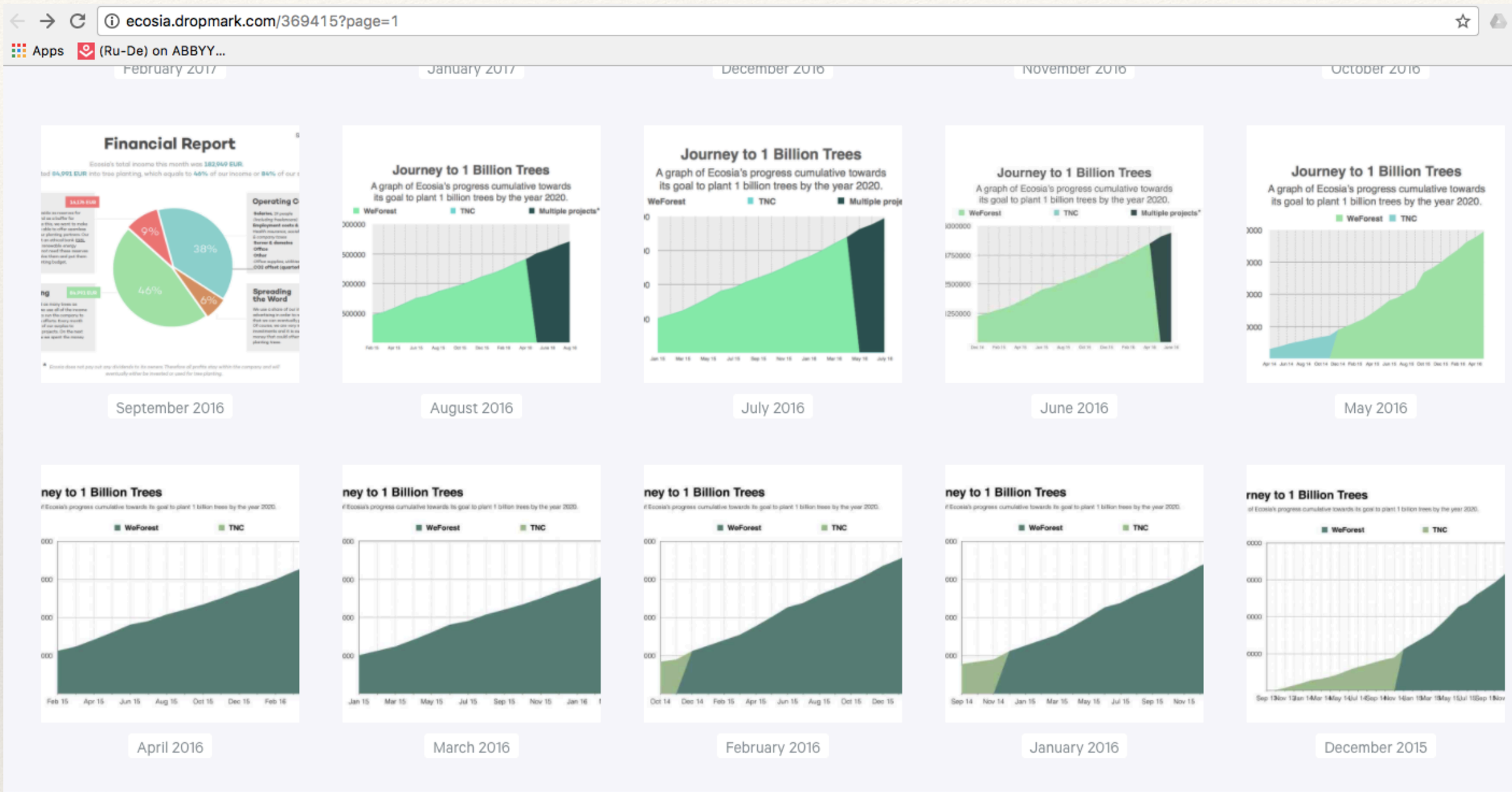
January 2017

December 2016

November 2016

October 2016

Screenshot of https://www.ecosia.org/ from October 4, 2017:



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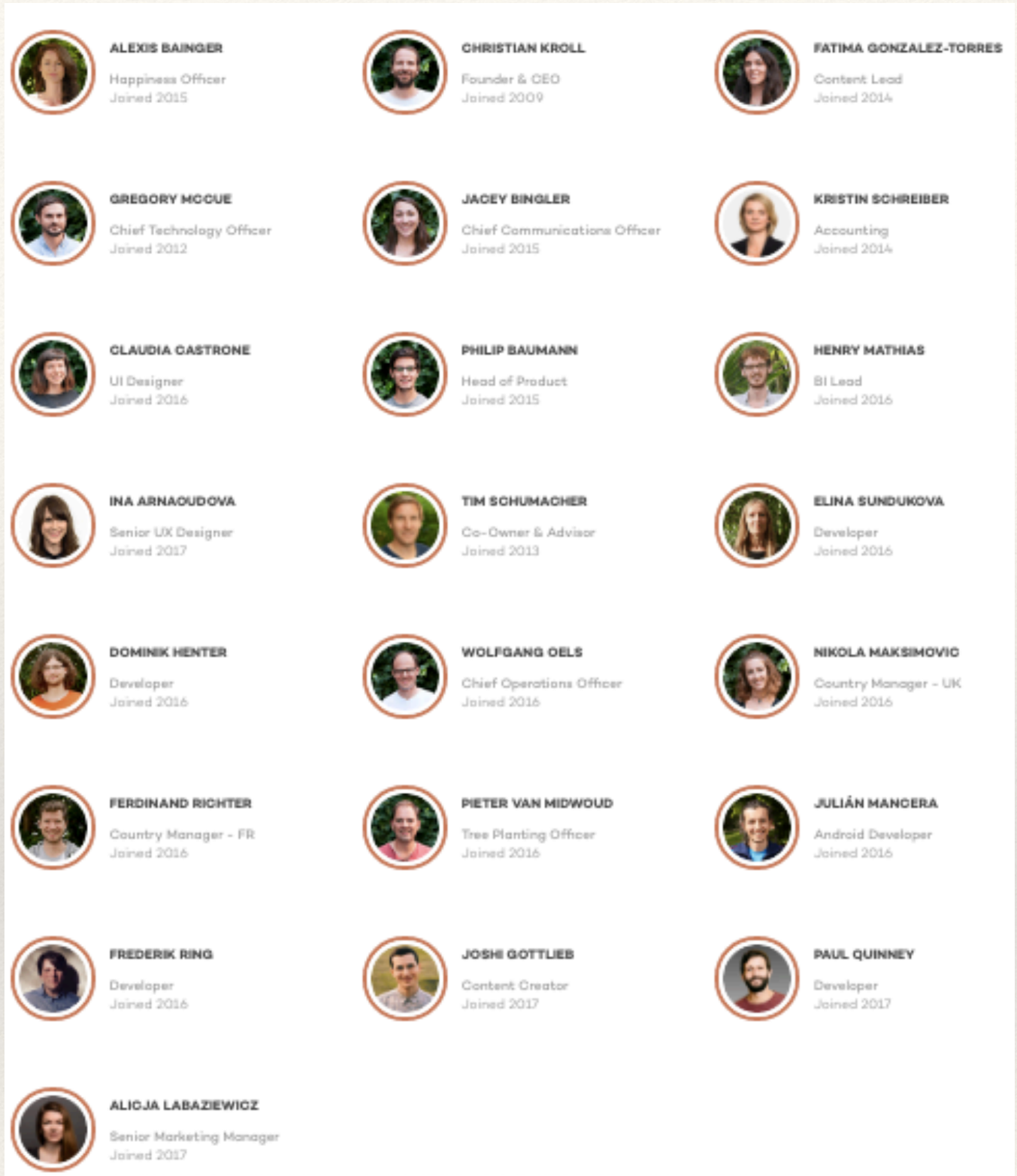

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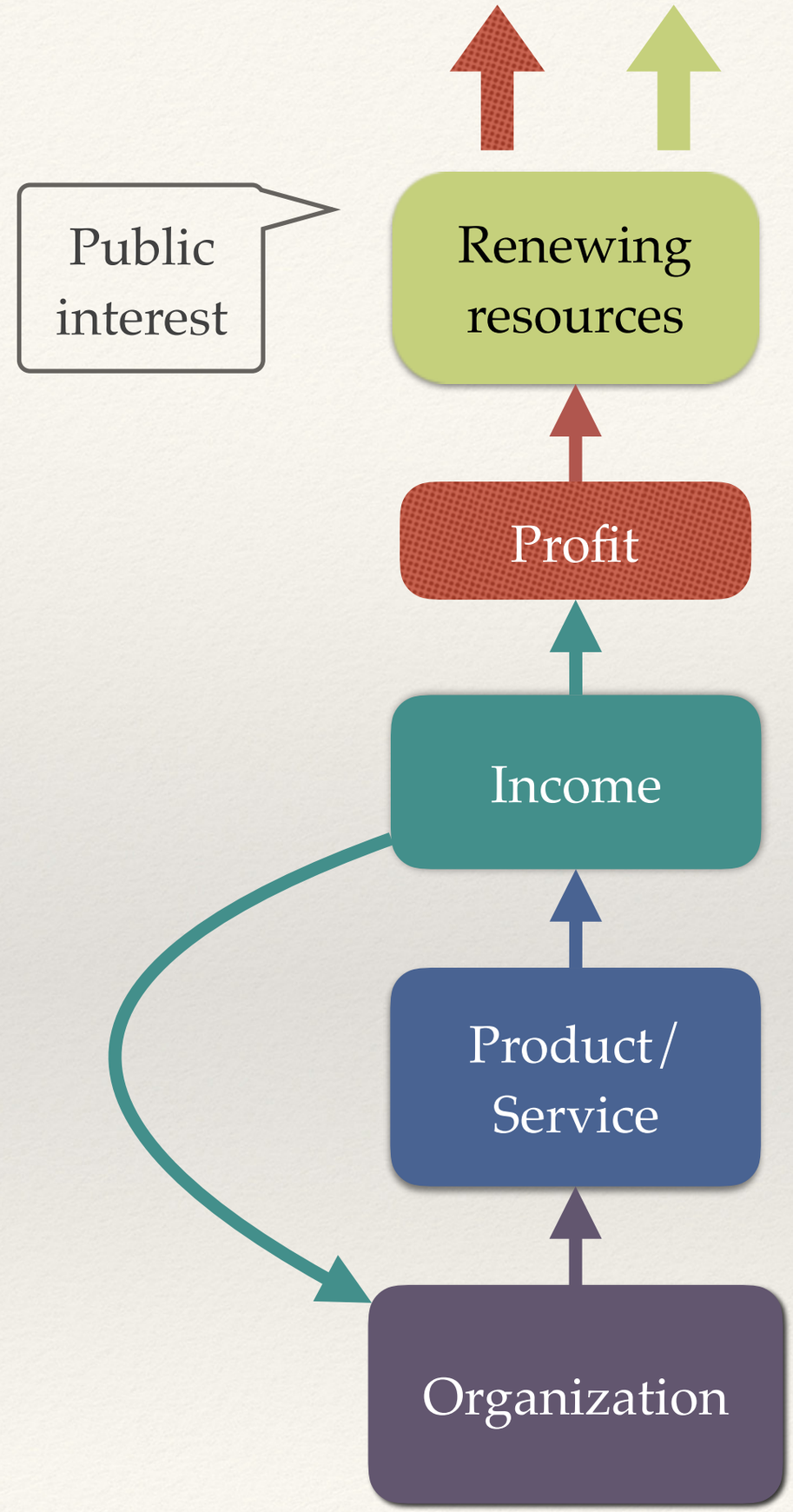
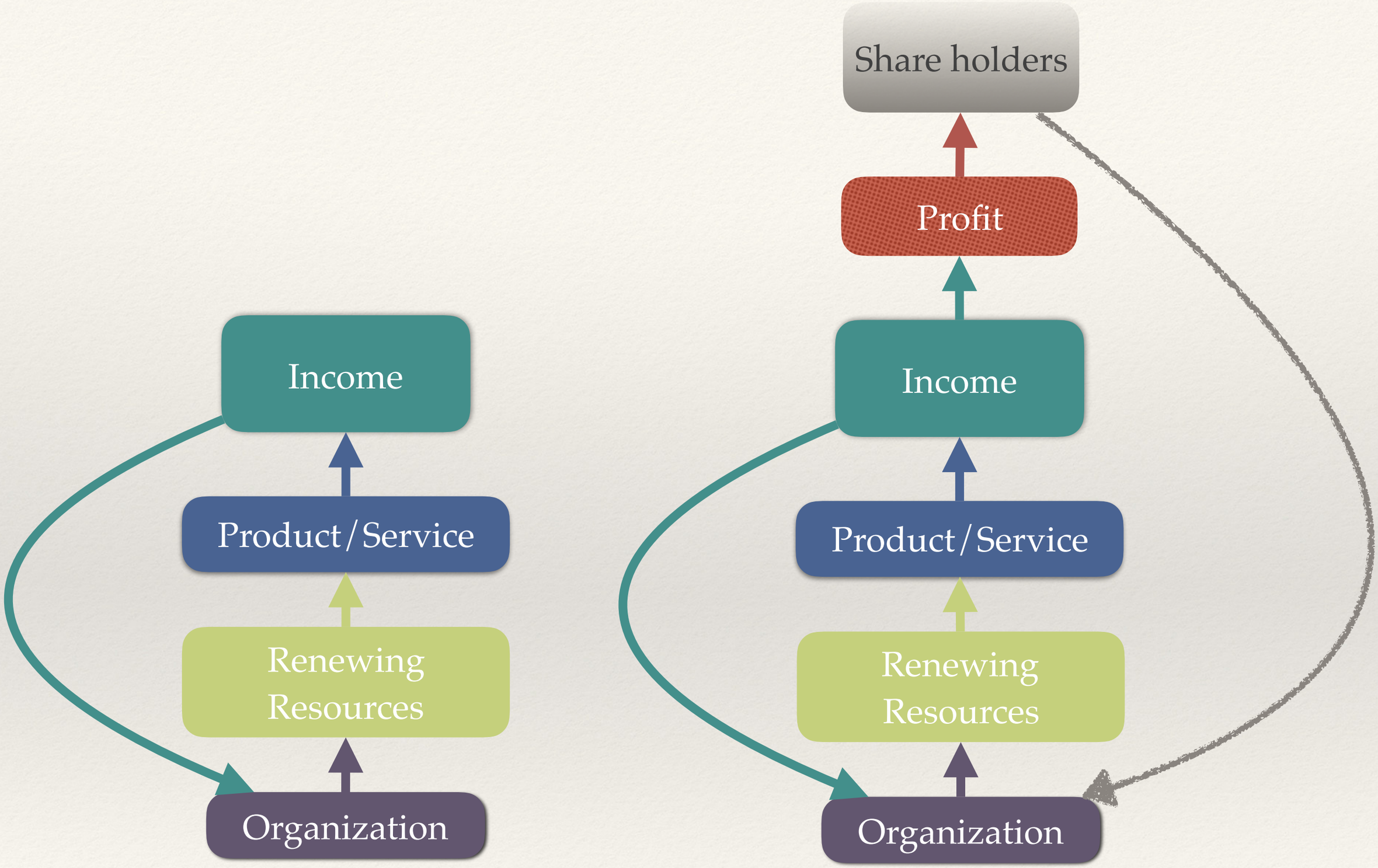

Public interest
Renewing resources
Profit
Income
Product / Service
Organization

Second Solution Type


Income
Product/Service
Renewing Resources
Organization
Share holders
Profit
Income
Product/Service
Renewing Resources
Organization

Richard Perkins

Information and pictures taken from http://www.ridgedalepermaculture.com/

- Small Farm in Ridgedale, Sweden
- 4 months without frost; low light intensity
- Paying four Stockholm salaries
- After 5 years all investment costs paid off
- Constantly increasing soil quality

ridgedale
PERMACULTURE

DESIGN OVERVIEW

Savannah style wide spaced Nut plantings over pasture over Keyline subsoil pattern

Spring fed ponds and microclimate plantings

Mixed species Holistic Planned Grazing across all paddocks. Dairy Cows, Sheep, Layers & Broilers moving daily on planned grazing

Spring fed reflective pond and cold climate vines on protected slope

Sea Buckthorn & Japanese Quince plantation

Front field with fruit trees over berries on Keyline Layout optimized for maximum solar gain with trees in center of each row & berries on each side

Contoured kitchen gardens & paddy fields with commercial polytunnel, root cellar, extensive vegetable beds & microclimate leveraging

Jean Pain compost and wood fired heating system

Perennial leaf crops used as architectual features in farm center

Plant based sewage system

90 Yr+ Spruce

Pig paddocks and leaf tree reforestation

RAM pump supplies quick release water access across farm

Larger Creek

Keyline Agroforestry strips planted for optimal solar gain. Hazel, Apple, Pear, Plum & Cherry on back rows and Berry fruit along the front

30 yr+ Larch Planting

"The Medicine Cabinet" ; Berry & super fruits

Riparians protected from grazing animals & planted with Coppice timber, fruit, nut & berry production. Edible mushroom production below.

Smaller Creek

Rotational coppiced Willow biomass & windbreak

Natural Swimming pool

Teaching & Dining yurts and social spaces

See: http://www.ridgedalepermaculture.com/

Bill Mollison,
David Holmgren

Perma-culture

- Energy cycling
- No waste
- Polyculture and diversity of species
- Observation and replication of natural patterns

P.A. Yeoman

Keyline Design®

- Profitable agriculture ↑ but Soil quality ↓
- Desertification and erosion
- Profitable agriculture ↑ Soil quality ↑

1. Climate
2. Land shape
3. Water
4. Roads
5. Trees
6. Buildings
7. Subdivision
8. Soil

Holistic Manage-ment®

Allan Savory

- Livestock ↑ Desertification ↑
- Livestock ↓ Desertification ↑
- (moving) Livestock ↑ Land health ↑

Willie Smits

- Reforestation of eroded grassland in Indonesia (Borneo and Sulawesi)

Pictures taken from a movie made by Raymond Hartman on the
Village hub in Tomohon
http://masarang.nl/en/projects/sugar-palm-miracle-tree/


Kambodscha
Philippinen
Ho-Chi-Minh-Stadt
Panay
Golf von Thailand
Palawan
Negros
Mindanao
Basilan
Malaysia
Kuala Lumpur
Celebessee
Singapur
BANDA ARC
Indonesien
Javasee
Jakarta
Bandasee

http://masarang.nl/en/projects/sugar-palm-miracle-tree/

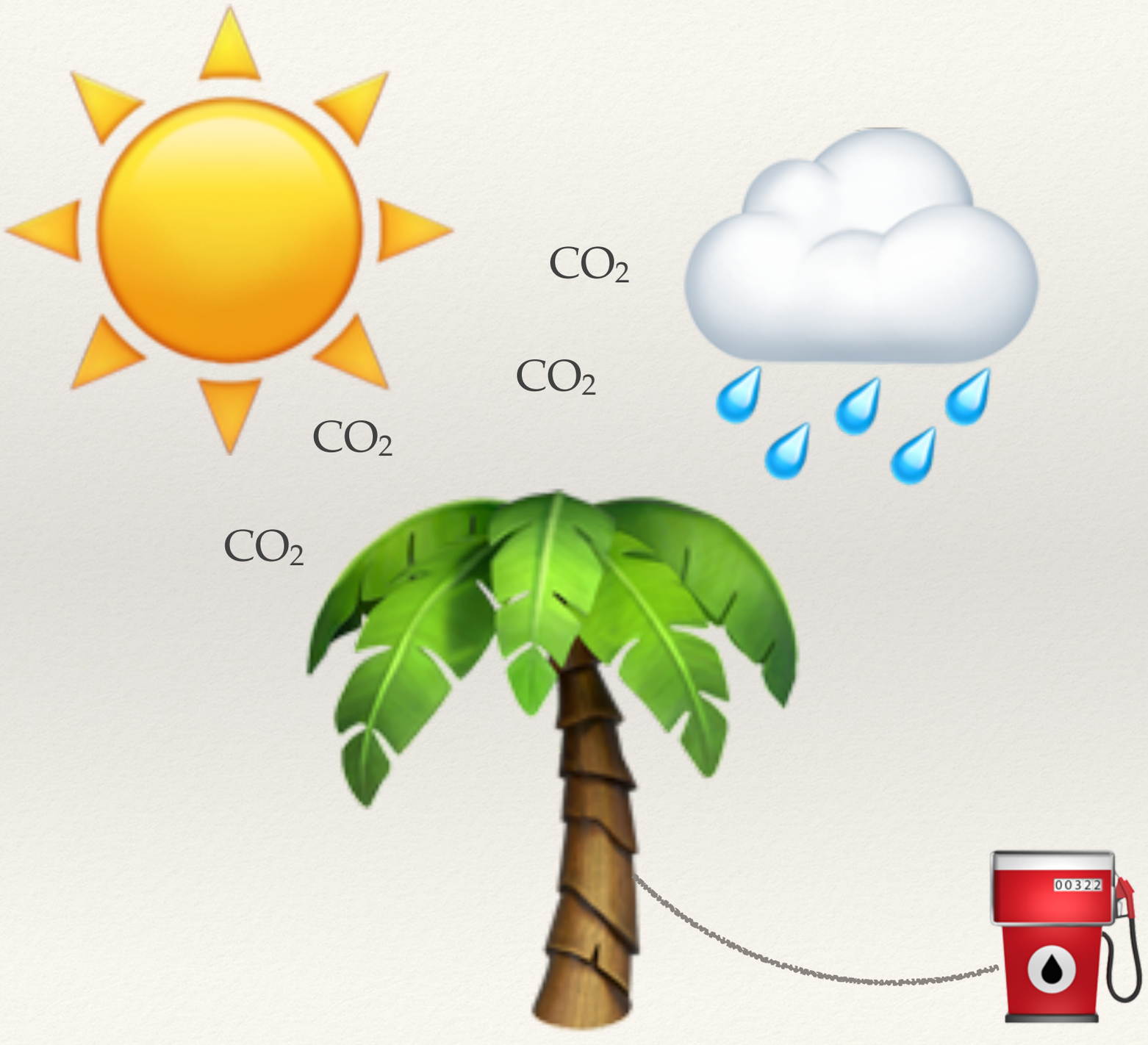
Arenga Pinnata – Sugar Palm

http://masarang.nl/en/projects/sugar-palm-miracle-tree/

- The palm transforms sunlight, rainwater and carbon dioxide into sugar juice:
  - harvested on a daily basis (full grown palms 20-30 litres per day; some even 50)
  - sugar concentration of 11%
- 60 different products can be produced from the palm
- Produces 3 times more energy than raw cane sugar
- Longer and more efficient photosynthesis process
- Palm doesn't exhaust the soil
- No parts of the tree need to be cut off for harvest
- Grows on low-nutrient soils
- Profound root system: Protection against erosion, resisting fires and floods

http://masarang.at/Masarang-s-Projekte/Zuckerpalme/New-document.aspx

Willie Smits



3) Towards an interdisciplinary multi-level-perspective based on the notion of *system contradictions*

Thank you!

justusschollmeyer@gmail.com