Dirk Helbing (ETH Zurich)
dhelbing@ethz.ch

Two Kinds of Agent-Based Approaches

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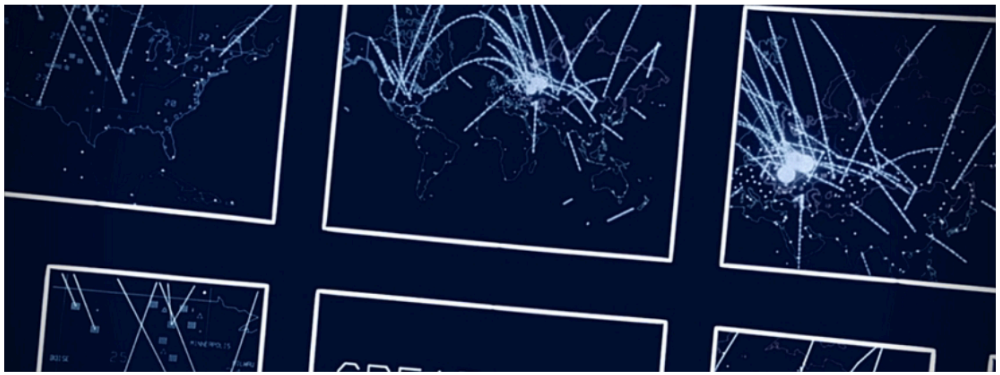
FuturICT

World Simulation Type I (based on Machine Learning)



Sentient World Simulation and NSA Surveillance – Exploiting Privacy to Predict the Future?

Last updated on July 28, 2013 by Daniel Faggella

Email

One of the major headlines in recent news is Edward Snowden's revelation of documents which prove that the US government is using high-tech software to gather massive amounts of private information on every-day Americans.

Photo of Edward Snowden

Snowden has taken bold action against the government in an effort to publicize the government's violation of constitutional rights and to "inform the public as to which is done in their name and that which is done against them".

Digital Doubles

education level

estimated net worth

types of recent purchases

investments

habits (like smoking & gambling)

number of kids

contact info

religious & political views

marital status

mortgage amount

salary

The Register®
Biting the hand that feeds IT

Sentient world: war games on the grandest scale

Sim Strife

23 Jun 2007 at 09:02, Mark Baard

Perhaps your real life is so rich you don't have time for another.

Even so, the US Department of Defense (DOD) may already be creating a copy of you in an alternate reality to see how long you can go without food or water, or how you will respond to televised propaganda.

The DOD is developing a parallel to Planet Earth, with billions of individual "nodes" to reflect every man, woman, and child this side of the dividing line between reality and AR.

Called the Sentient World Simulation (SWS), it will be a "synthetic mirror of the real world with automated continuous calibration with respect to current real-world information", according to a concept paper for the project.

"SWS provides an environment for testing Psychological Operations (PSYOP)," the paper reads, so that military leaders can "develop and test multiple courses of action to anticipate and shape behaviors of adversaries, neutrals, and partners".

Manipulation of the Choices of People by Personalized Information

Tristan Harris: Mass Mind Control

How a handful of tech companies control billions of minds every day | Tristan Harris

258,580 views

6K 237 SHARE

This will create an ”optimal world” based on “old thinking and behavior”

Big data, meet Big Brother

China invents the digital totalitarian state

The worrying implications of its social-credit project

Utilitarian thinking (profit maximization, one-dimensional optimization) will seriously harm the world

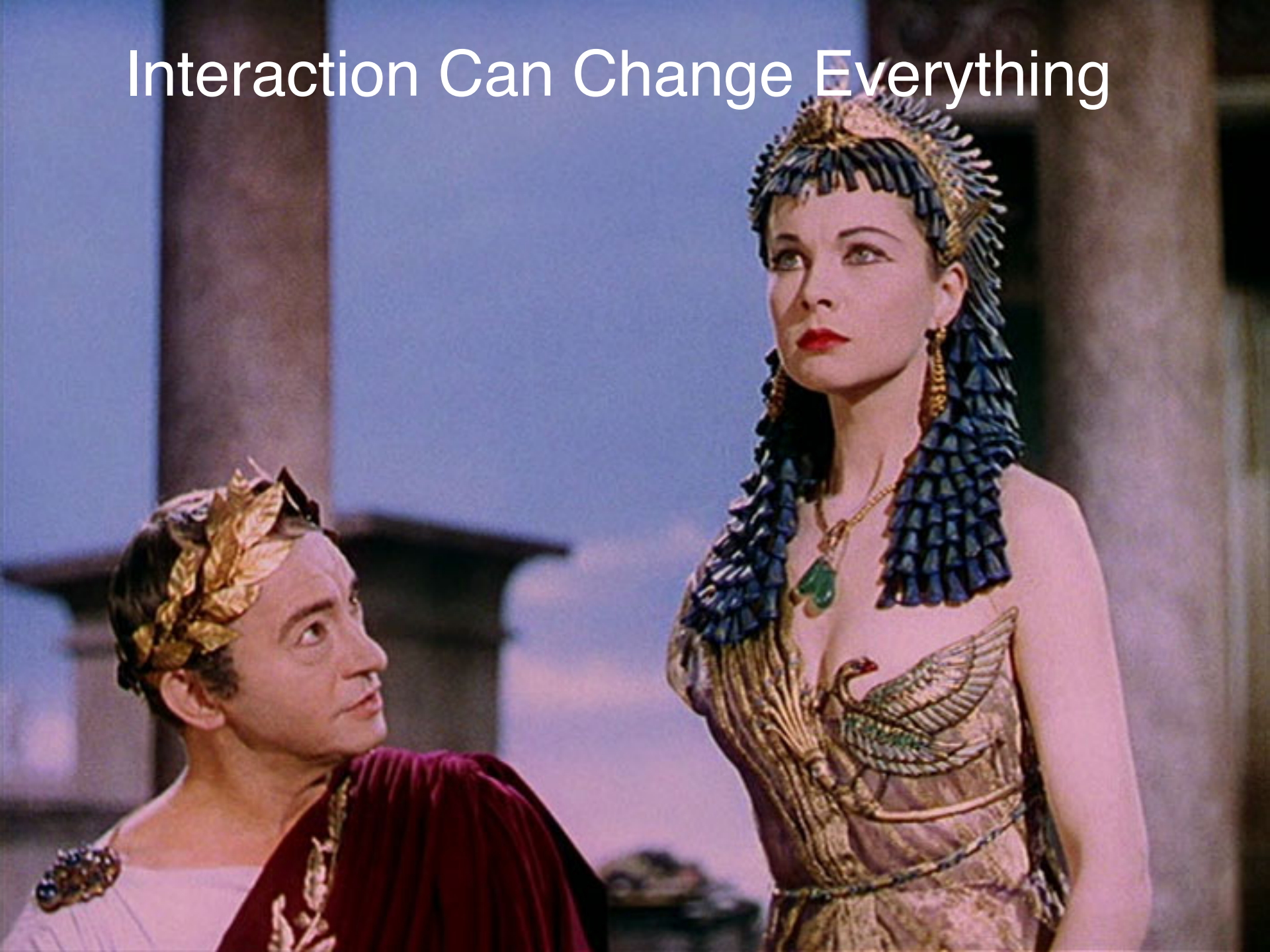
The Making of
Behavioral Economics
ISBEHAVING
Richard H. Thaler
Best-selling coauthor of Nudge
© WeChat/Xinjiang Judicial Administration

The New Concept of Peace Rooms

As compared to a war room setting, a “peace room” is characterized by a number of additional features such as: a higher degree of transparency (to reduce possible flaws and increase trust), a democratic framework of operation (for legitimacy), the use by interdisciplinary teams meeting international scientific standards (to achieve the integration of the best knowledge available), the supervision by ethical experts (to ensure responsible use and innovation), a multi-stakeholder and multi-perspective approach (to find solutions that work for everyone – as much as this is possible), and, in order to increase problem solving capacity, participatory opportunities for civil society (by means of NGOs, citizen science, and/or crowd sourcing).

World
Simulation
Type II (using
parametric models,
mechanism design, and a
participatory approach)

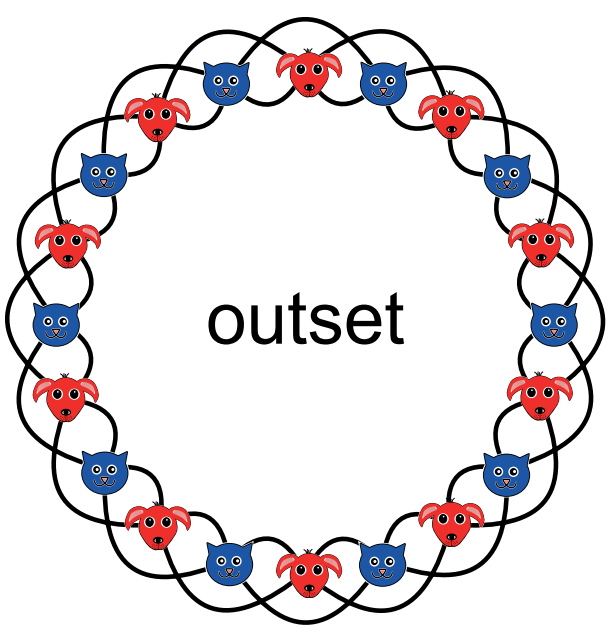
Interaction Can Change Everything

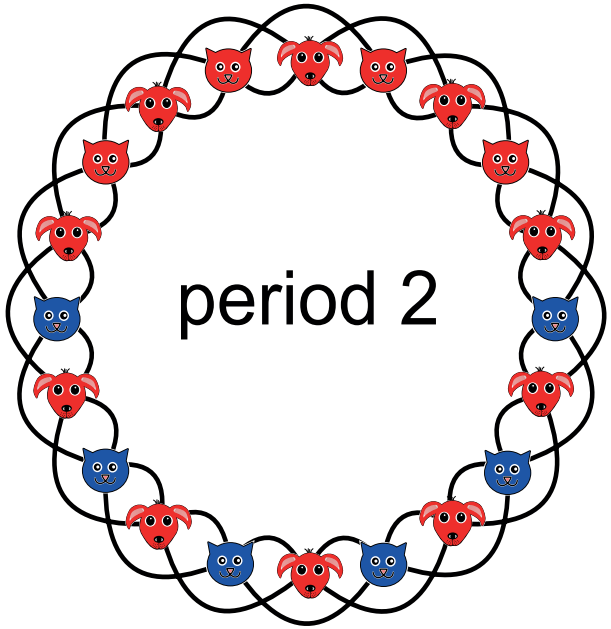


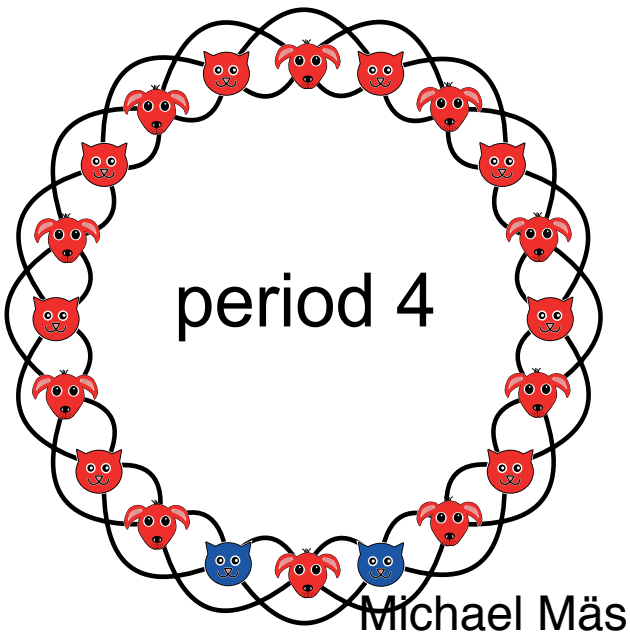
Cascading Effects: Risk and Opportunity

Mousetrap fission, by Gerhard G. Paulus, University of Jena, https://www.youtube.com/watch?v=Wiz1VVLYgl4

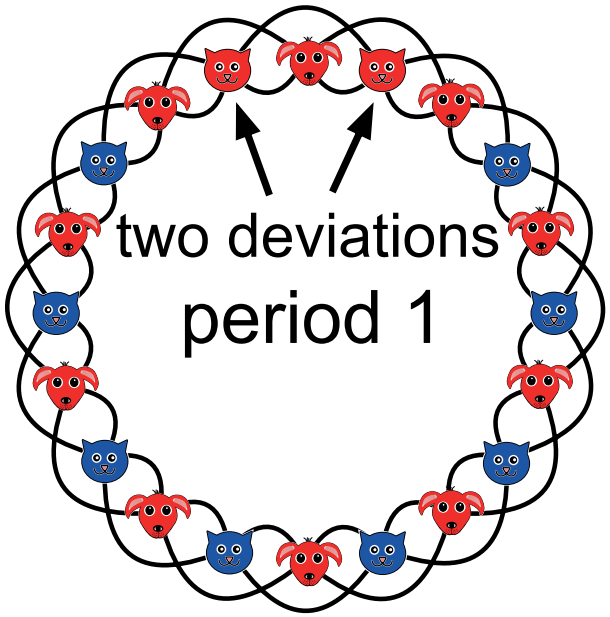
Perturbations Trigger A Different Outcome

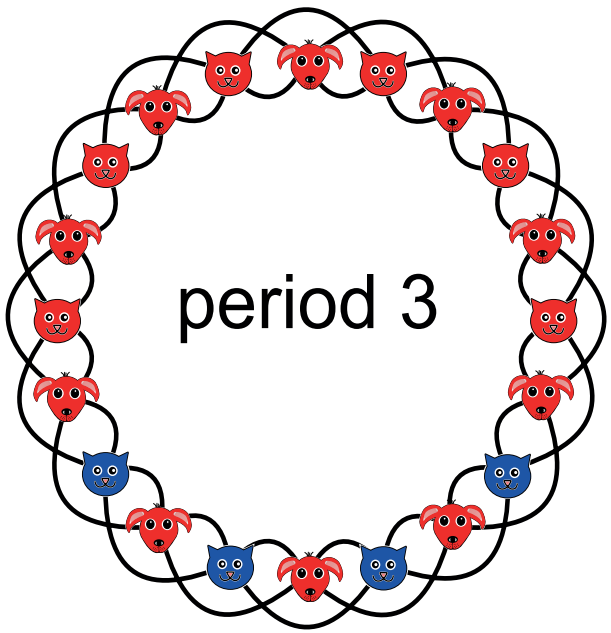


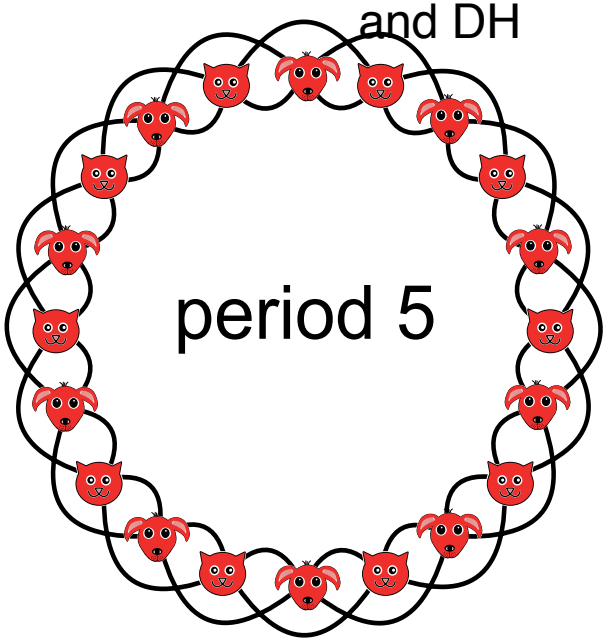




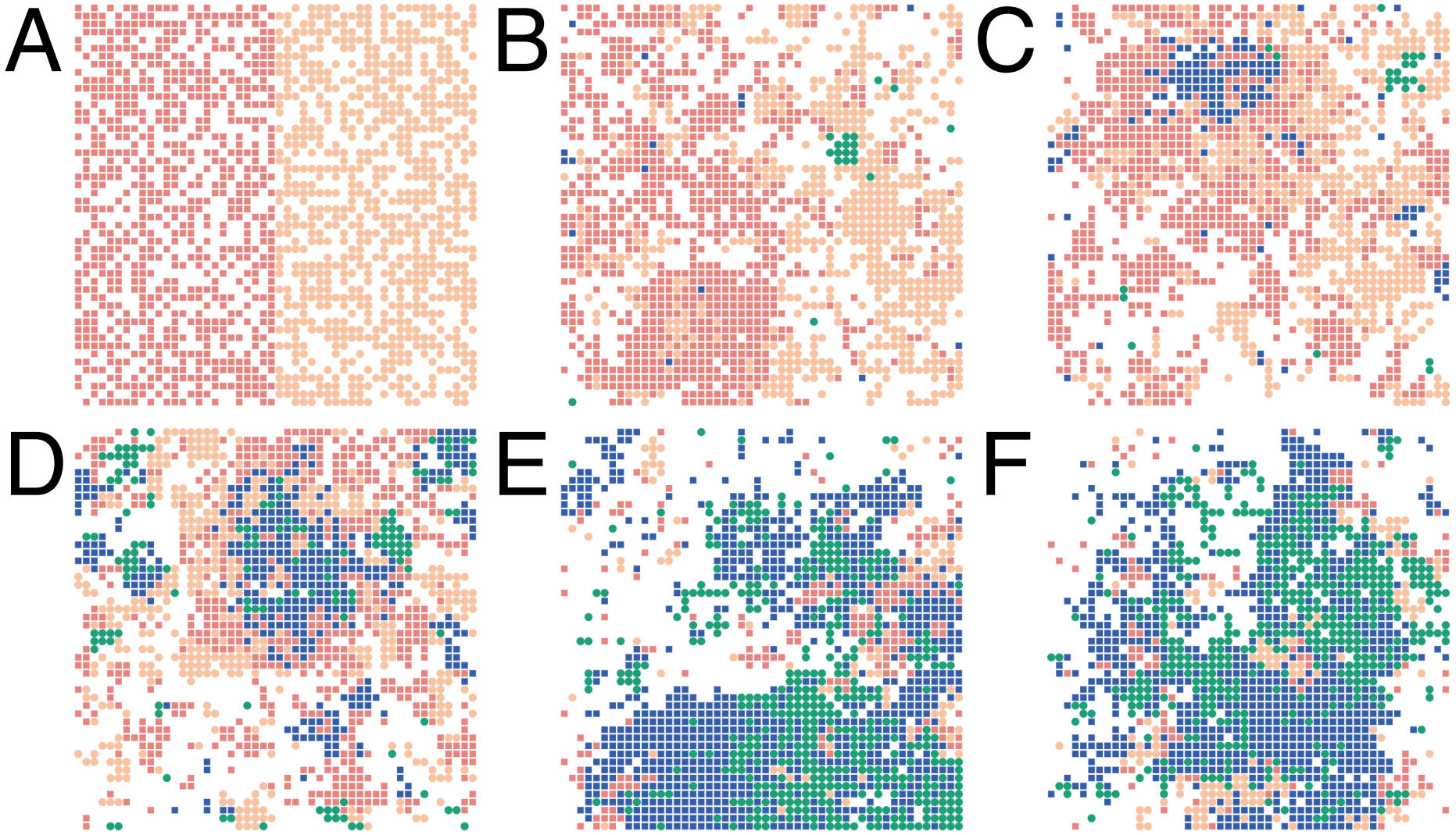
Michael Mäs and DH



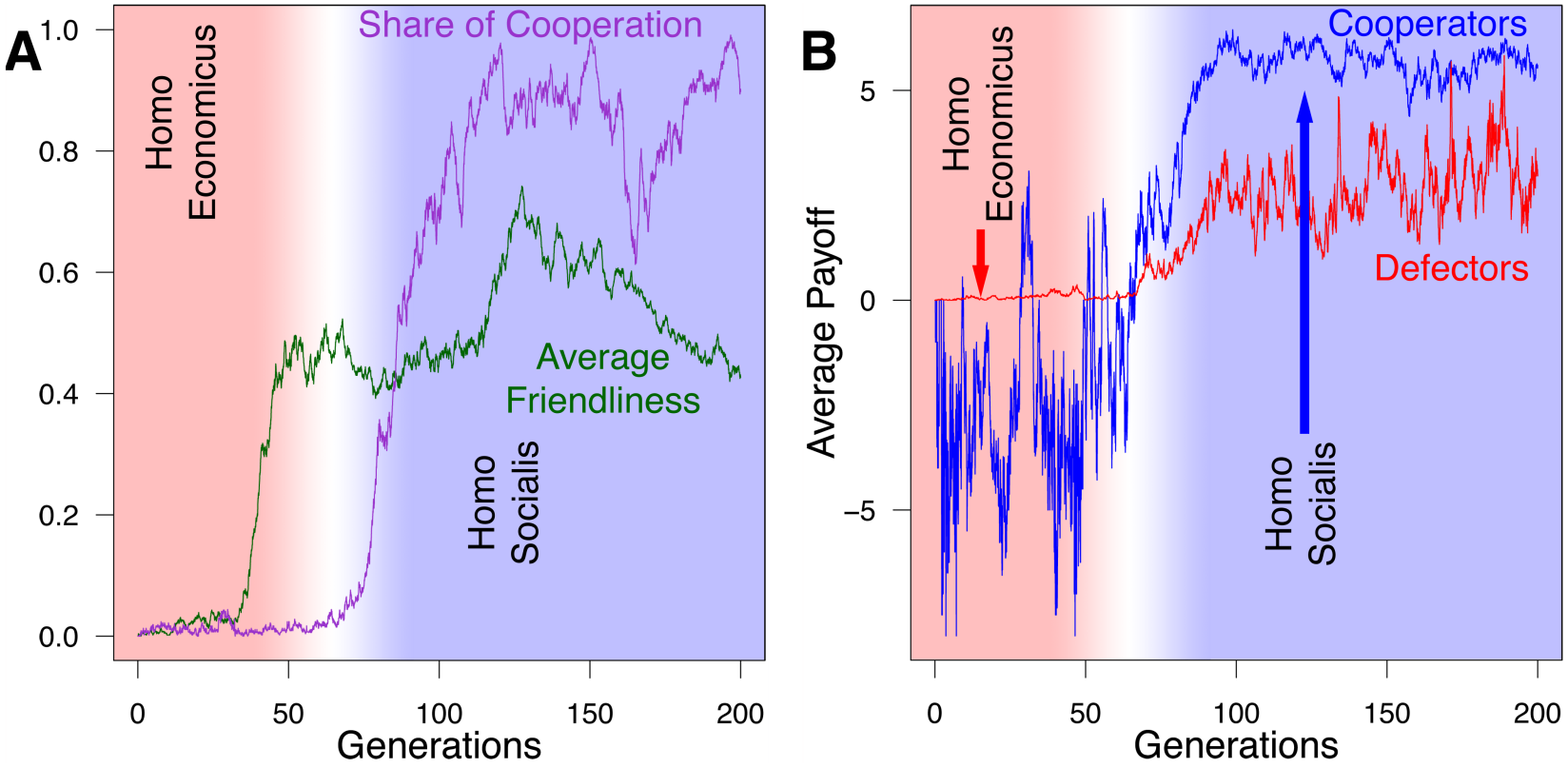




Emergence of “Networked Thinking”



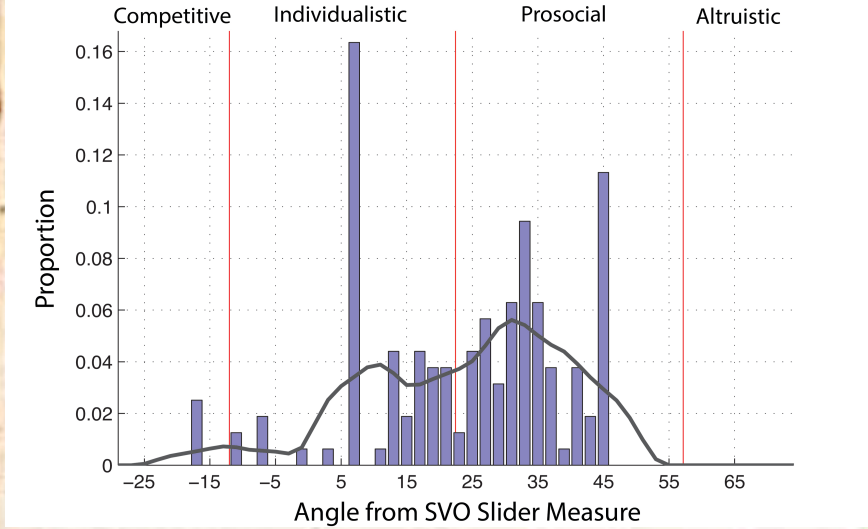
Benefit of ”Networked Thinking”



The “homo socialis” is conditionally cooperative, takes self-determined but other-regarding decisions (considering the impact on others).

This implies interdependent decisions, “networked minds”.

"How ever selfish man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it."



R.O. Murphy, K.A. Ackermann, M.J.J. Handgraaf (2011) *Judgment and Decision Making* **6**(8), 771–781.

THE

THEORY

OF

MORAL SENTIMENTS.

By ADAM SMITH,
Professor of Moral Philosophy in the
University of Glasgow.

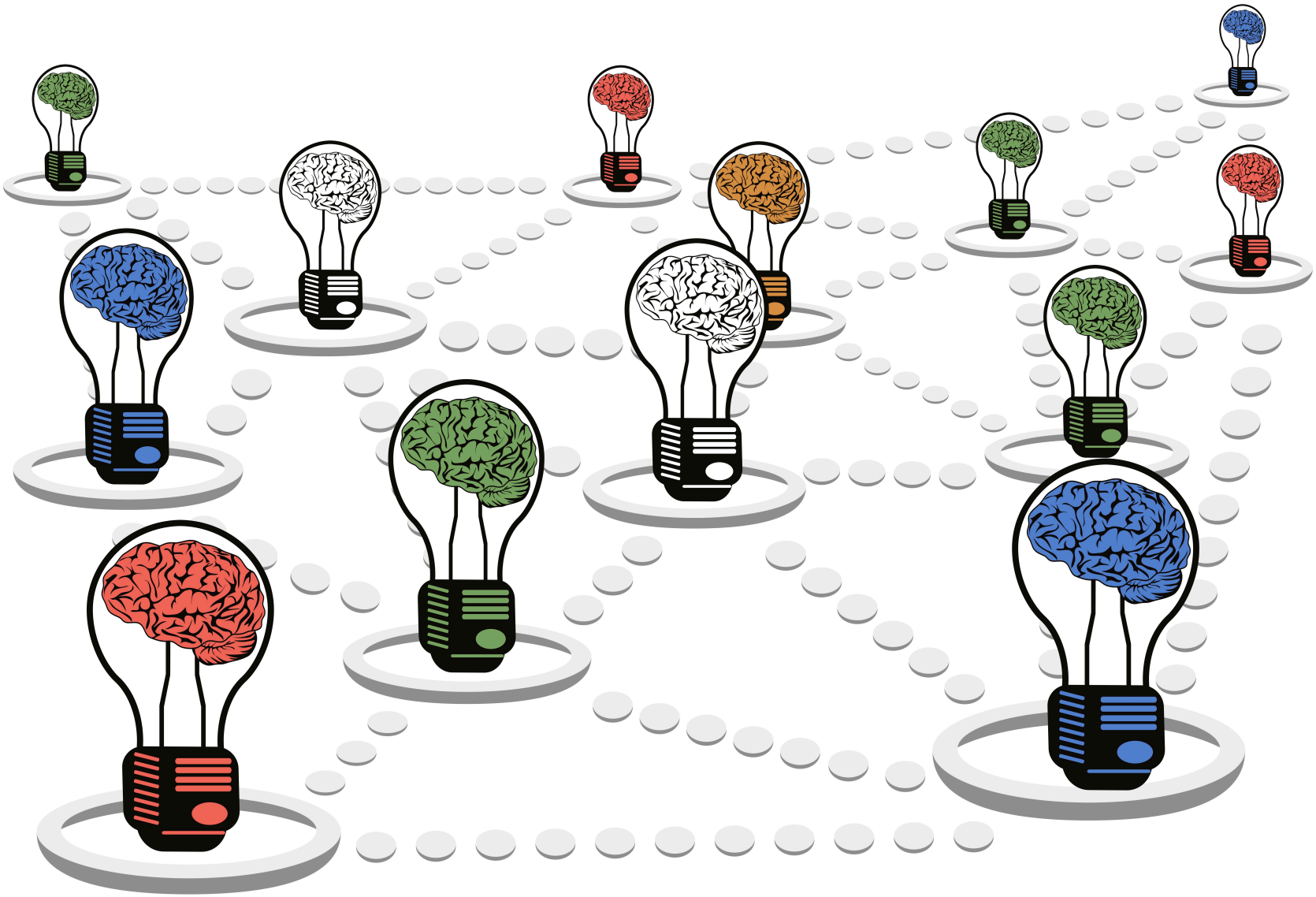
LONDON:
Printed for A. Millar, in the Strand;
And A. Kincaid and J. Bell, in Edinburgh.
M DCC LIX.

Adam Smith: The Theory of Moral Sentiments. 1759.

Mechanism and Systems Design

- The holy grail -

Bring the Best Ideas of Many Minds Together



http://medialniproroci.blogspot.ch/2013/04/sharing-is-new-shoppingand-working.html

Diversity Wins, Not the Best

Leaderboard

Display top 20 leaders.

Rank	Team Name	Best Score	% Improvement	Last Submit Time
1	BellKor's Pragmatic Chaos	0.8558	10.05	2009-06-26 18:42:37
Grand Prize - RMSE <= 0.8563				
2	PragmaticTheory	0.8582	9.80	2009-06-25 22:15:51
3	BellKor in BigChaos	0.8590	9.71	2009-05-13 08:14:09
4	Grand Prize Team	0.8593	9.68	2009-06-12 08:20:24
5	Dace	0.8604	9.56	2009-04-22 05:57:03
6	BigChaos	0.8613	9.47	2009-06-23 23:06:52
Progress Prize 2008 - RMSE = 0.8616 - Winning Team: BellKor in BigChaos				
7	BellKor	0.8620	9.40	2009-06-24 07:16:02
8	Gravity	0.8634	9.25	2009-04-22 18:31:32
9	Opera Solutions	0.8638	9.21	2009-06-22 05:53:30
10	xlvector	0.8639	9.20	2009-06-26 13:49:04
11	xiangliang	0.8639	9.20	2009-06-26 07:47:34
12	BruceDengDaoCiYiYou	0.8641	9.18	2009-06-02 17:08:31
13	Ces	0.8642	9.17	2009-06-24 14:34:14
14	majia2	0.8642	9.17	2009-06-23 08:07:50

Top-down and majority decisions obstruct collective intelligence

Wisdom of crowds requires independent exploration and then integration

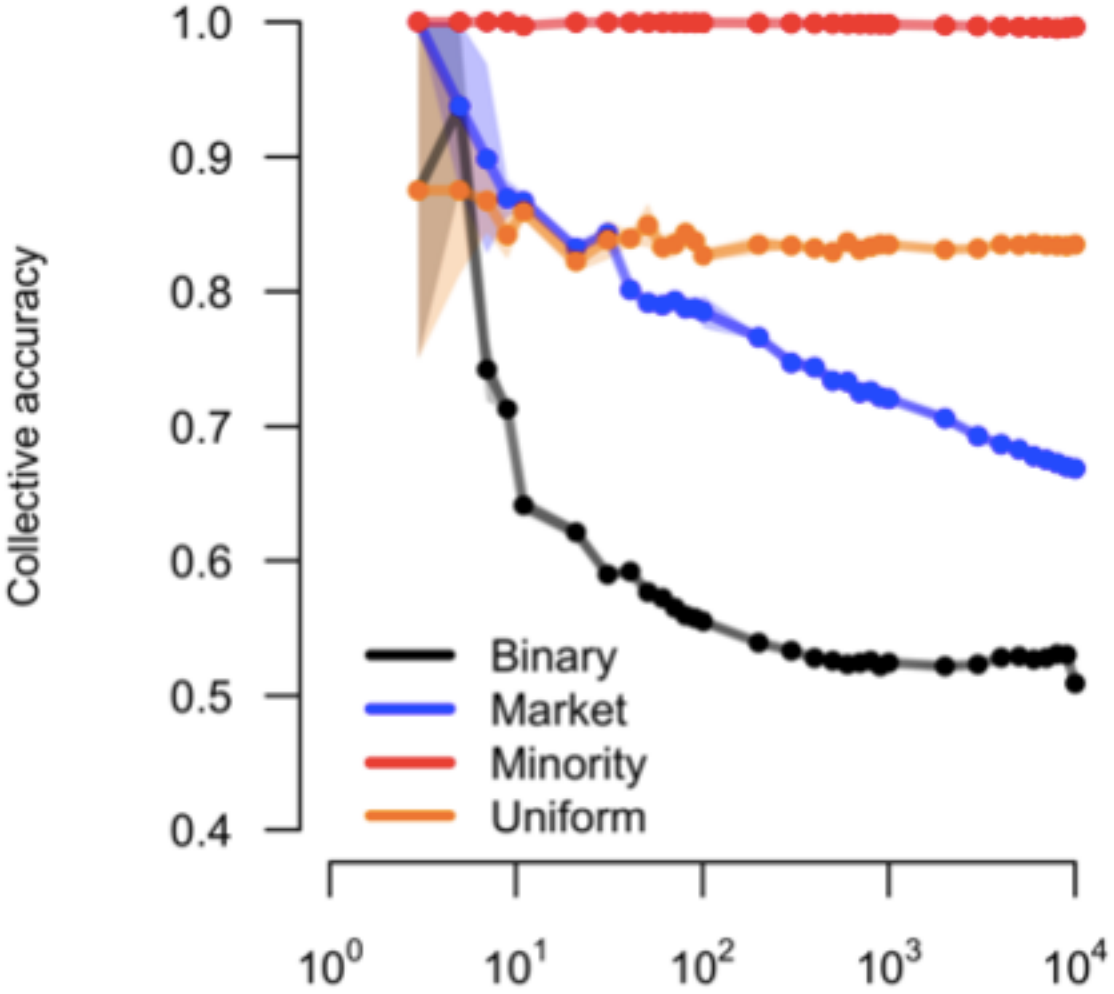
IMAGINECHINA/CORBIS

Many choices that people consider their own are already determined by algorithms.

Build digital democracy

Open sharing of data that are collected with smart devices would empower citizens and create jobs, say **Dirk Helbing** and **Evangelos Pournaras**.

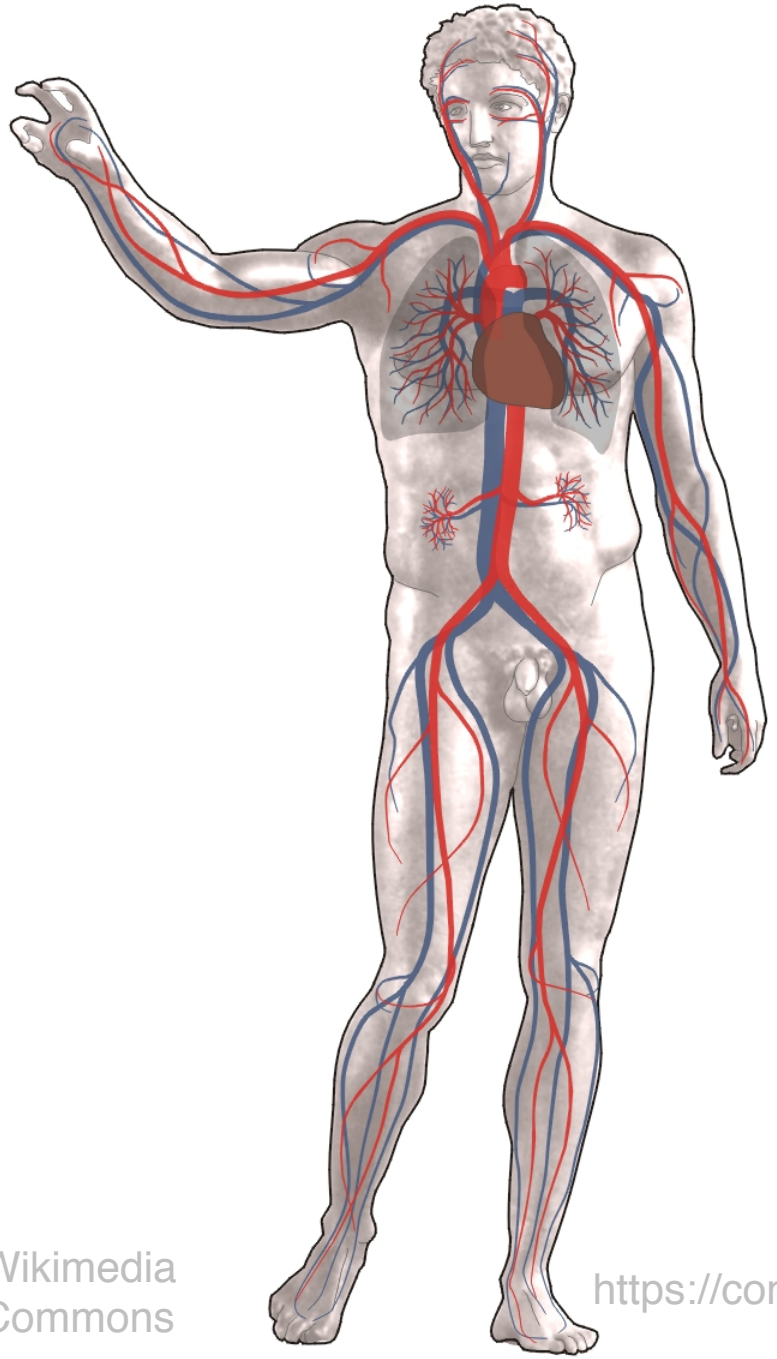
Optimal Incentives: “Minorities Report” Strategy Can Outperform Yes/No-Democracies and Markets!



R. Mann and DH: Minorities Report: Optimal Incentives for Collective Intelligence, Preprint (2016)

Complexity Science allows us to use the hidden forces behind self-organization

With Suitable Feedback Loops, a Complex Dynamical System Self-Organizes Like Magic



We are living

not just on one

thing, say

water. We need

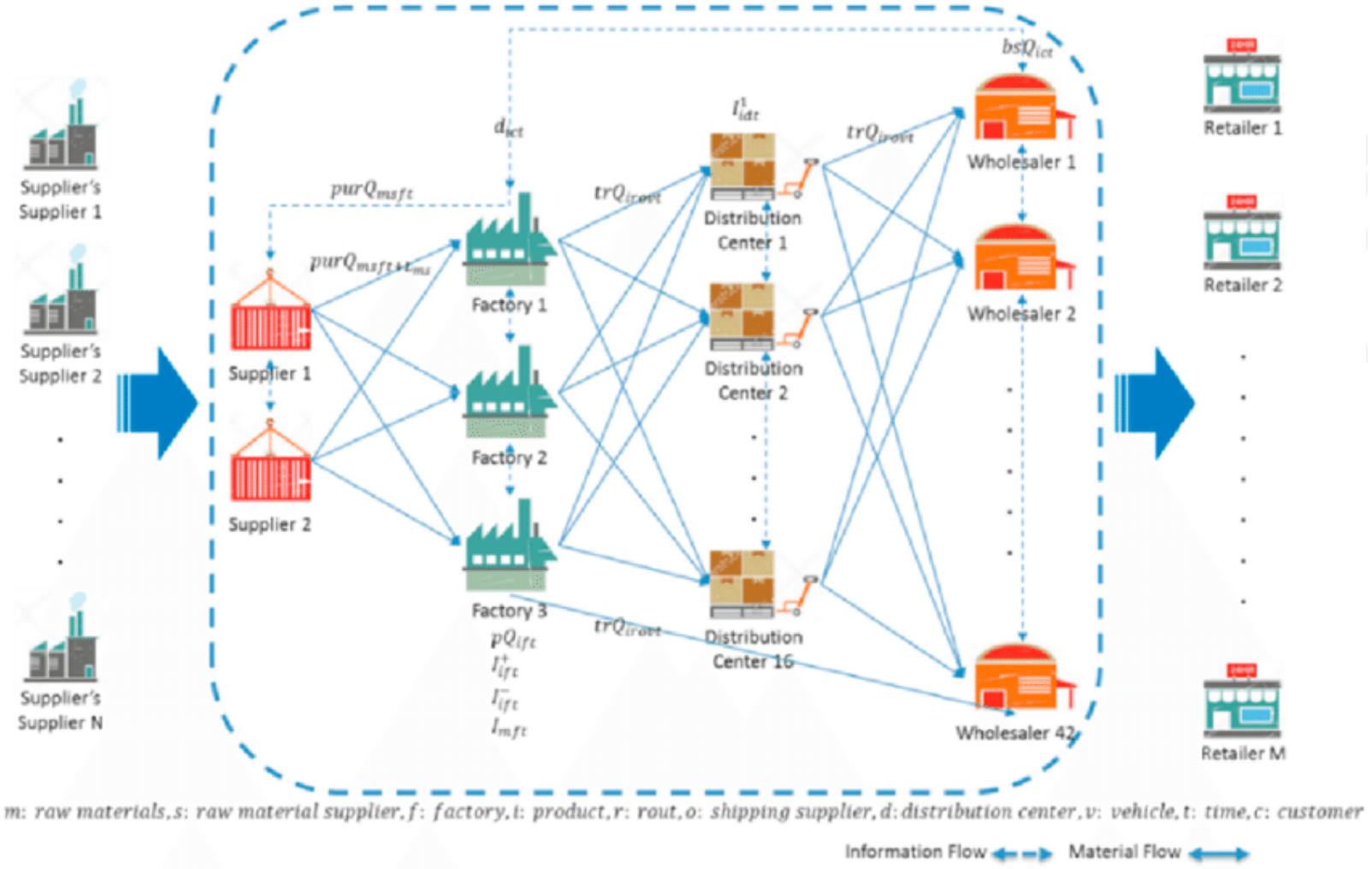
- carbohydrates
- proteins
- vitamins
- minerals

Wikimedia Commons

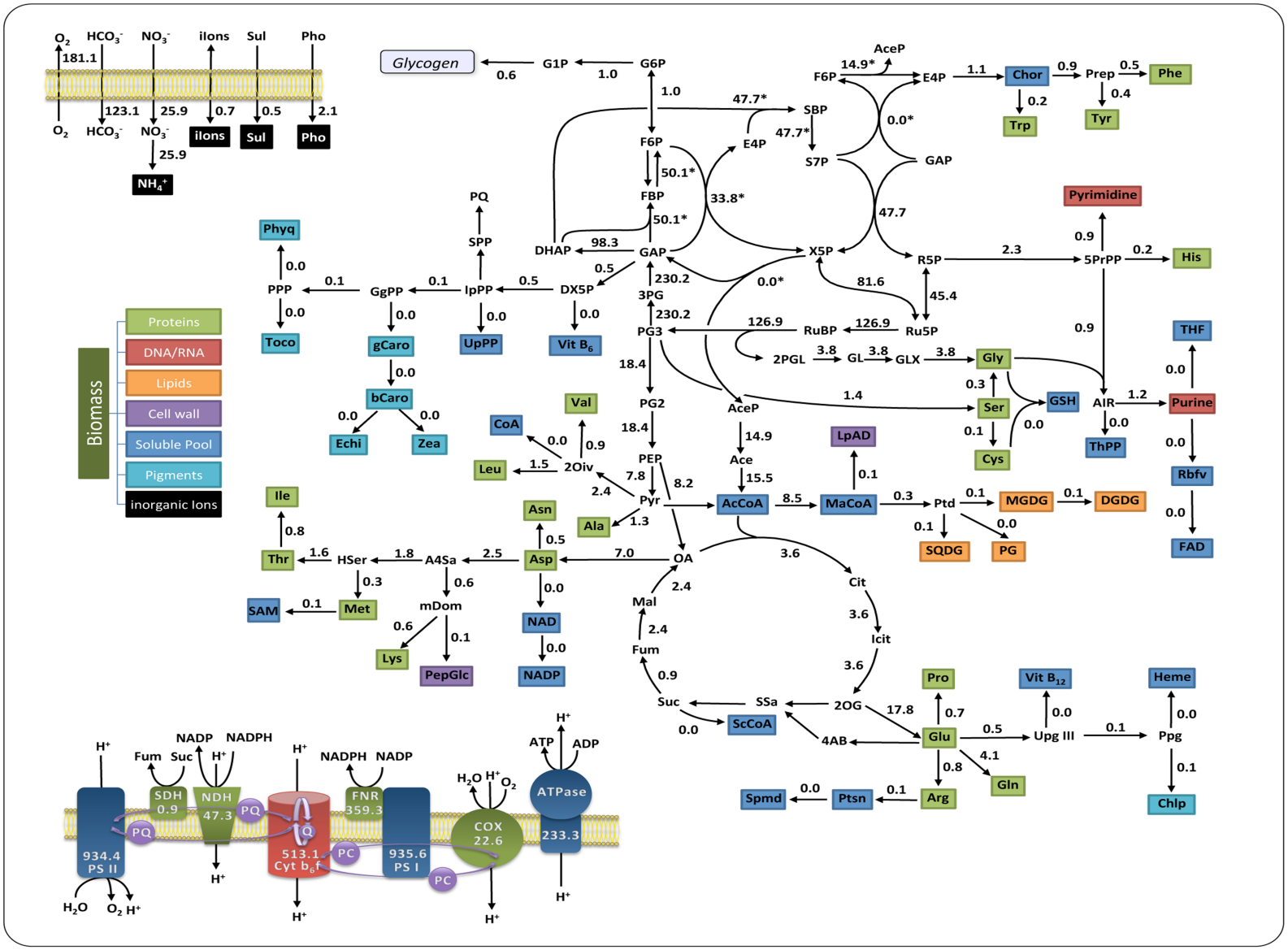
https://commons.wikimedia.org/wiki/File:Grafik_blutkreislauf.jpg

Socio-Ecological Finance FIN+:
Participatory sustainability

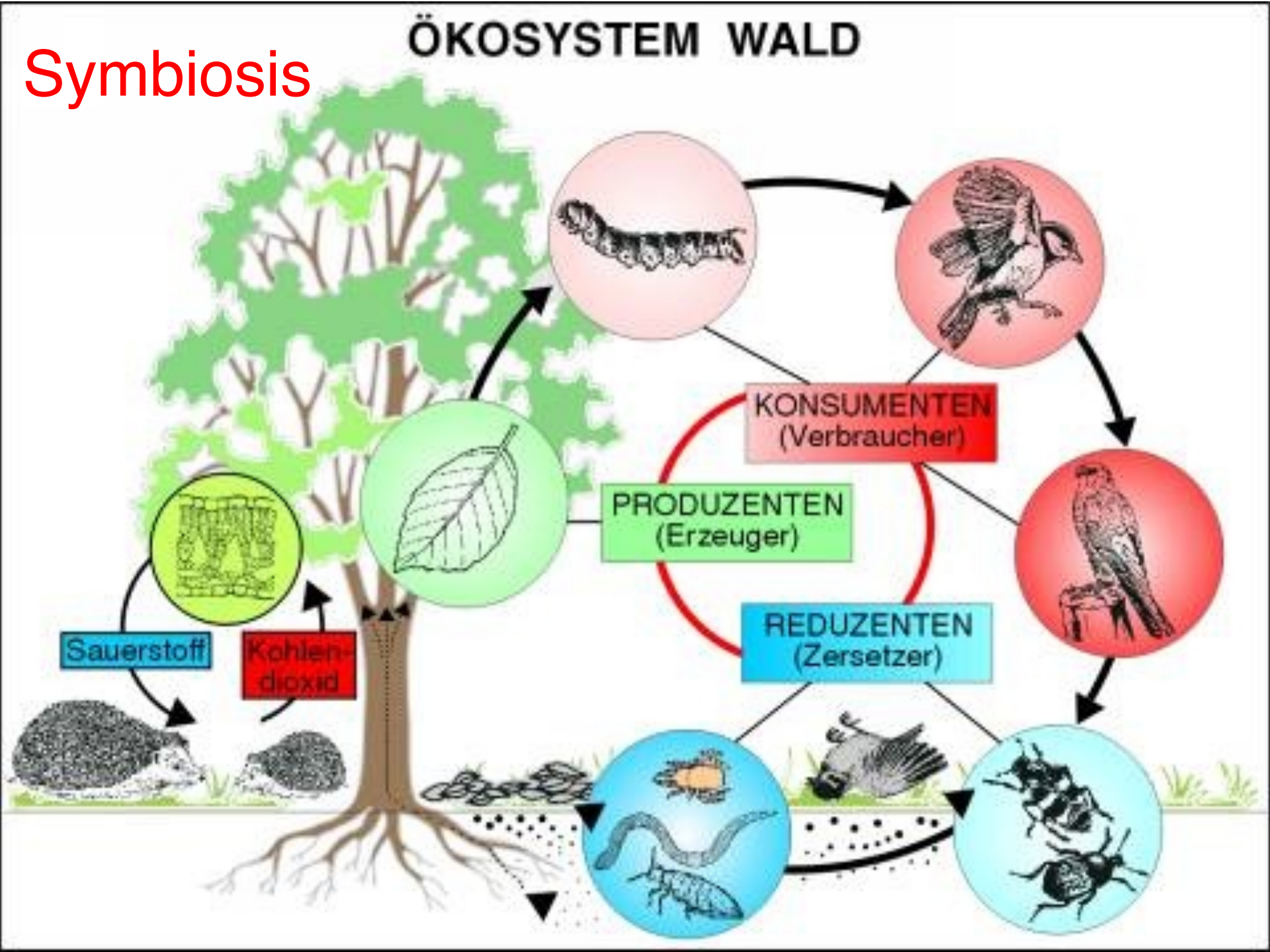
A Typical Supply Network Today

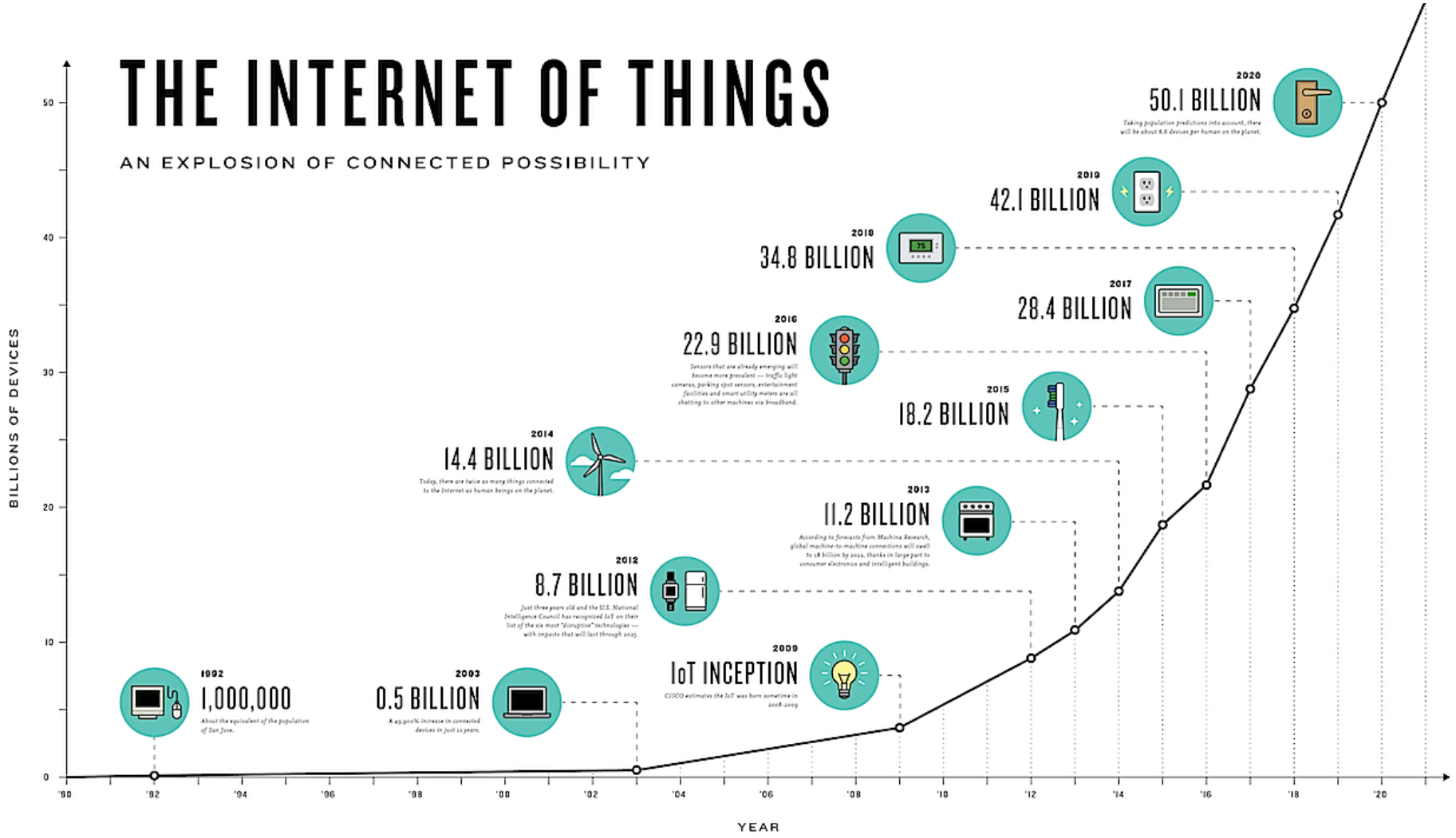


A Typical Metabolic Network

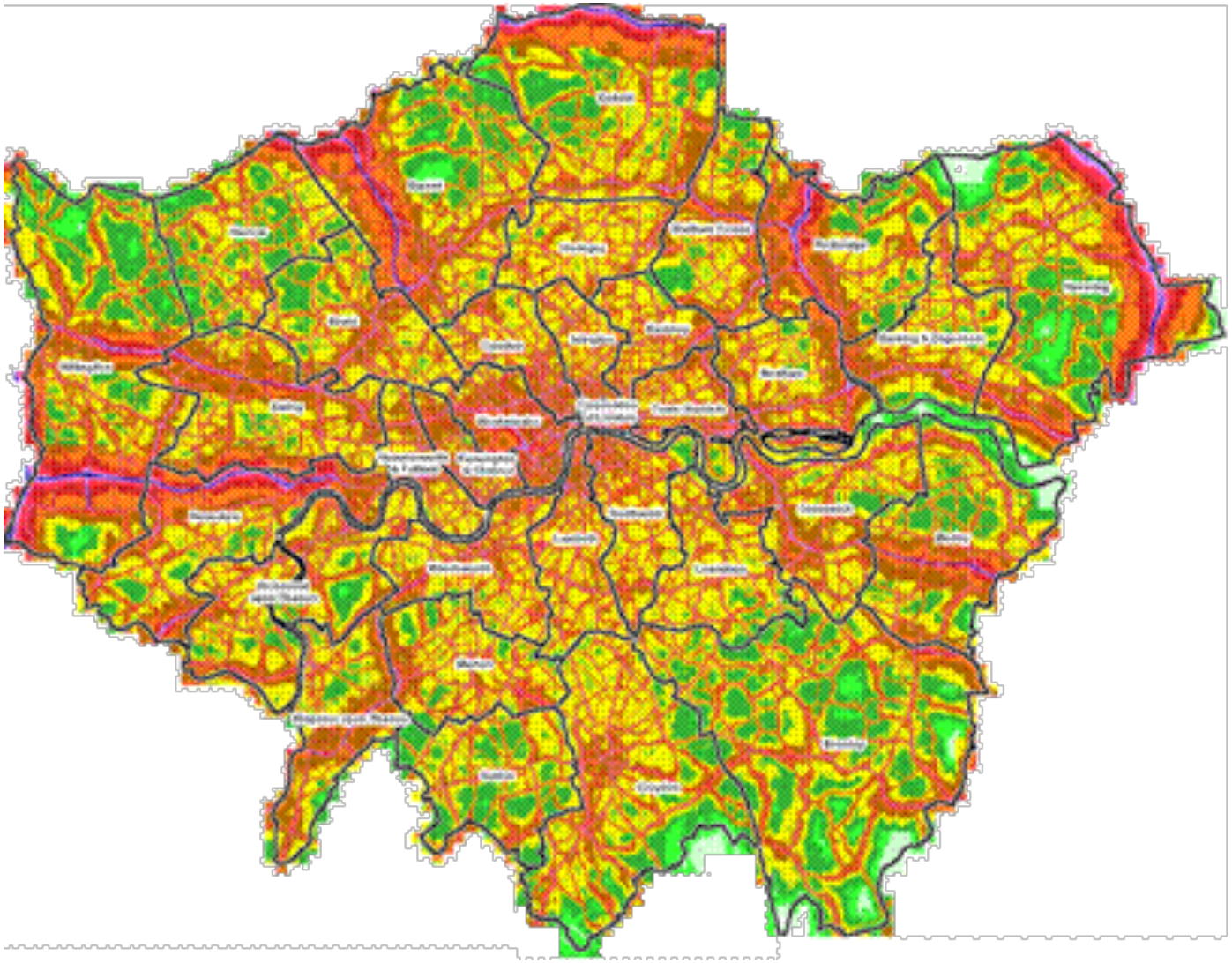


Symbiosis


ÖKOSYSTEM WALD
KONSUMENTEN
(Verbraucher)
PRODUZENTEN
(Erzeuger)
REDUZENTEN
(Zersetzer)
Sauerstoff
Kohlen-
dioxid


THE INTERNET OF THINGS
AN EXPLOSION OF CONNECTED POSSIBILITY
1992
1,000,000
About the equivalent of the population of San Jose.
2003
0.5 BILLION
A 49,900% increase in connected devices in just 10 years.
2009
IoT INCEPTION
CISCO estimates the IoT was born sometime in 2008-2009
2012
8.7 BILLION
Just three years old and the U.S. National Intelligence Council has recognized IoT on their list of the six most "disruptive" technologies — with impacts that will last through 2025.
2013
11.2 BILLION
According to forecasts from Machina Research, global machine-to-machine connections will swell to 18 billion by 2022, thanks in large part to consumer electronics and intelligent buildings.
2014
14.4 BILLION
Today, there are twice as many things connected to the Internet as human beings on the planet.
2015
18.2 BILLION
2016
22.9 BILLION
Sensors that are already emerging will become more prevalent — traffic light cameras, parking spot sensors, entertainment facilities and smart utility meters are all chatting to other machines via broadband.
2017
28.4 BILLION
2018
34.8 BILLION
2019
42.1 BILLION
2020
50.1 BILLION
Taking population predictions into account, there will be about 6.6 devices per human on the planet.
BILLIONS OF DEVICES
0
10
20
30
40
50
'90
'92
'94
'96
'98
'00
'02
'04
'06
'08
'10
'12
'14
'16
'18
'20
YEAR

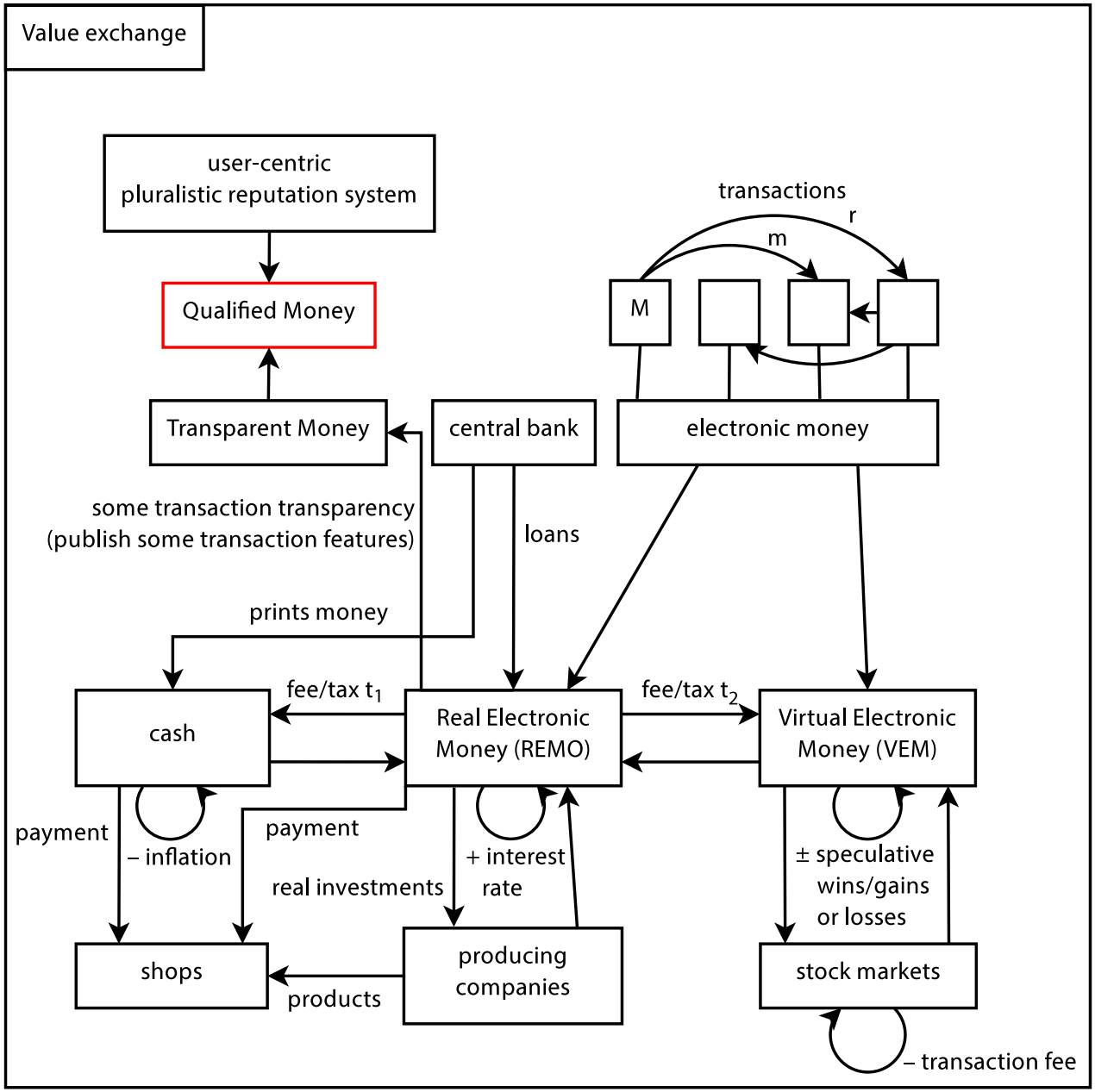
Mapping Noise and other Externalities



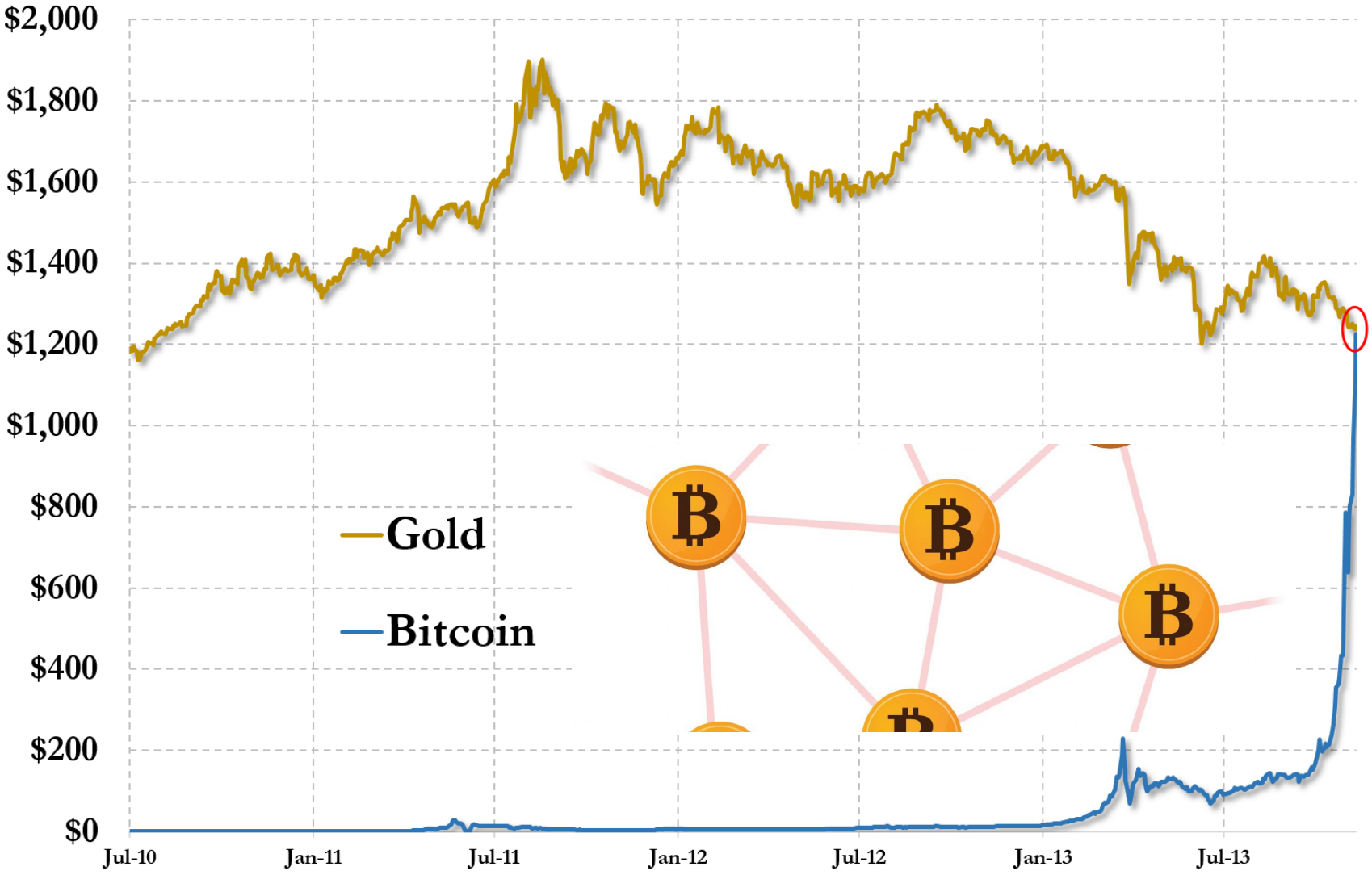
The No. 1 Principle

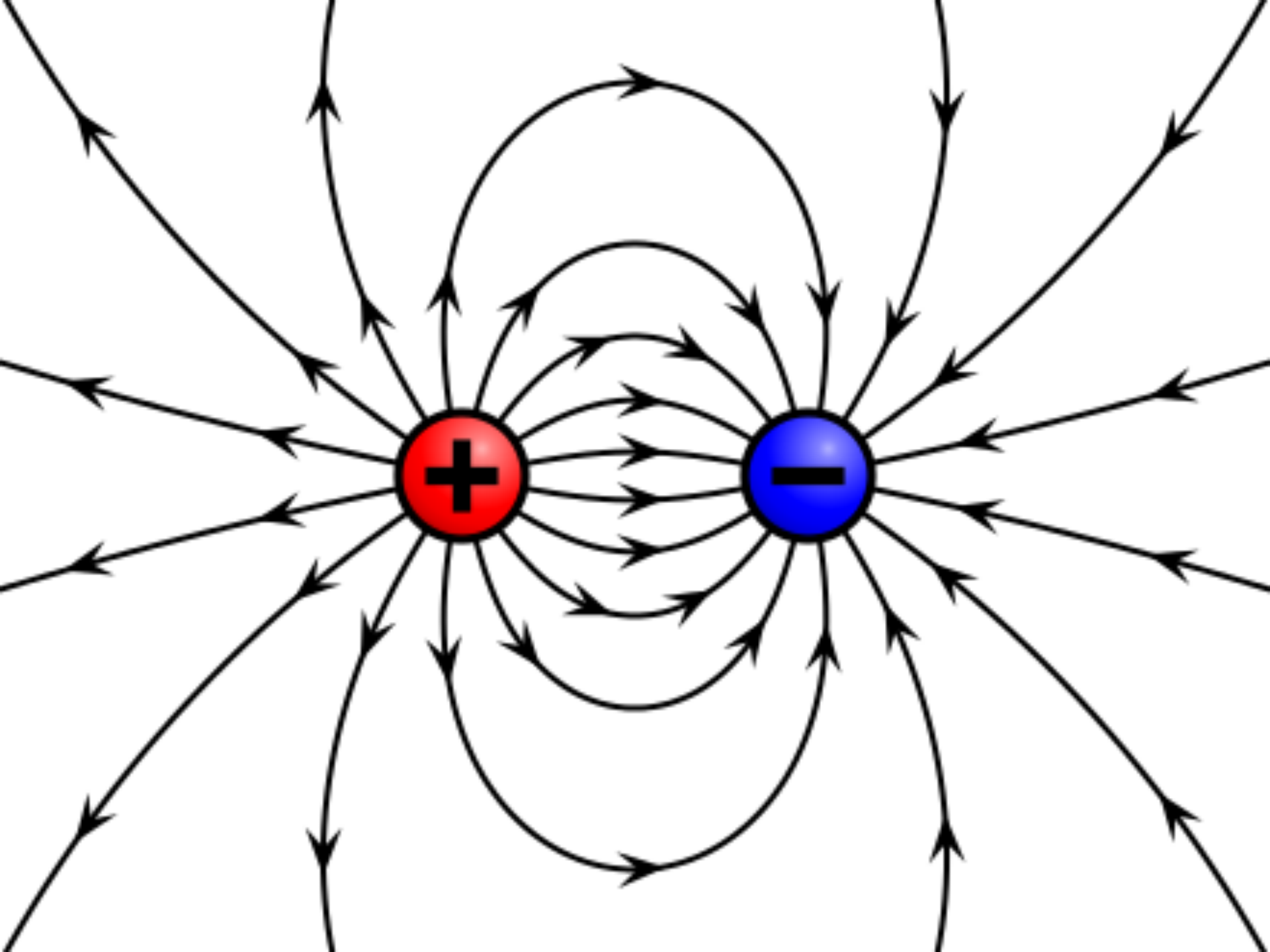
Increase positive externalities, reduce negative ones, and ensure fair compensation

We Need a Multi-Dimensional Incentive/Reward System: „Qualified Money“

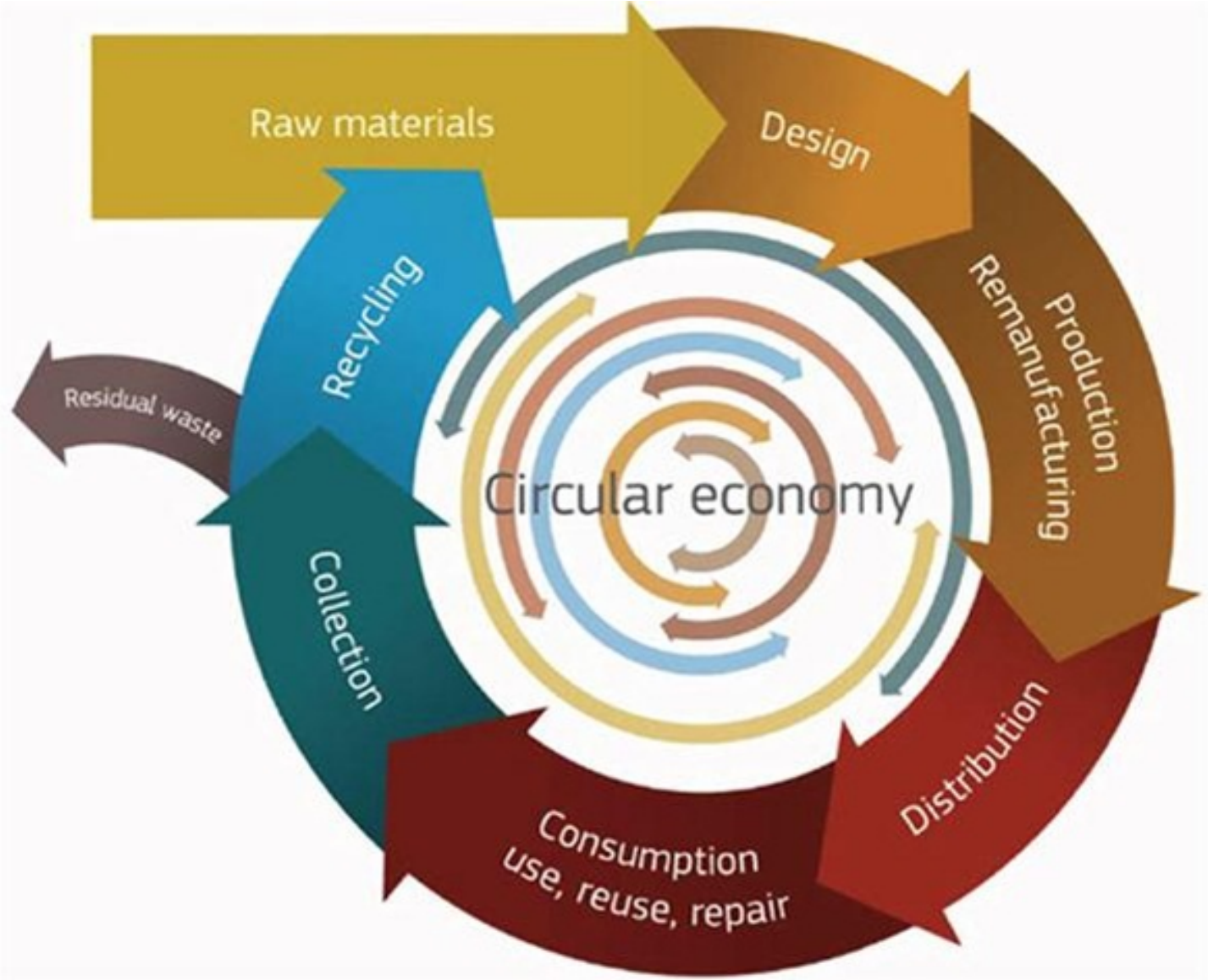


It is now possible to create such new money(s), as BitCoin has shown

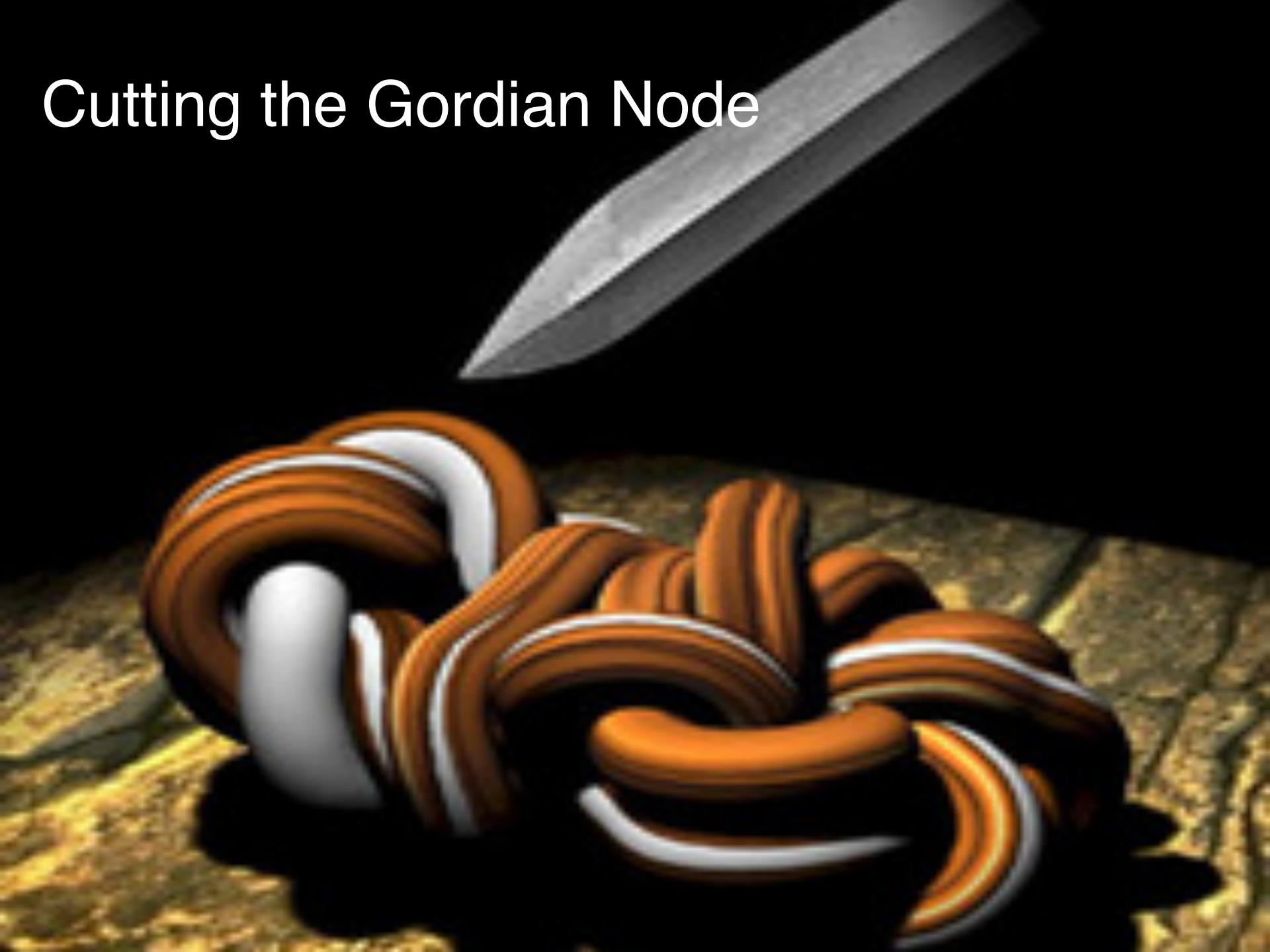




Circular Economy



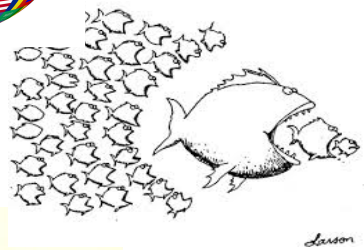
Cutting the Gordian Node



A Resilient World
Redundancy
Decentralization, Modular Design
Diversity, Pluralism
Distributed Control
Multi-dimensional, Local Feedback
Participatory Approaches
Digital Assistance/Coordination

Support Favorable Interactions with Personal Digital Assistants

Task	Technology
Support situational / context awareness	**Social Mirror**
Facilitate profitable interactions	**Social Adapter**
Avoid lossful interactions	**Social Protector**
Incentivize favorable interactions / support value transfer	**Social Money**

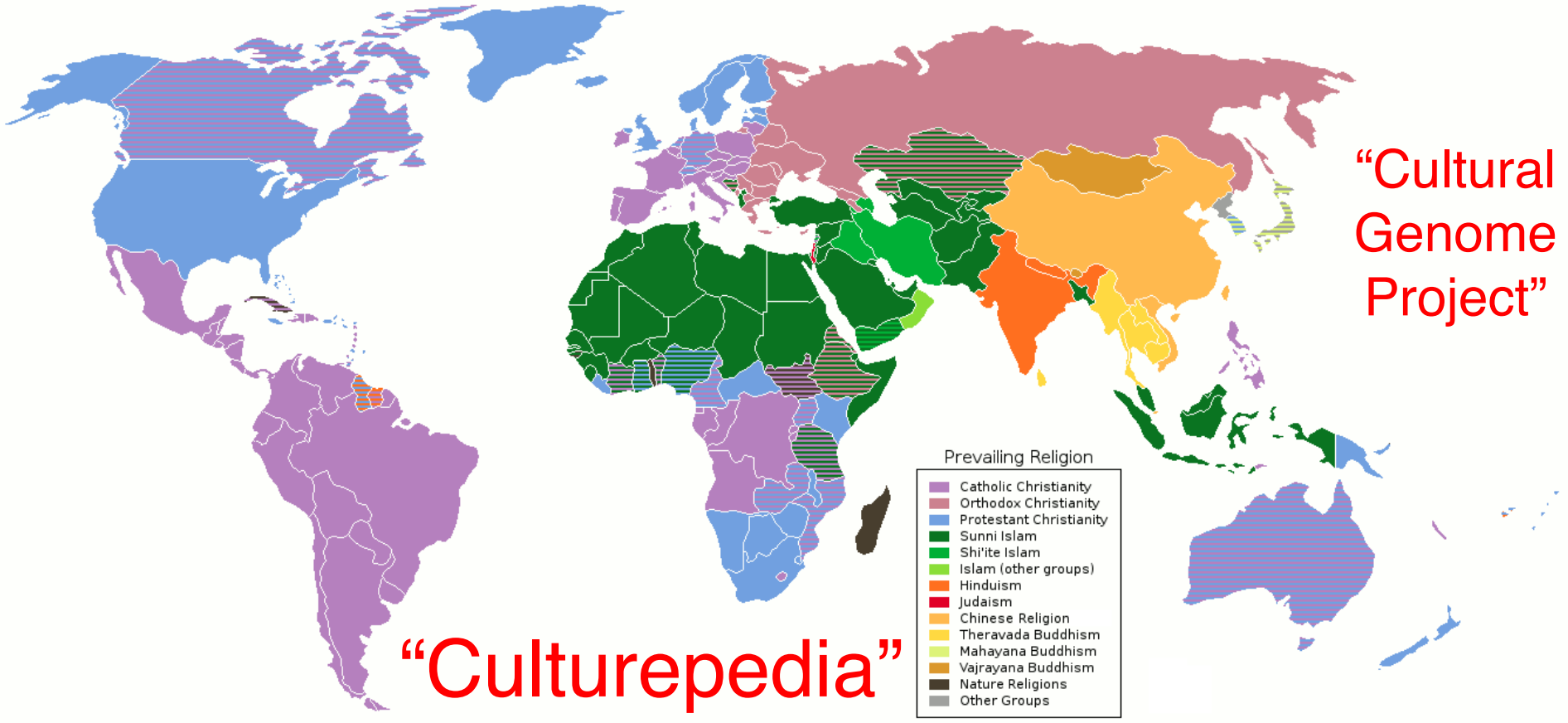


Combine the Best of All Systems

- Competition (Capitalism)
- Cooperation (Global Approach)
- Experimentation (Evolution)
- Intelligent Design (Big Data, AI)
- Collective Intelligence (Democracy)

But how???

Discover, Use and Combine the Success Principles Underlying Different Cultures



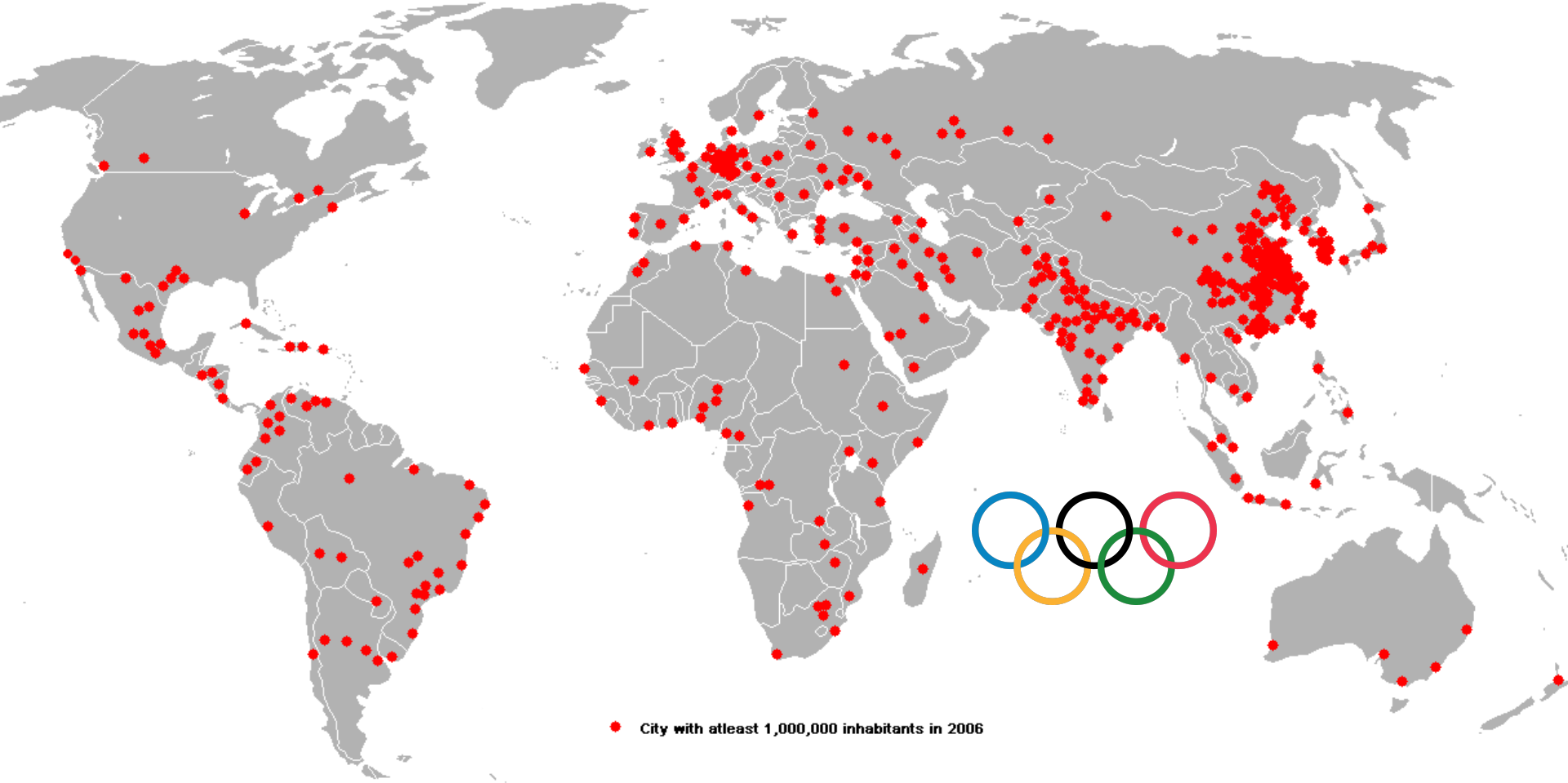
"Cultural Genome Project"

"Culturepedia"

Overcome the large degree of "cultural analphabetism"

Image by LilTeK21 on commons.wikimedia.org, GNU Free Documentation License

Countering Global Problems Bottom-Up: City Olympics for Better Climate, Energy, Sustainability + Resilience Solutions



Public domain (SoccerFan (update to a map done by Bogdan)

Glocalisation Rather than Globalisation

- Think global
- Act local (and diverse)
- Experiment
- Learn from each other
- Help each other

Let‘s Do This Together!

Image Source: http://demosite.in/applicationdevelopment.php