Artificial Creative Systems

Multi-agent Simulations of Social Creativity

Rob Saunders, University of Sydney

Outline

- Motivation for studying social creativity
  - Why study social creativity?
  - Why model social creativity?
- Approaches to modelling social creativity
  - What approaches have been used?
  - How is computational creativity different?
- An agent-based model of creative systems
  - A systems view of creativity[1]
  - An artificial creative system

Join "Social Creativity" and open:

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http://social-creativity.local/~rob/autumn/
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Let's jump in...

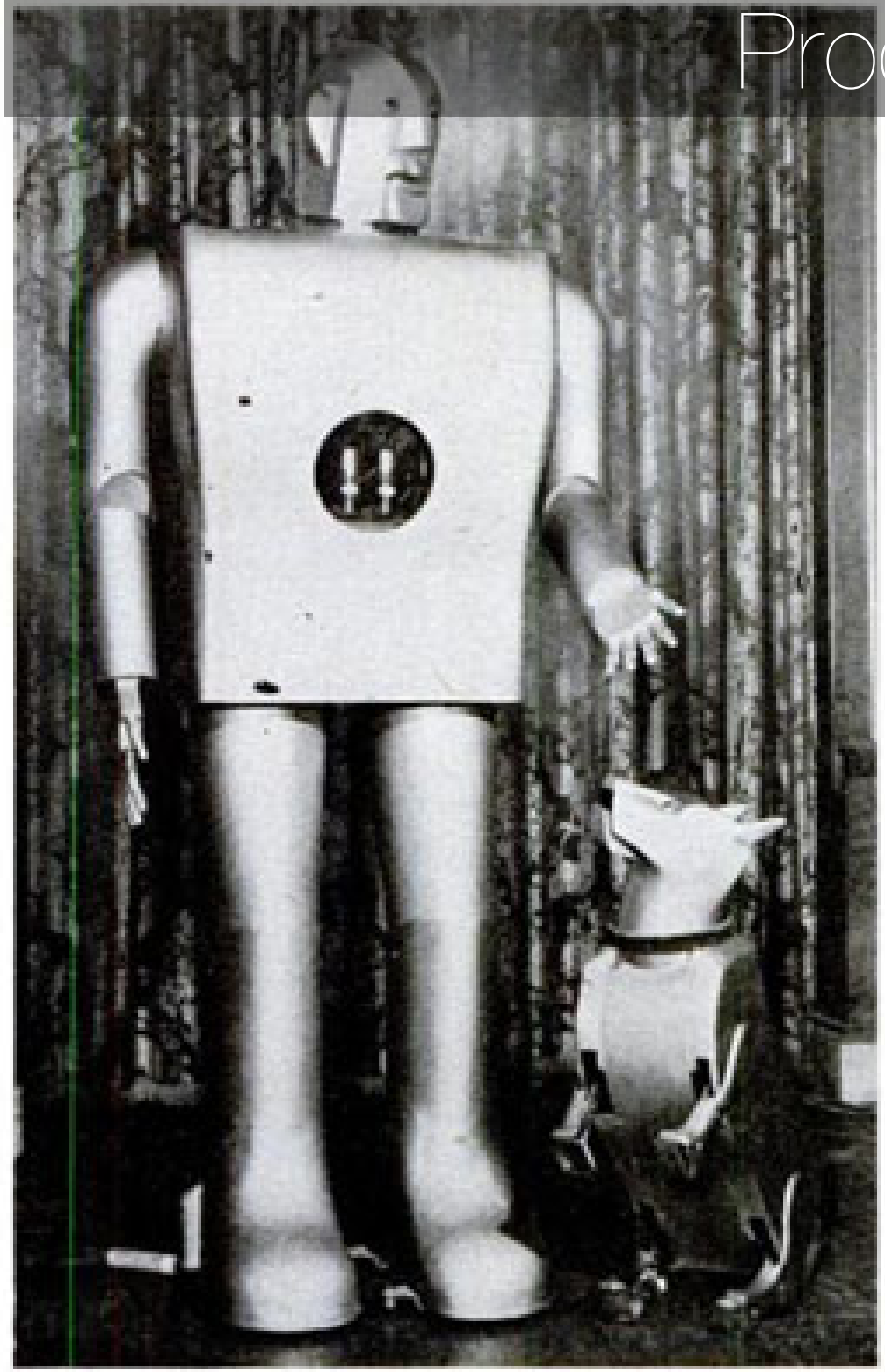
Why Study Social Creativity?

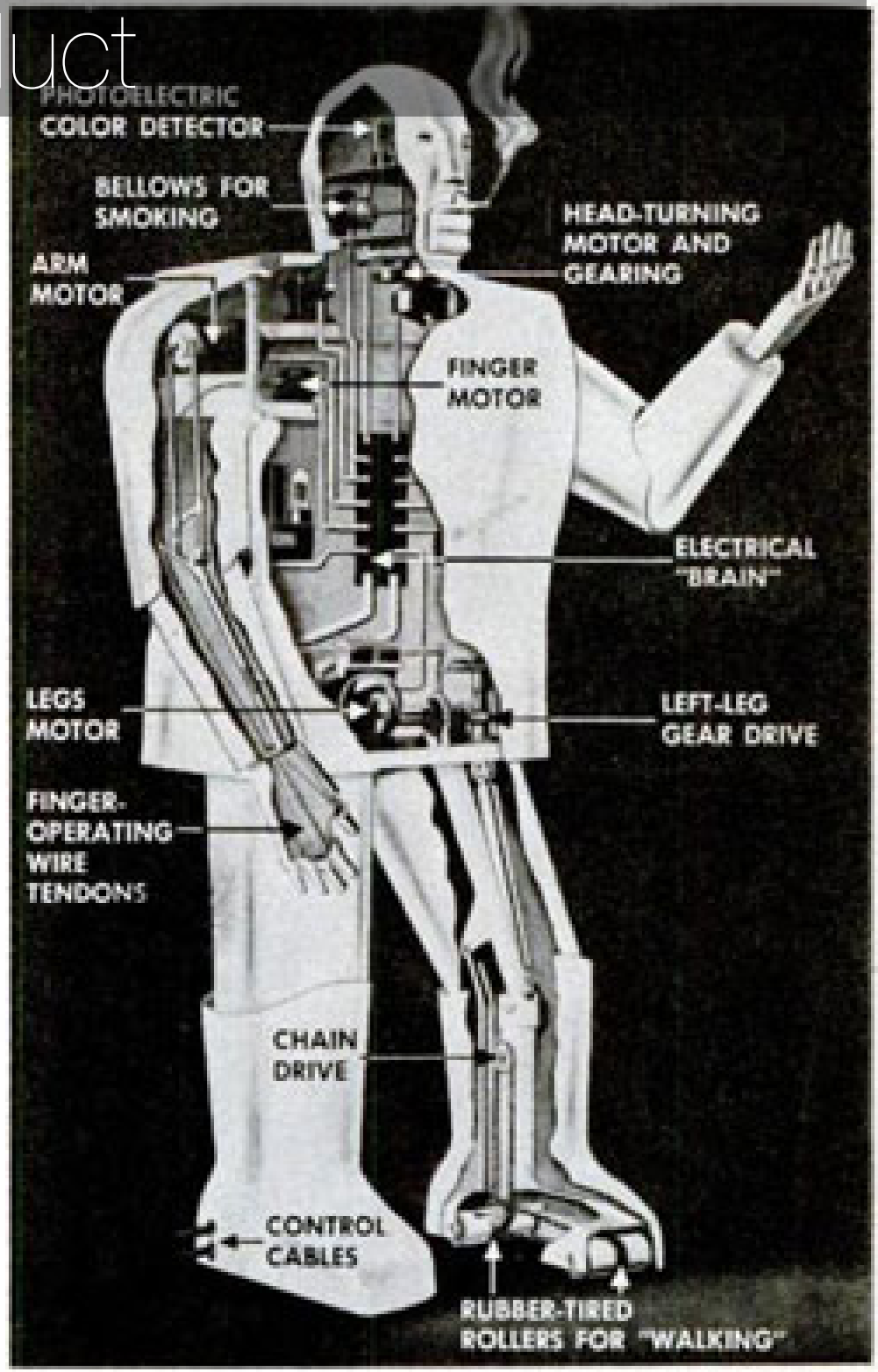
The Myth of the Lone Genius

The Four Ps of Creativity

Process

Product




PHOTOELECTRIC
COLOR DETECTOR
BELLOWS FOR
SMOKING
HEAD-TURNING
MOTOR AND
GEARING
ARM
MOTOR
FINGER
MOTOR
ELECTRICAL
"BRAIN"
LEGS
MOTOR
LEFT-LEG
GEAR DRIVE
FINGER-
OPERATING
WIRE
TENDONS
CHAIN
DRIVE
CONTROL
CABLES
RUBBER-TIRED
ROLLERS FOR "WALKING"

People

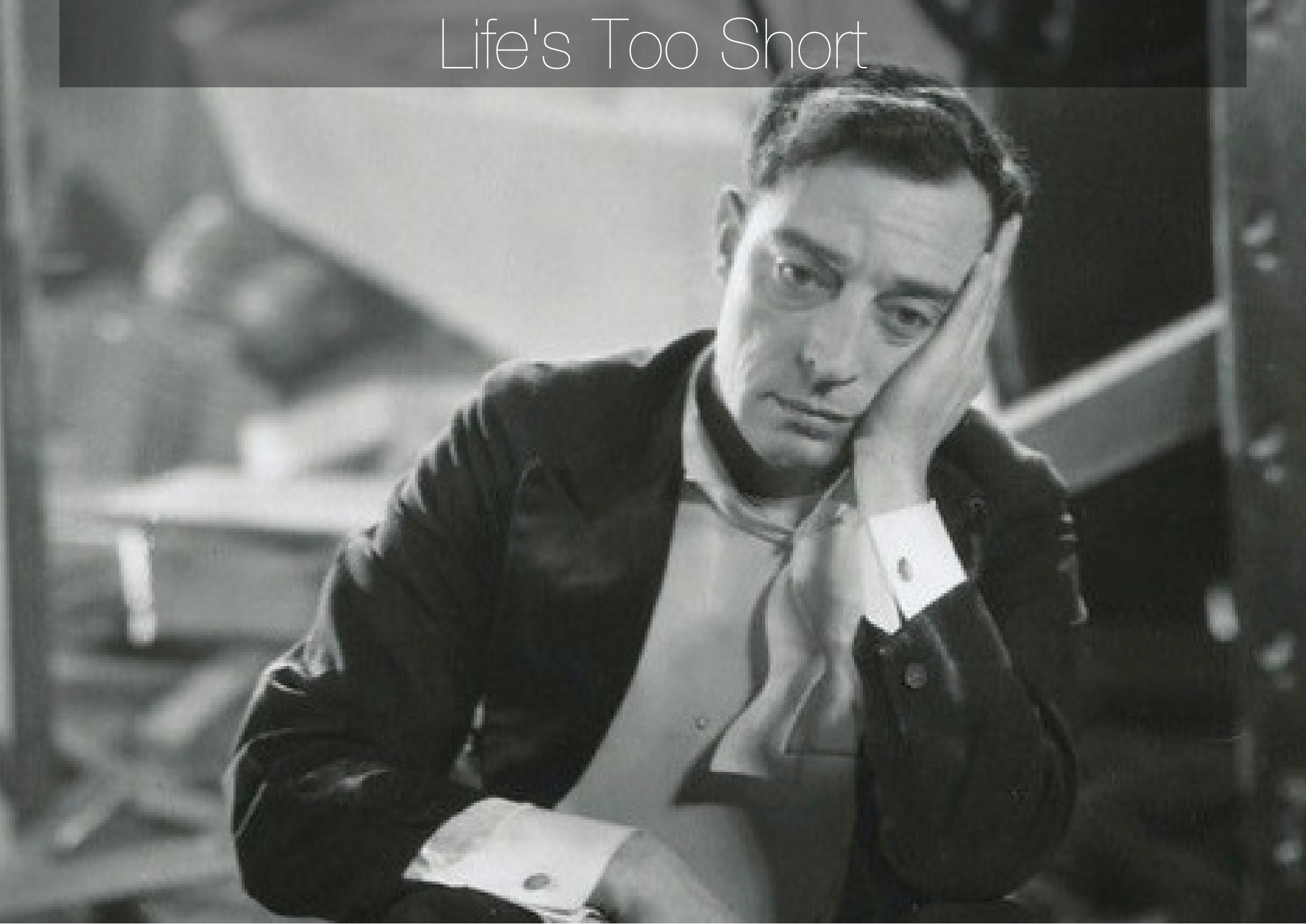
Press

Buy Four Get One Free!

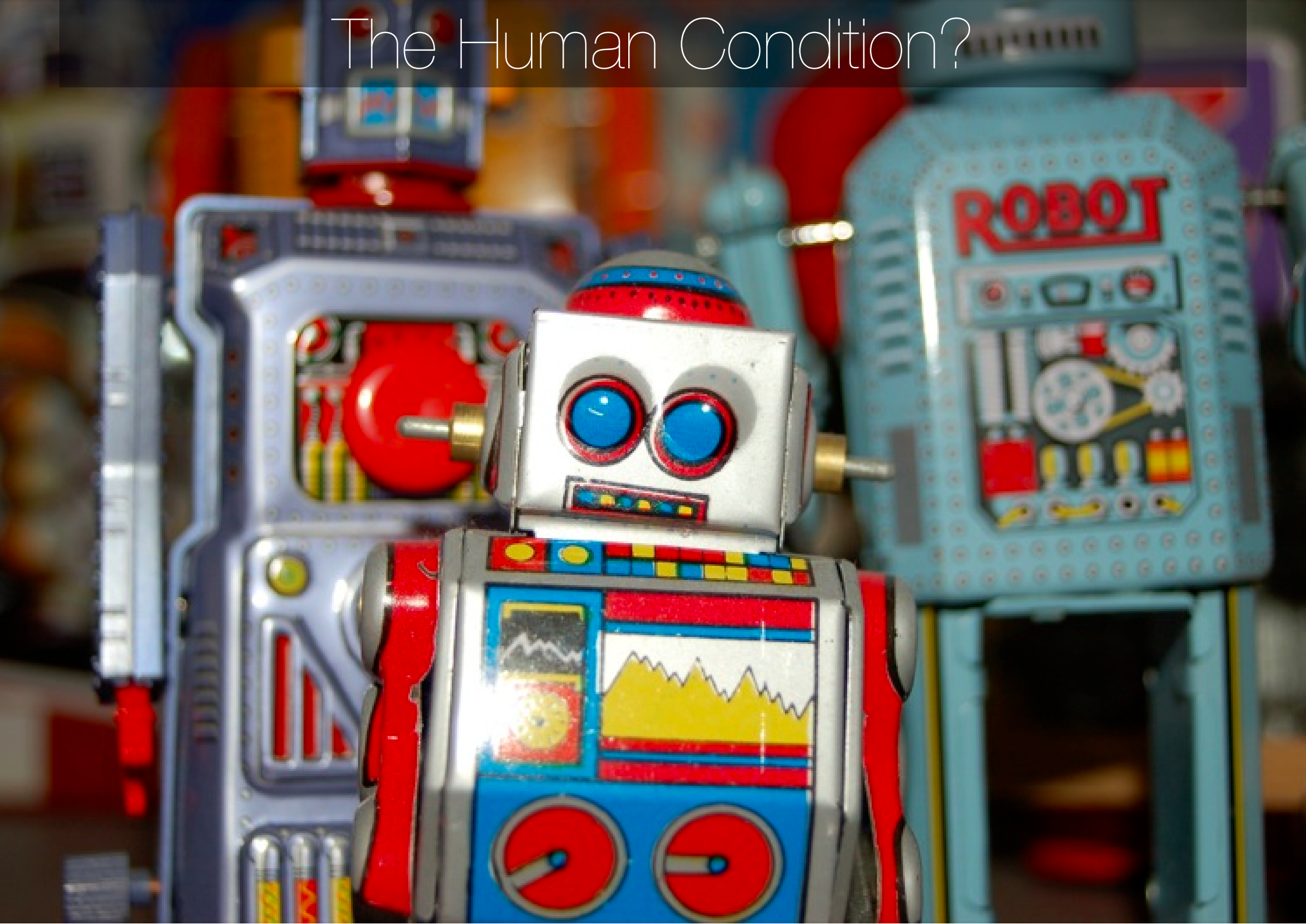
Persuasion

Why Model Social Creativity?

Life's Too Short



The Human Condition?



Approaches to Modelling Social Systems

Multi-agent Simulations

Autonomy

No central "top down" control.

Bounded Rationality

No access to global information.

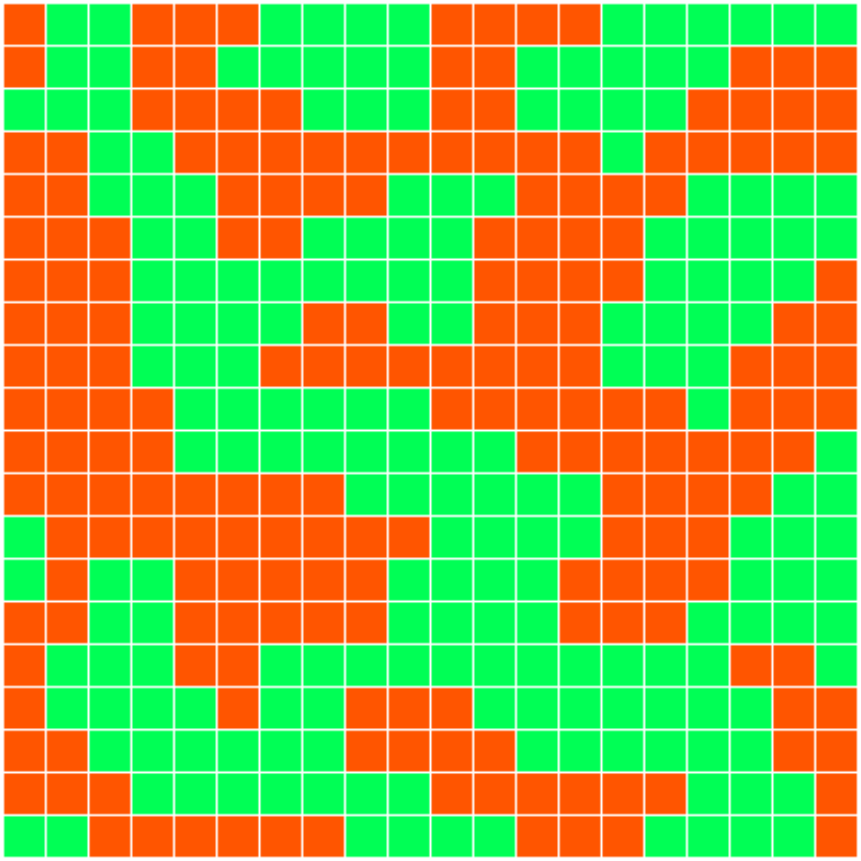
Local Interactions

Agents interact with "neighbours".

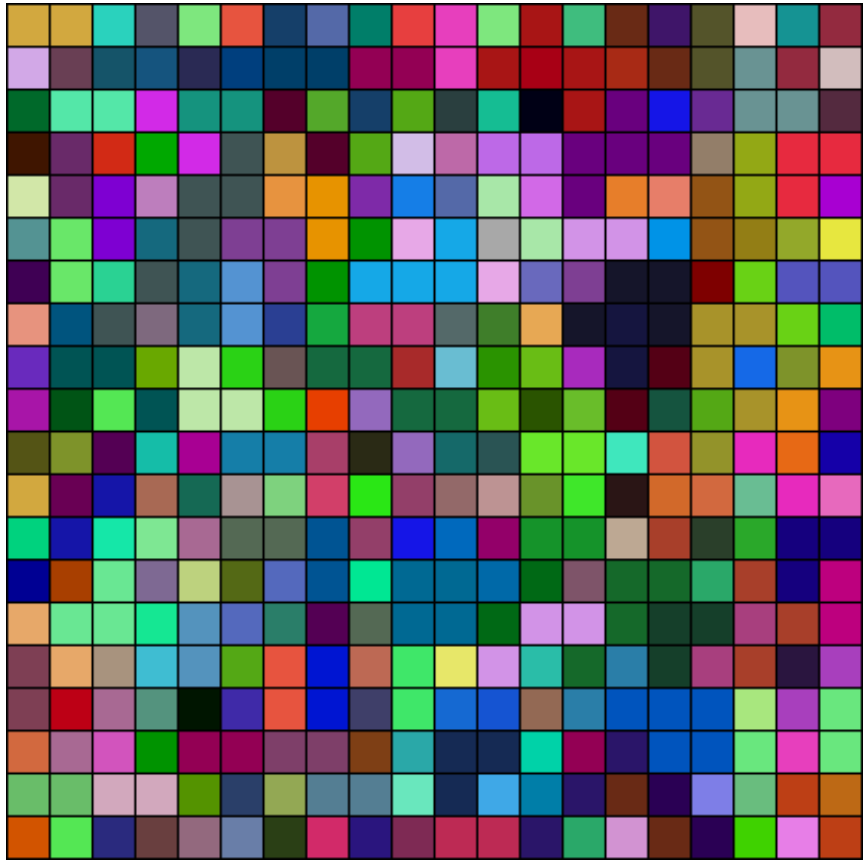
Spatial Models

Lattices, dynamic networks, spaces, etc.

Computational Social Science



Schelling's Model of Segregation



Axelrod's Model of Dissemination

Why Computational Creativity?

The Computational Social Sciences and Economics have been doing things like this since the 1960s, so what's the big deal about modelling social creativity as part of computational creativity?

- Focus on the phenomenon of creativity
- Focus on the production of artefacts
- Multi-level modelling (individual/social/cultural)

What Has Been Done?

What Models Have Been Produced?

Bown

Multi-agent model of the evolution of music

Colton

Multi-agent model for exploring number sequences

Saunders

Multi-agent model of emergence of 'cliques'

Sosa

Multi-agent model of emergence of 'gatekeepers'

An Agent-Based Model of Social Creativity

What Could We Model?

Systems-Based Models of Creativity

Vygotsky

Cultural Systems: creators use culturally constructed symbols and tools to produce new cultural artifacts

Luhmann

Autopoeitic Social Systems: communication is the essential element of the system, individuals are replaceable

Csikszentmihalyi

DIFI / Creative Systems: creativity happens in the interaction between three components of a creative system: domain, field and individual

A Systems View of Creativity

Domain

artefacts, descriptions, practices, laws

Individual

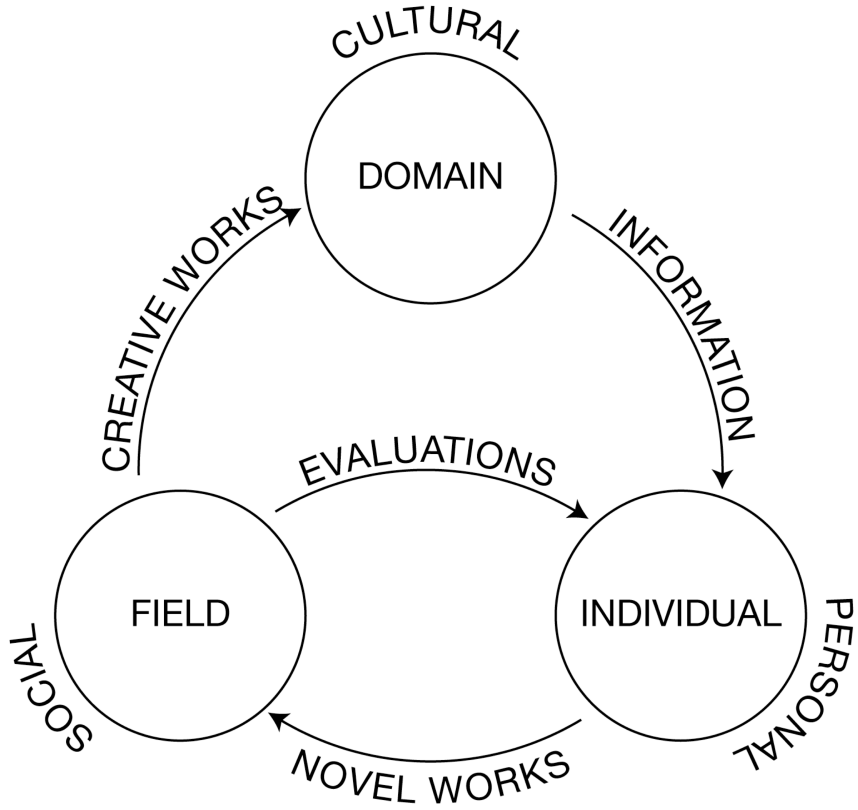
generator of novelty

Field

peers and other gatekeepers

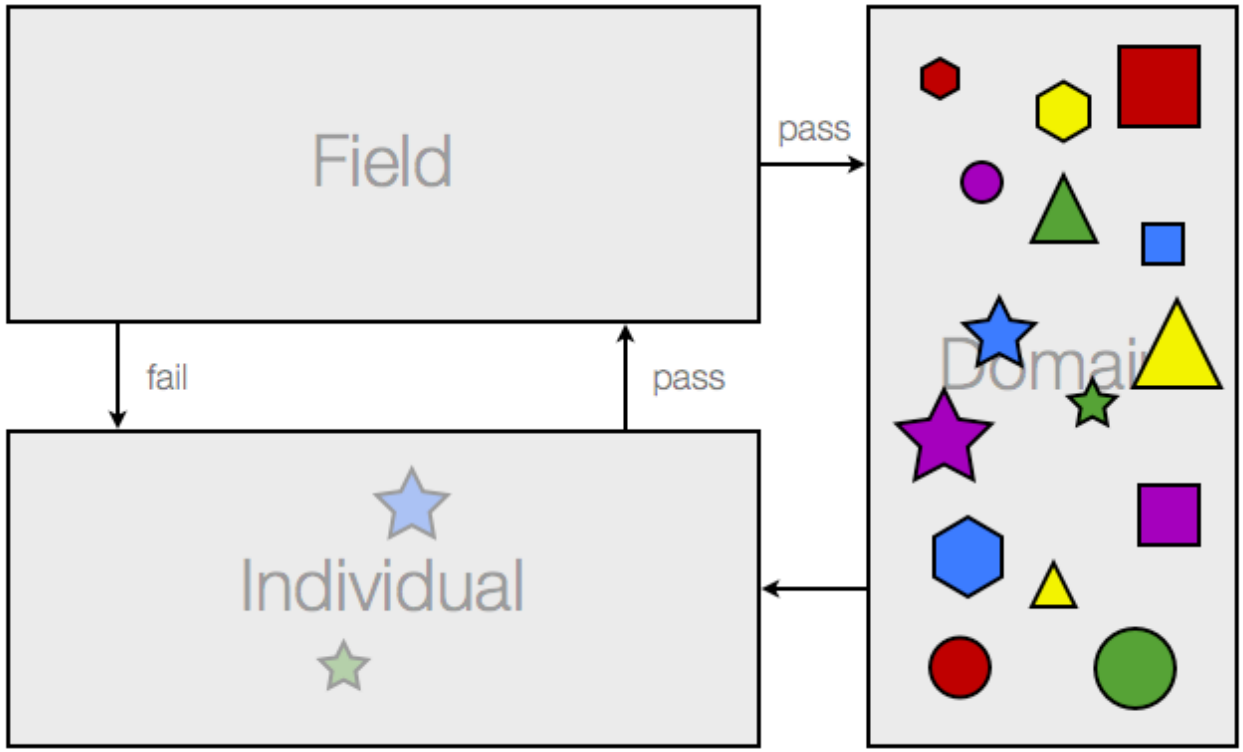
Interaction

flow of information between components

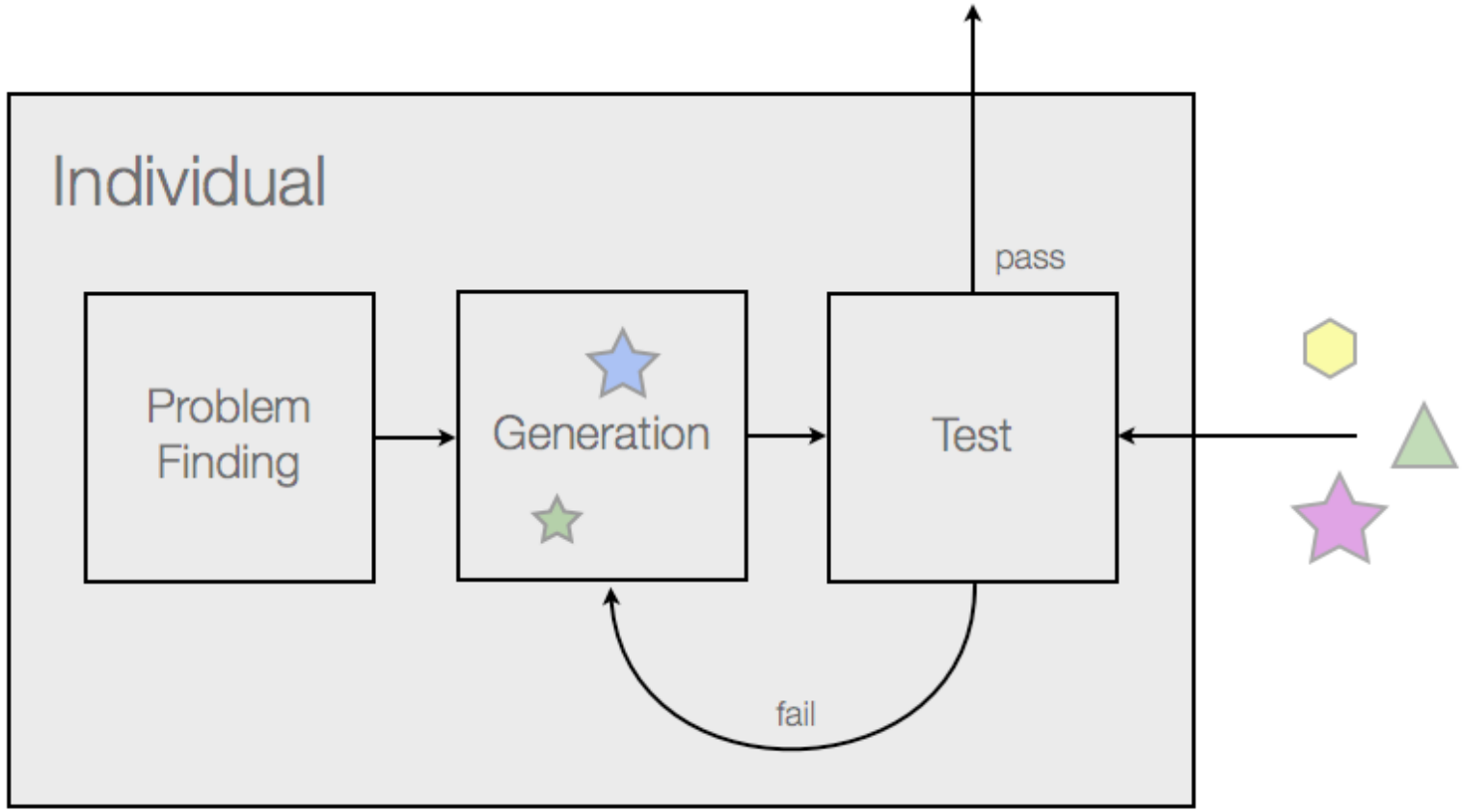


Csikszentmihalyi's System View of Creativity

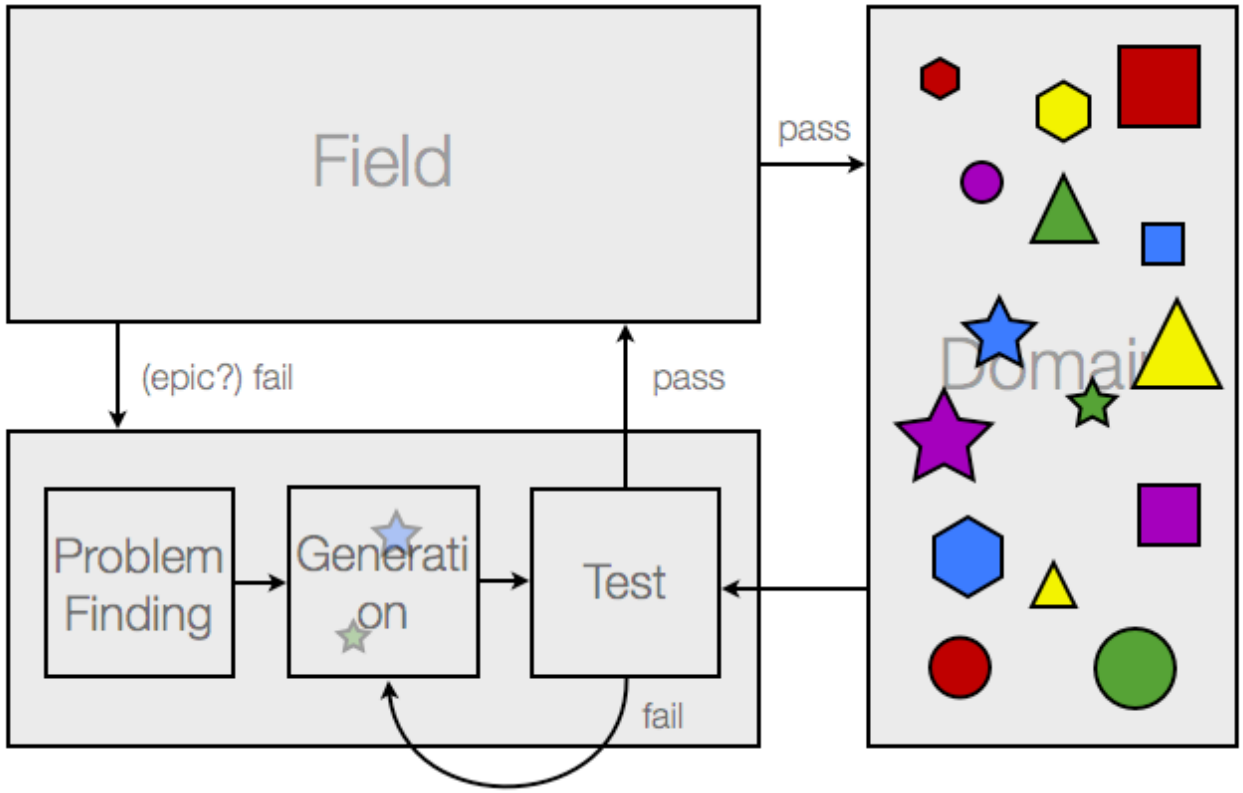
Generate-and-Test



Generate-and-Test (?)

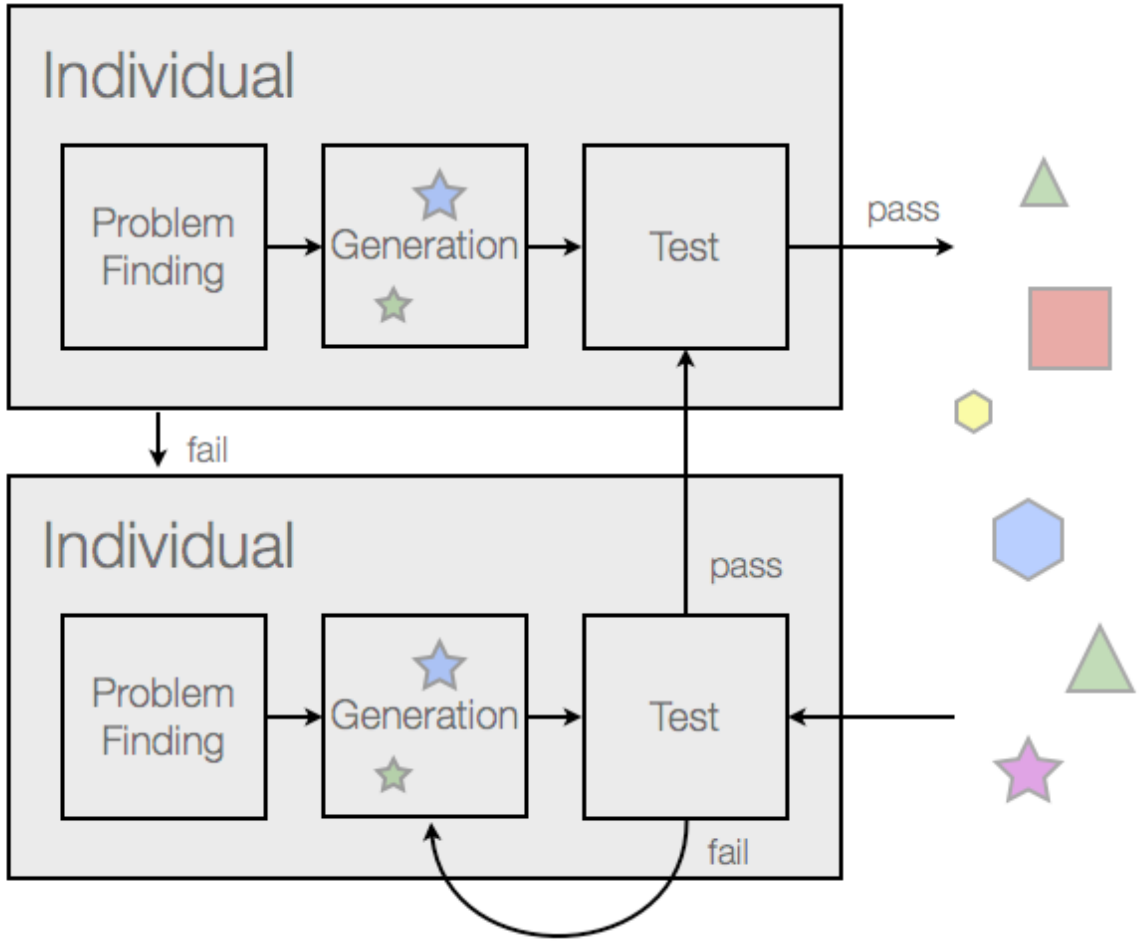


Dual Generate-and-Test

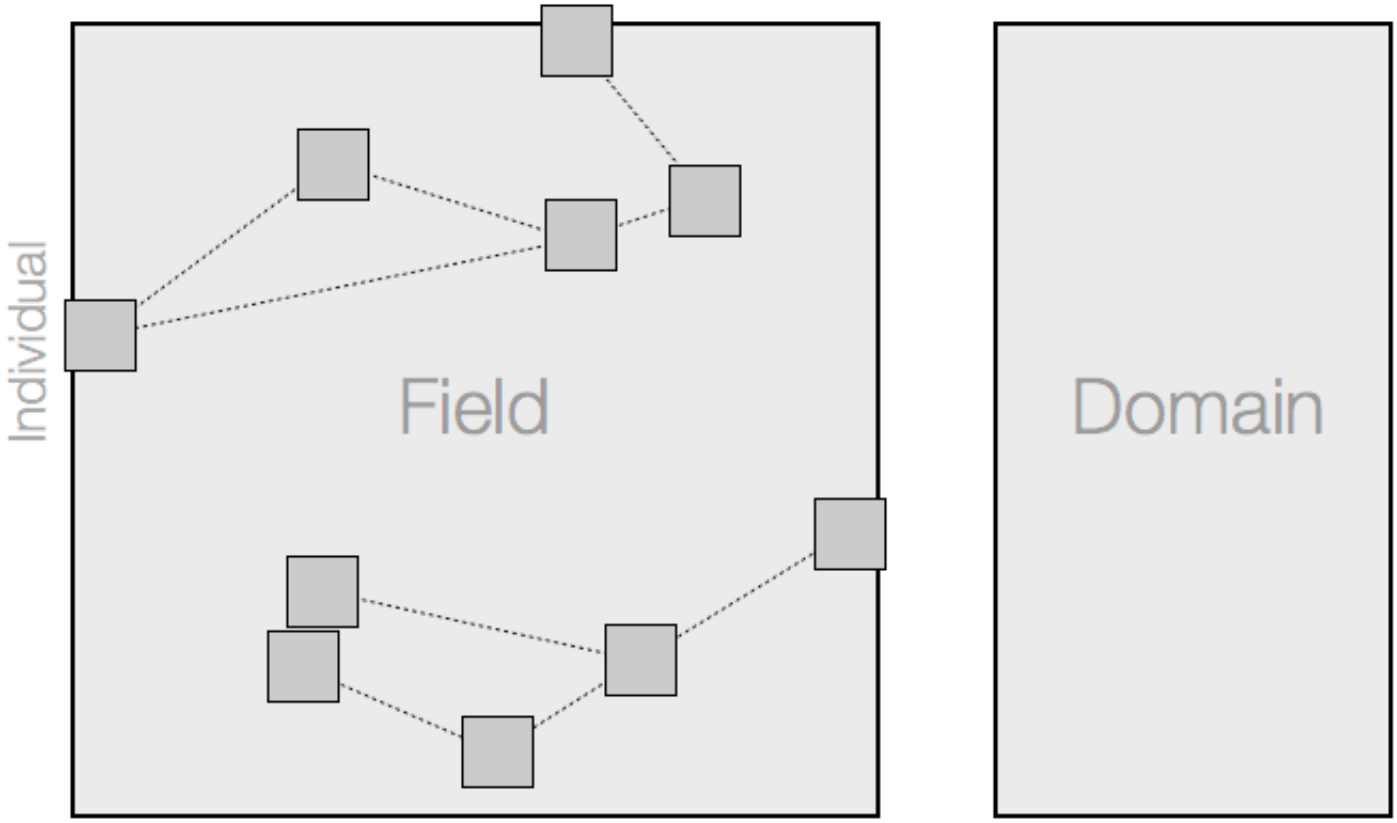


Distributing the Field

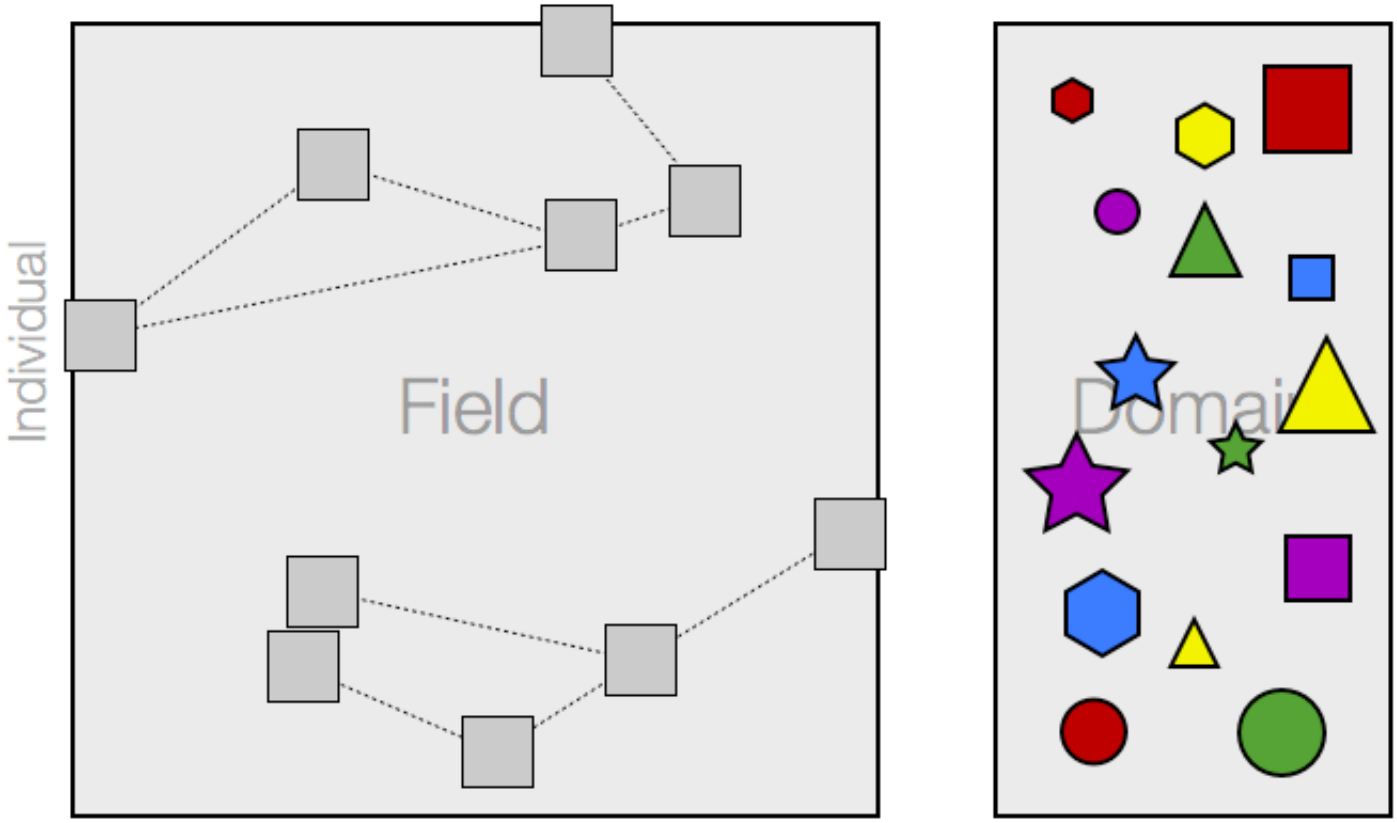
Artificial Creative Systems



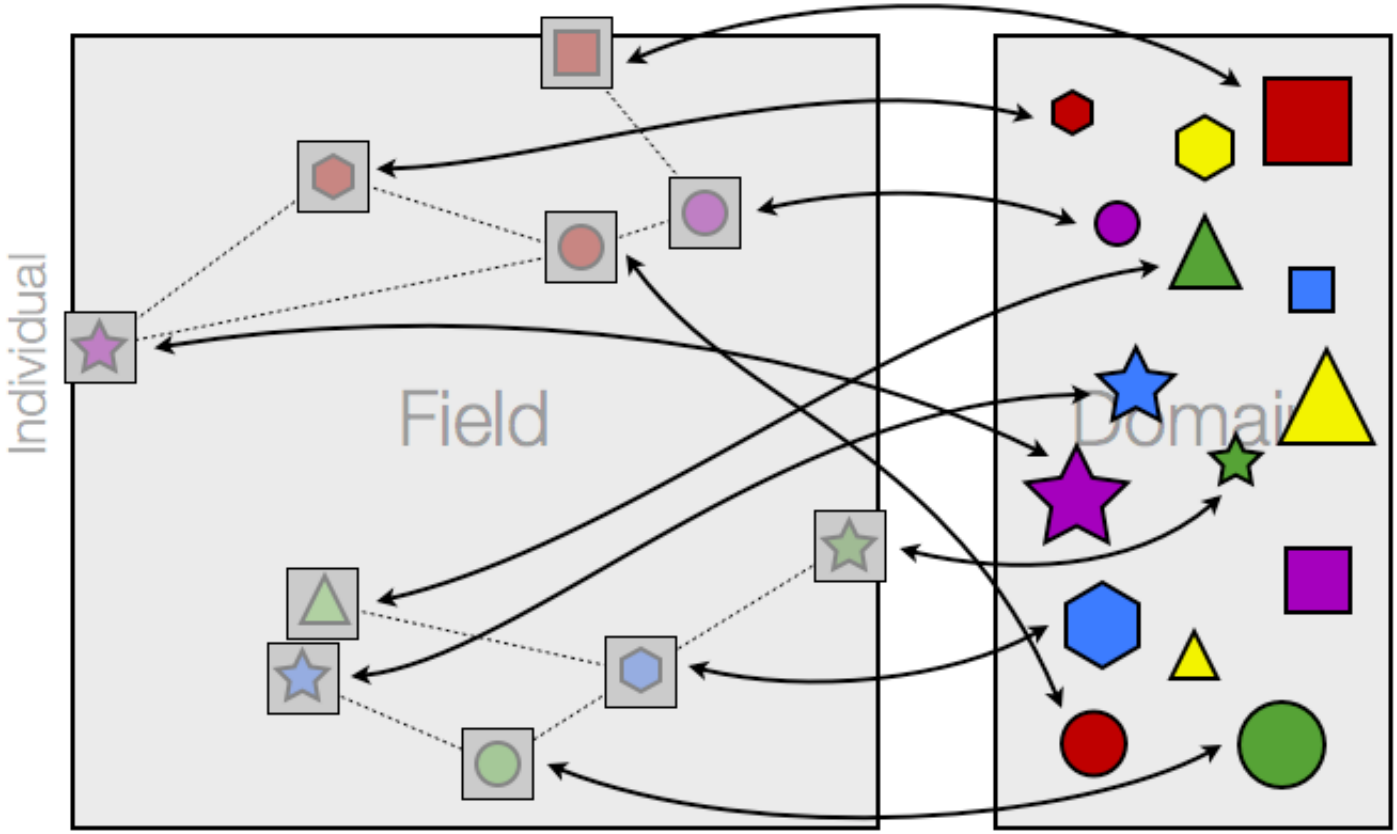
Artificial Creative Systems



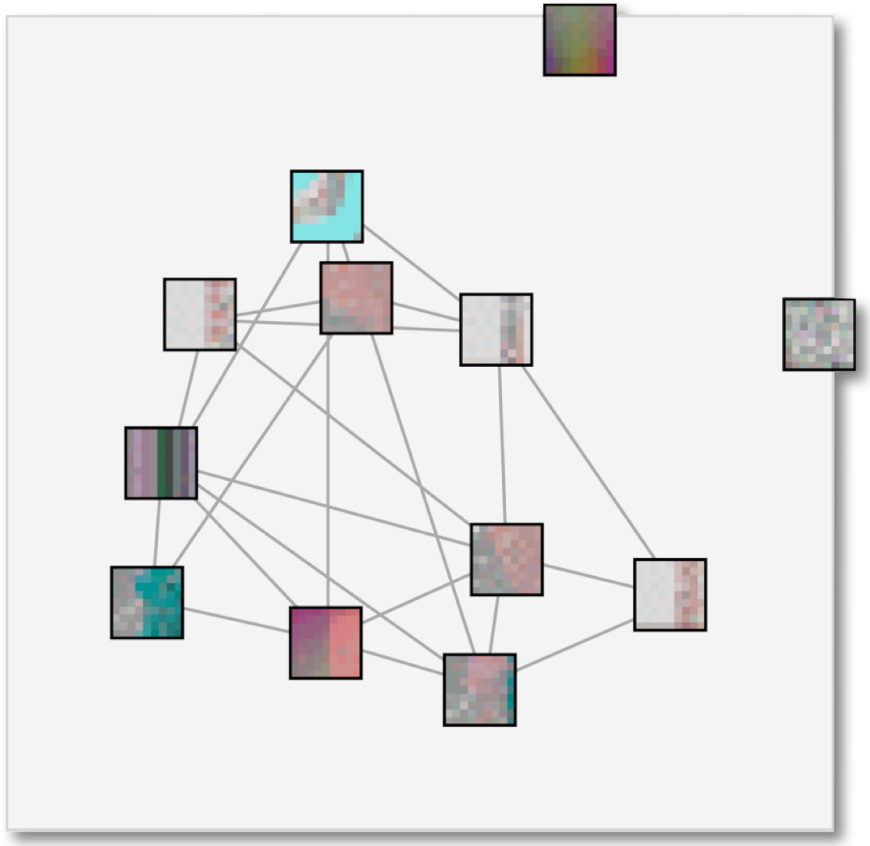
Artificial Creative Systems



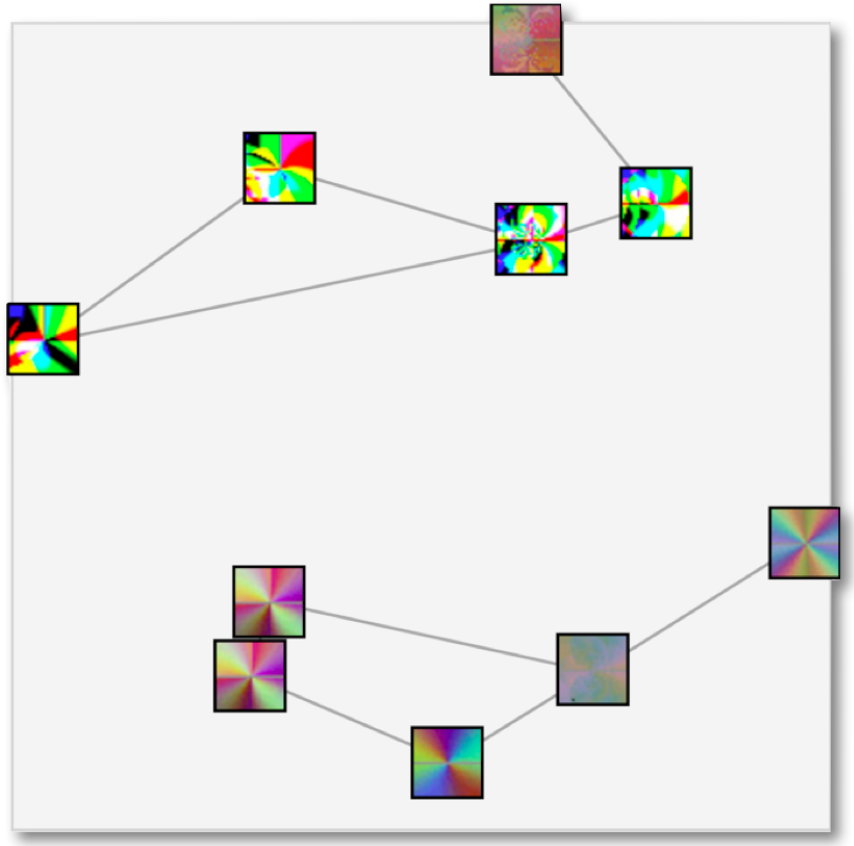
Artificial Creative Systems



The Digital Clockwork Muse



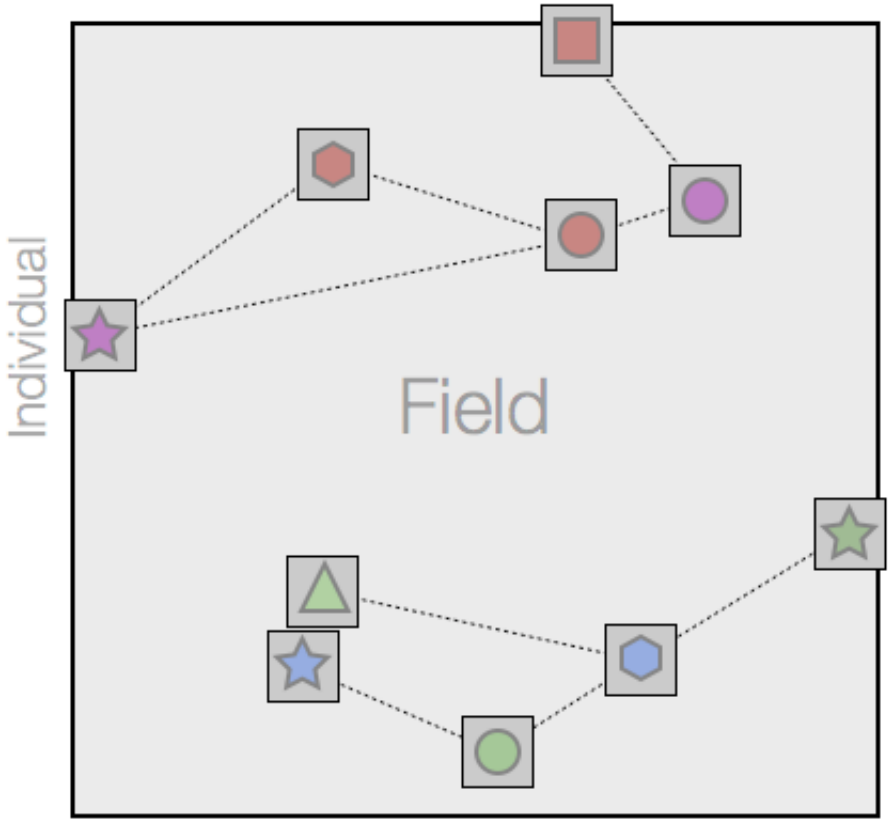
Law of Novelty



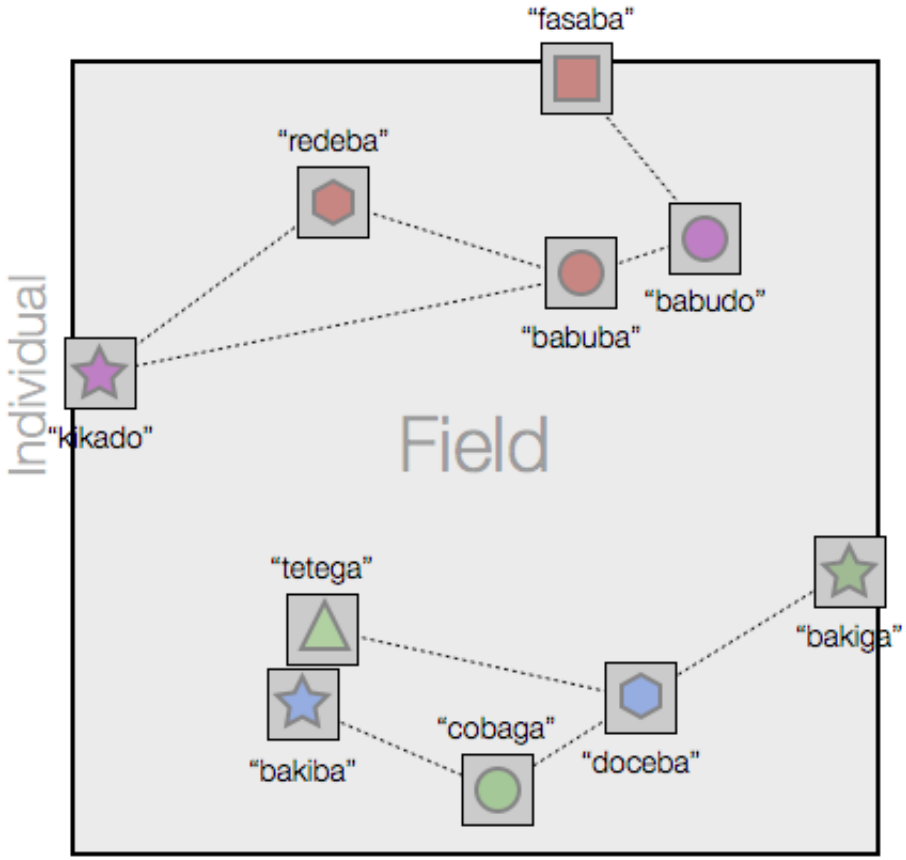
Clique Formation

Distributing the Domain

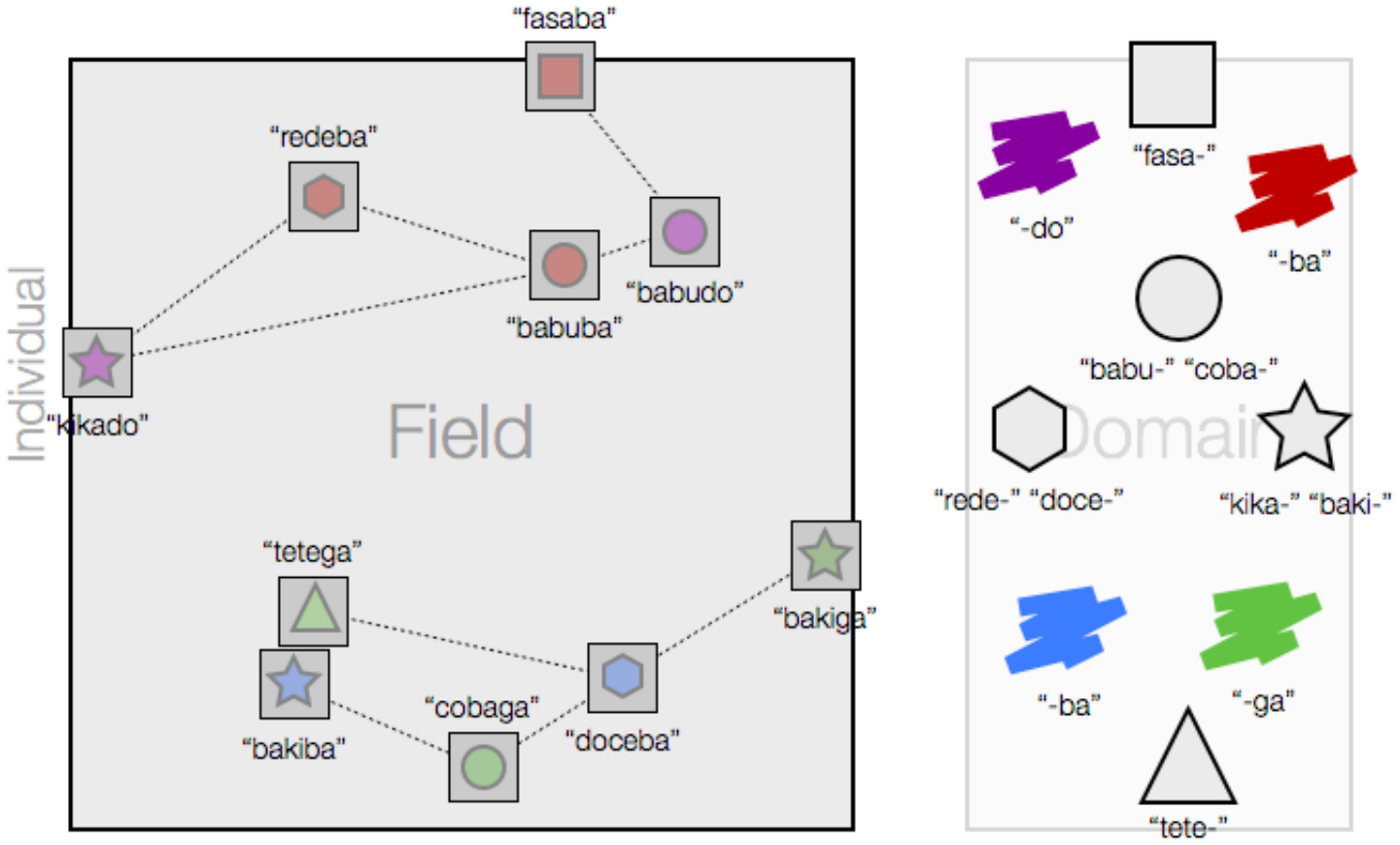
Artificial Creative Systems



Artificial Creative Systems

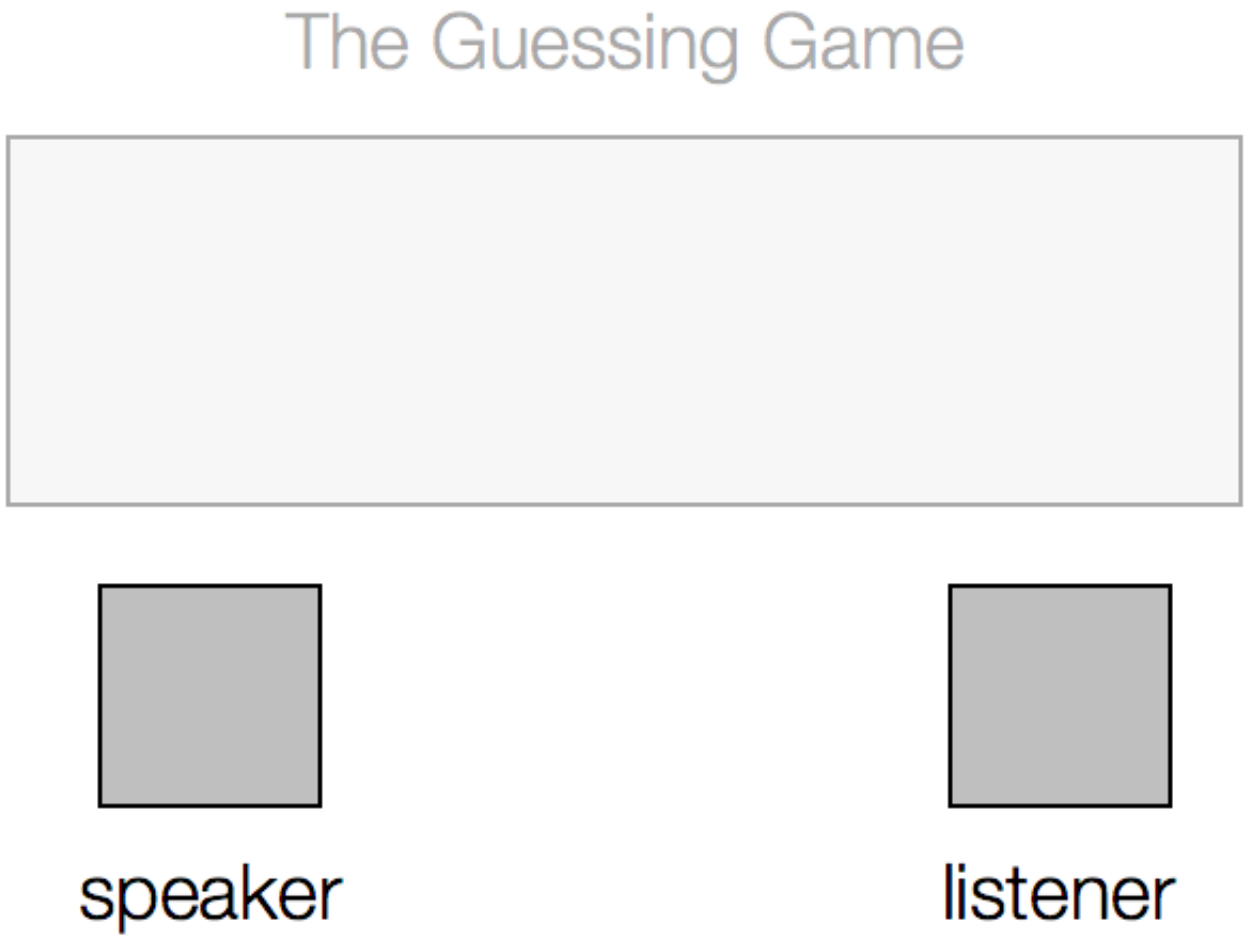


Artificial Creative Systems

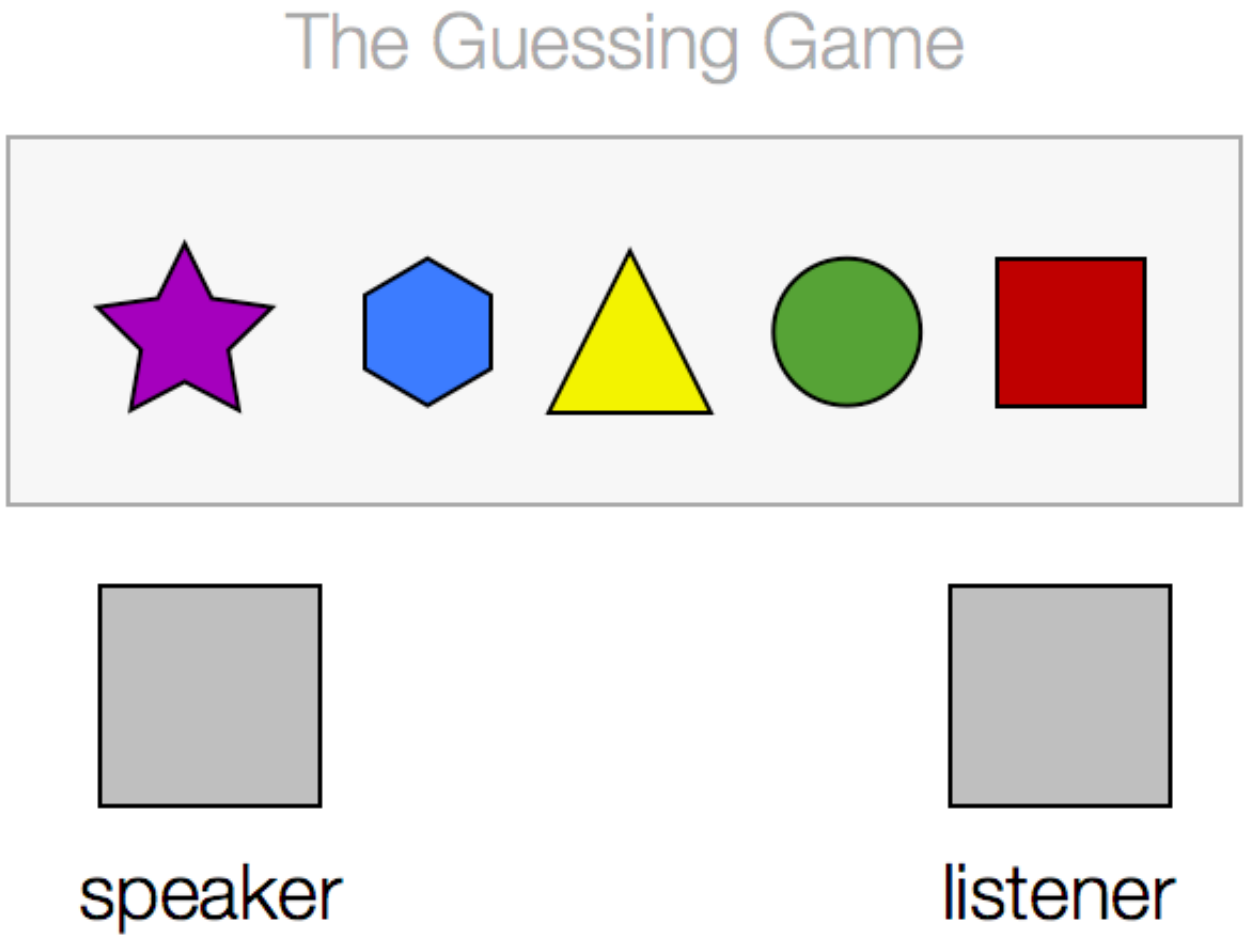


Evolution of Language

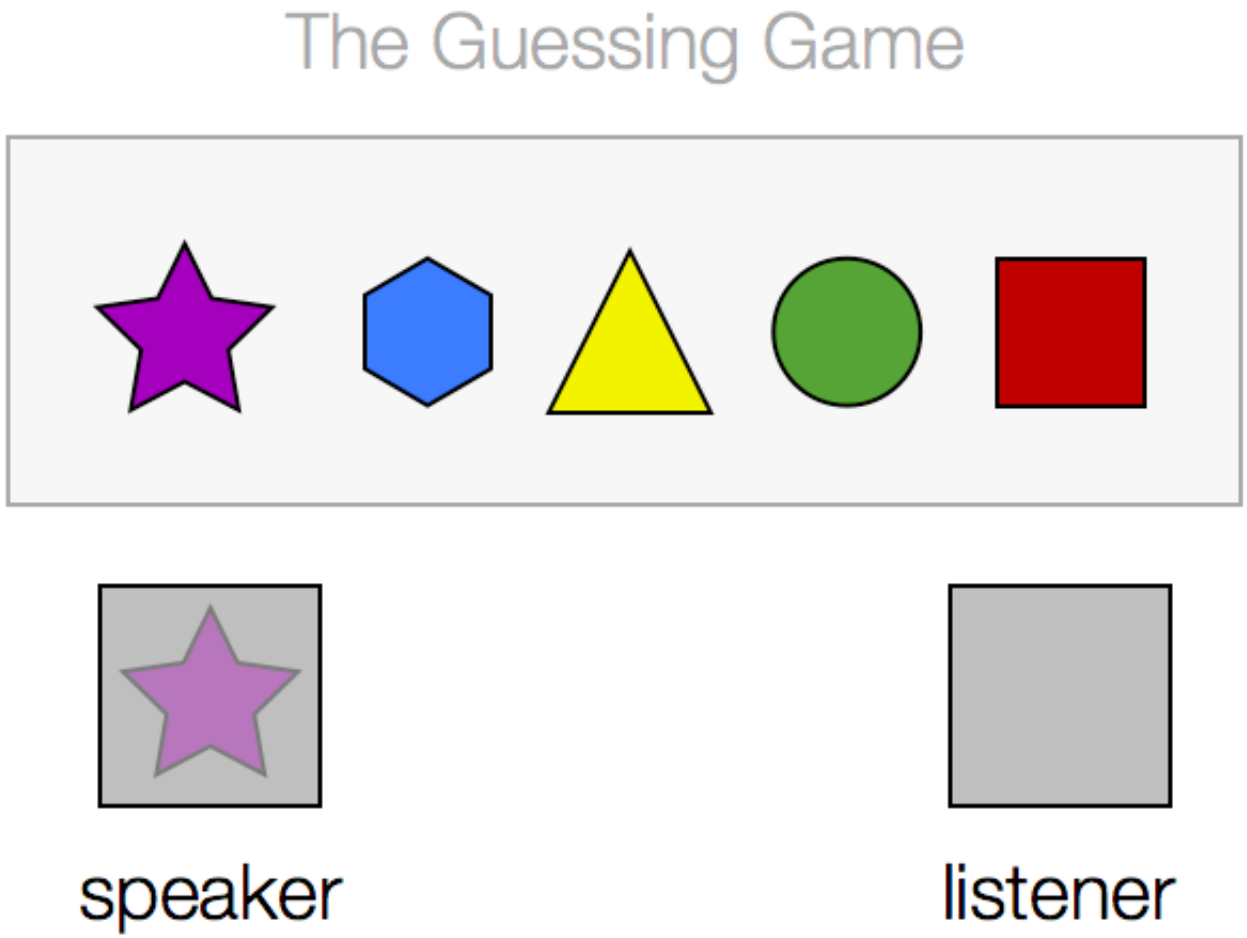
Language Games



Language Games



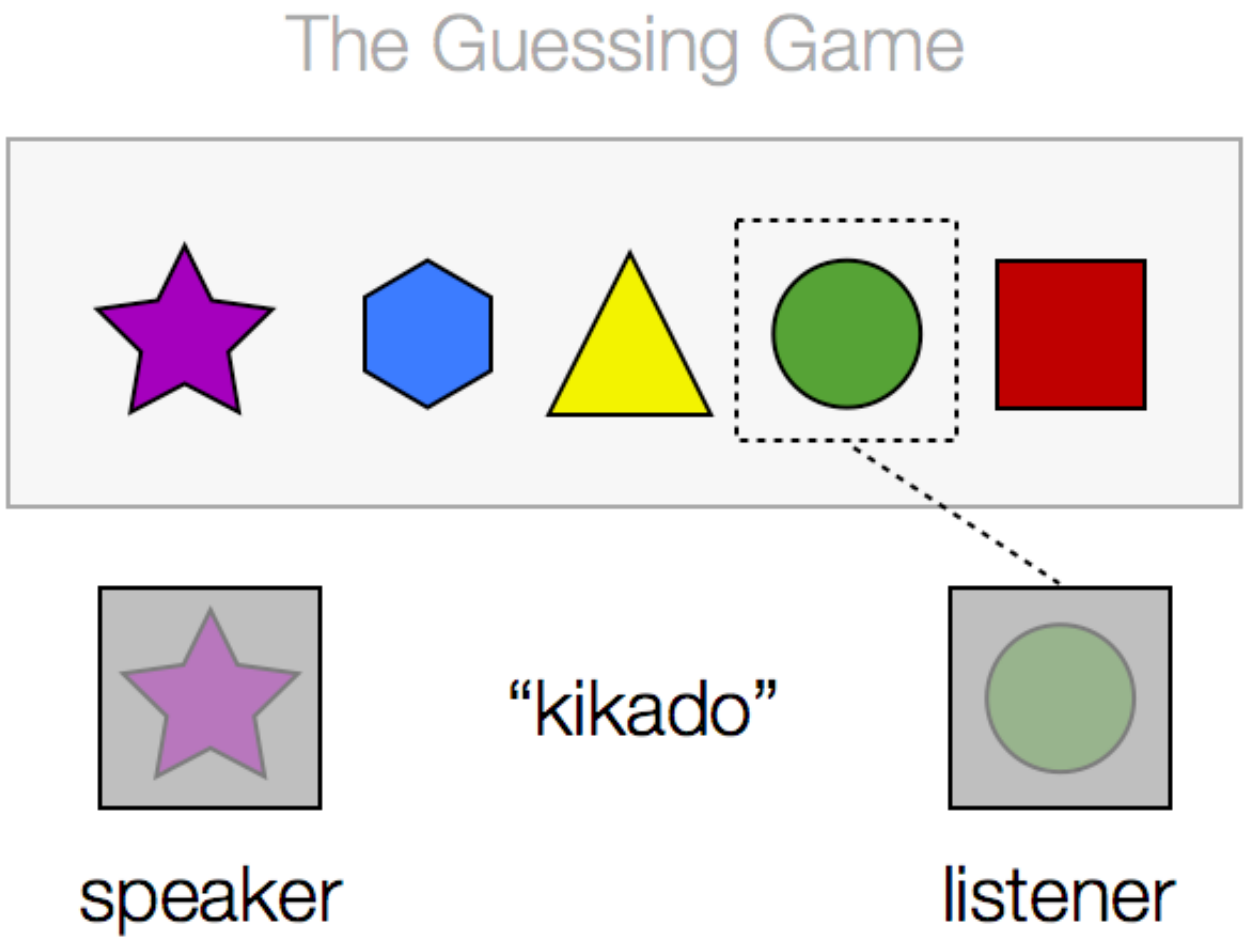
Language Games



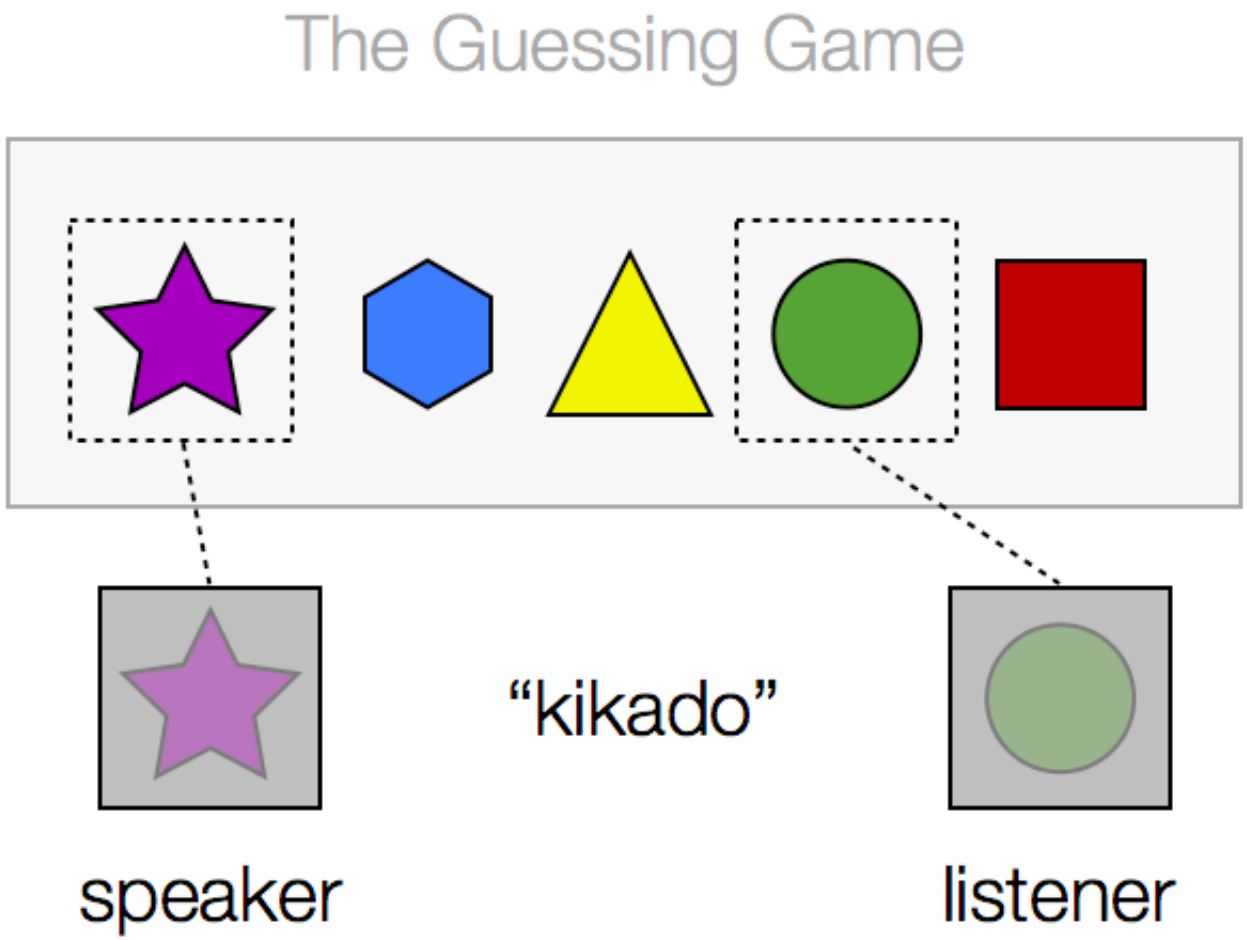
Language Games

Language Games

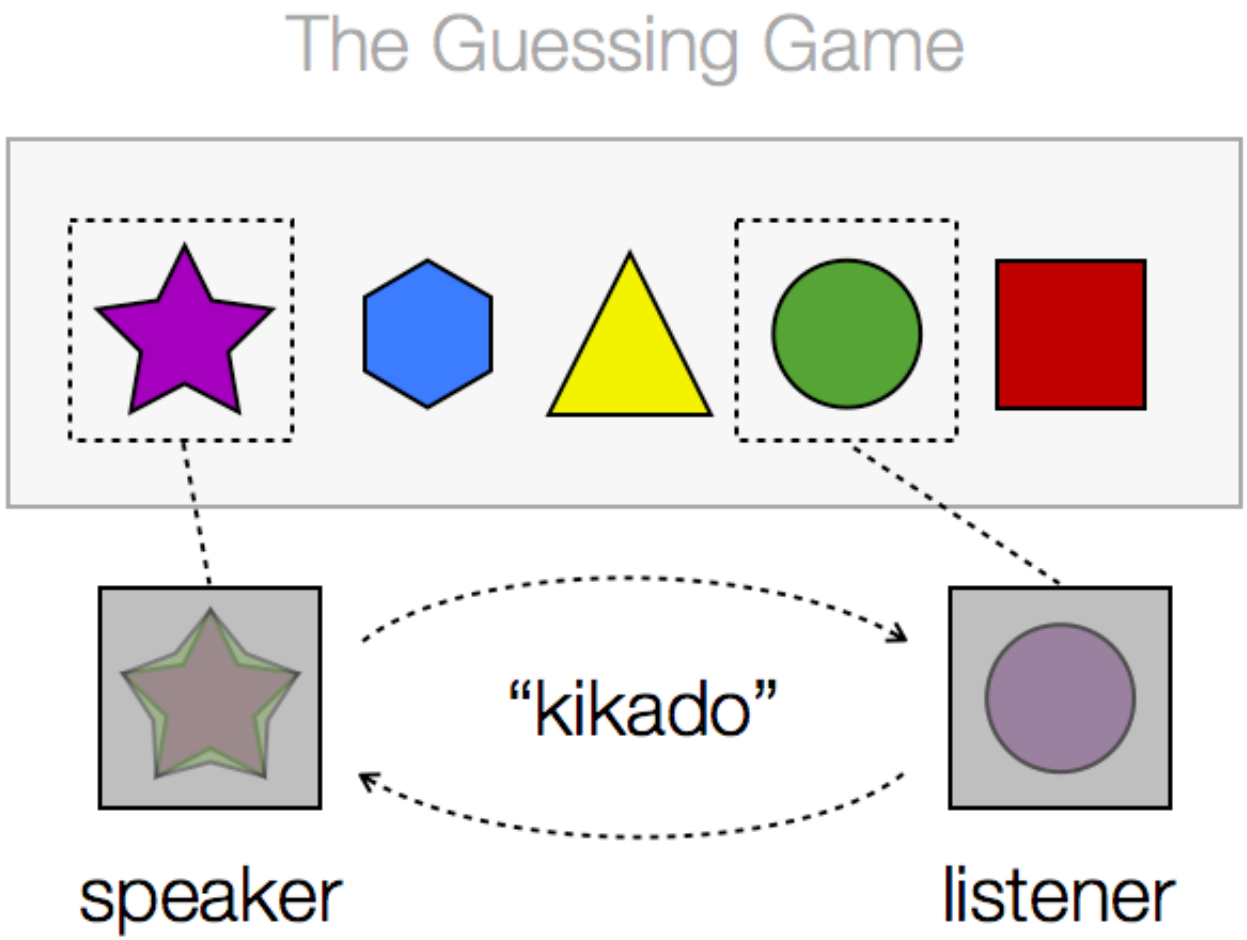
Language Games



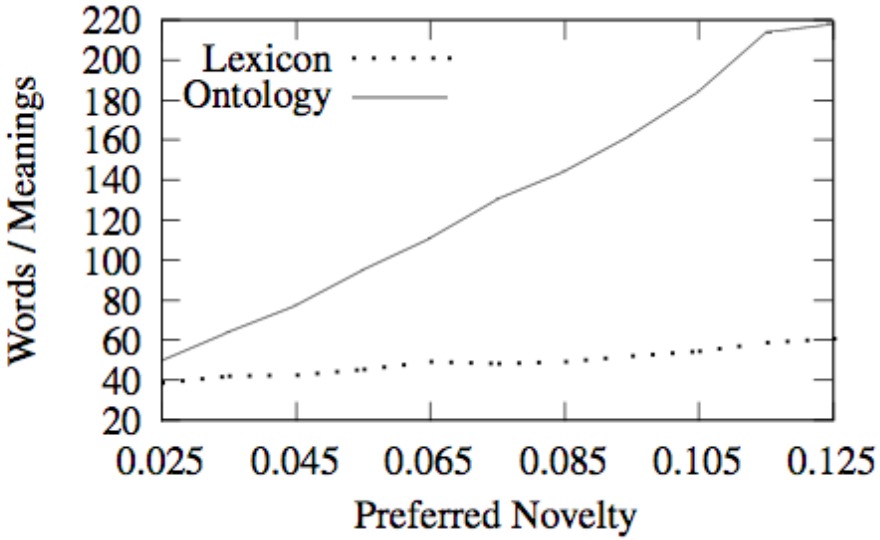
Language Games

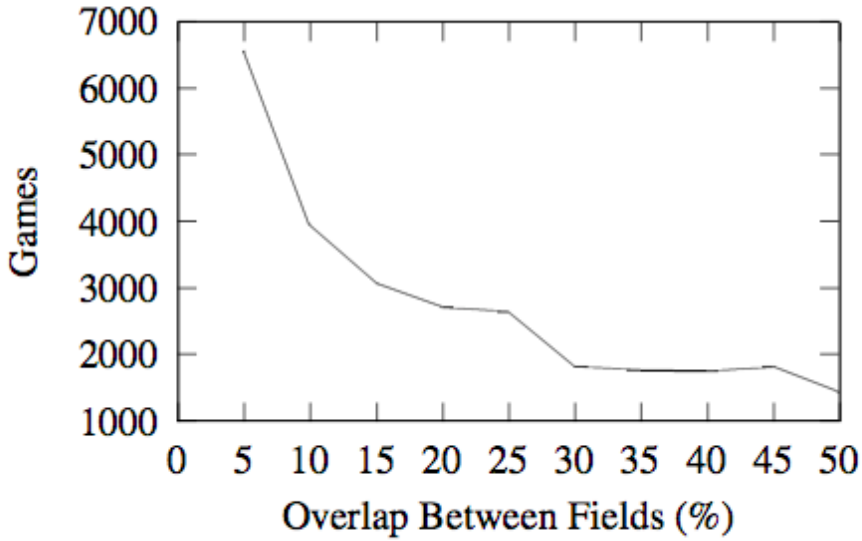


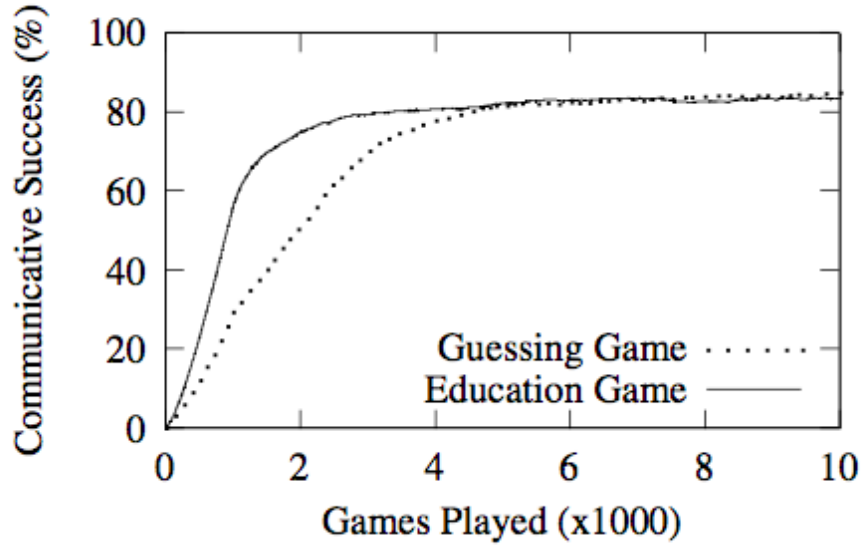
Language Games



Simulations of Domains







Where is this going?

Language Games for Artificial Creative Systems

The Generation Game to model the role of clients in a creative process where utterances are used to model requirements and multiple agents may attempt to satisfy the brief in different ways

Compositional Languages and Grammars

Languages grounded in use that can be decomposed into significant components will support modelling of the role that language plays in ideation, specific curiosity and surprise

Creative Languages

Language as generator

The ambiguity of language can be used to produce new design goals by combining concepts not previously seen before...

hovercraft + skateboard

www.airboard.com

Spa Back Airboard Pty Ltd | Perth, Australia

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Join "Social Creativity" and open:

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http://social-creativity.local/~rob/autumn/
```

Let's take a peek...

A Systems View of Creativity

Domain

artefacts, descriptions, practices, laws

Individual

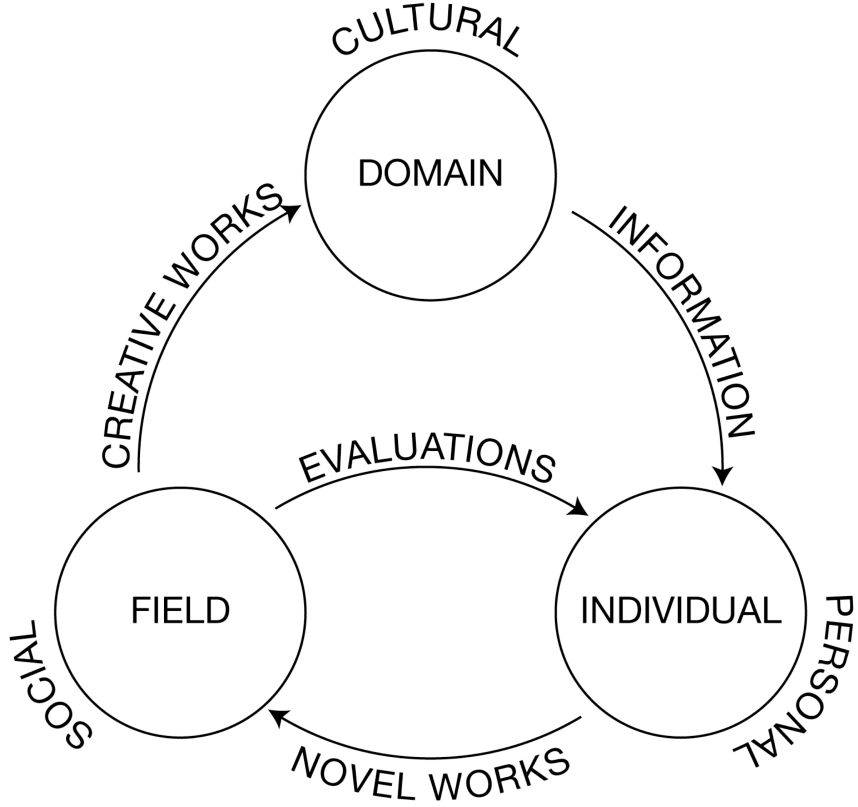
generator of novelty

Field

peers and other gatekeepers

Interaction

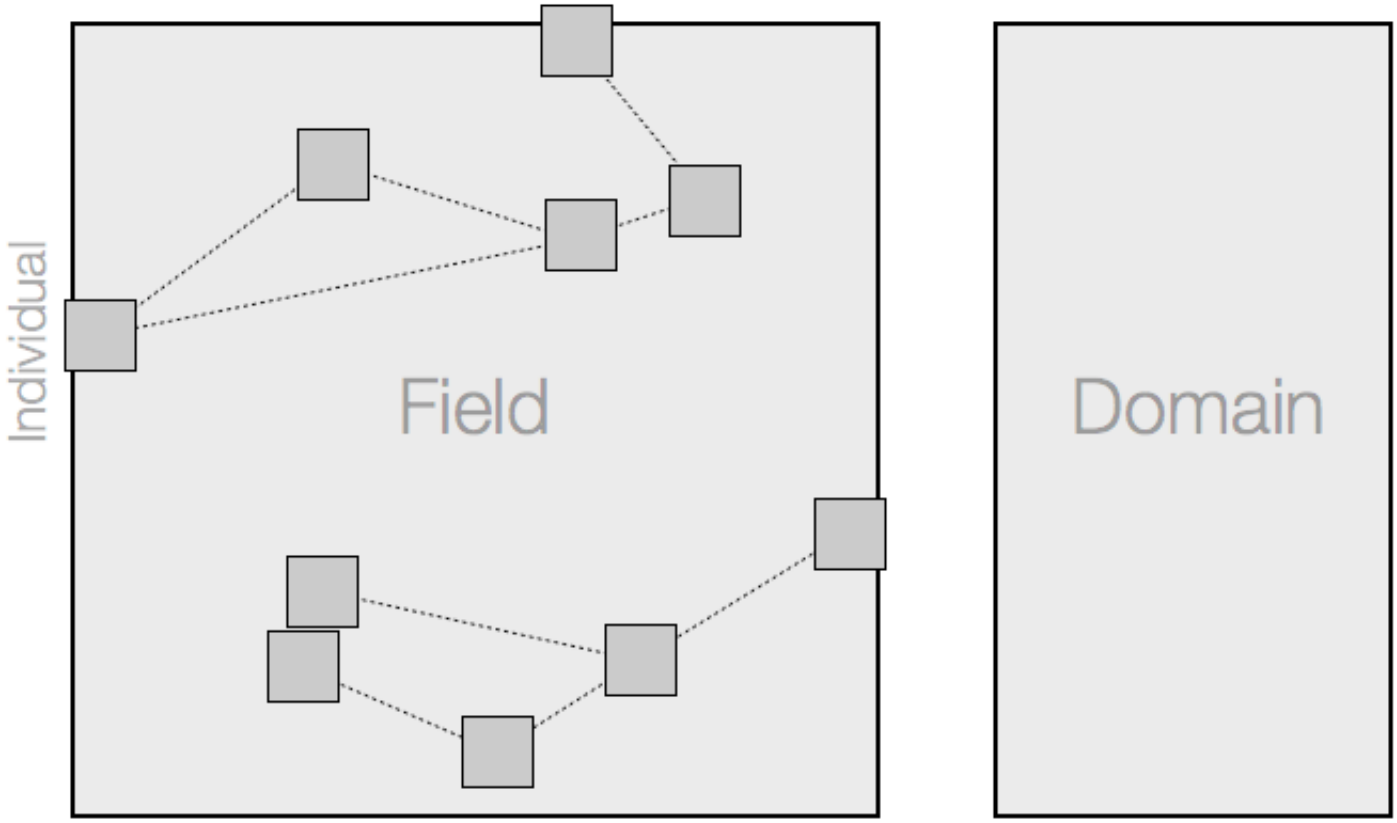
flow of information between components



Csikszentmihalyi's System View of Creativity

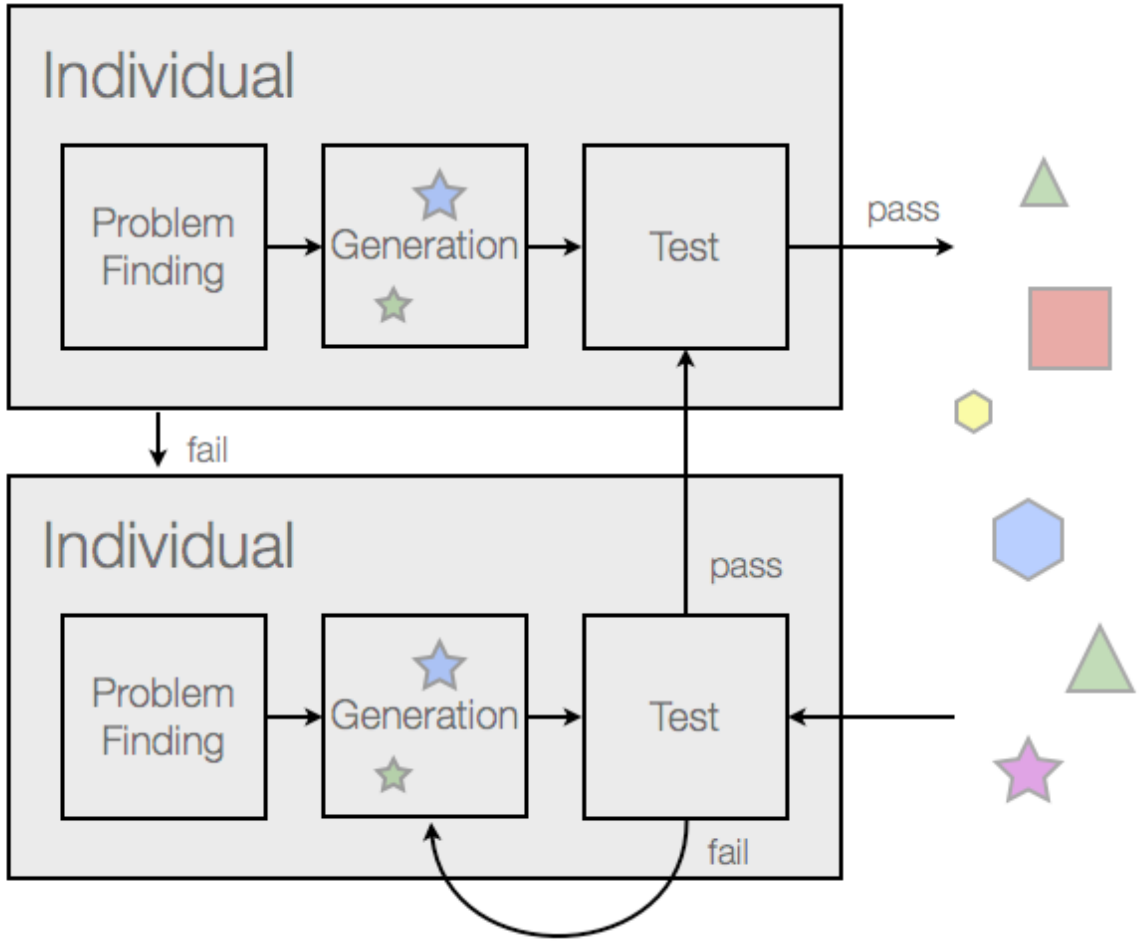
The Field

Artificial Creative Systems



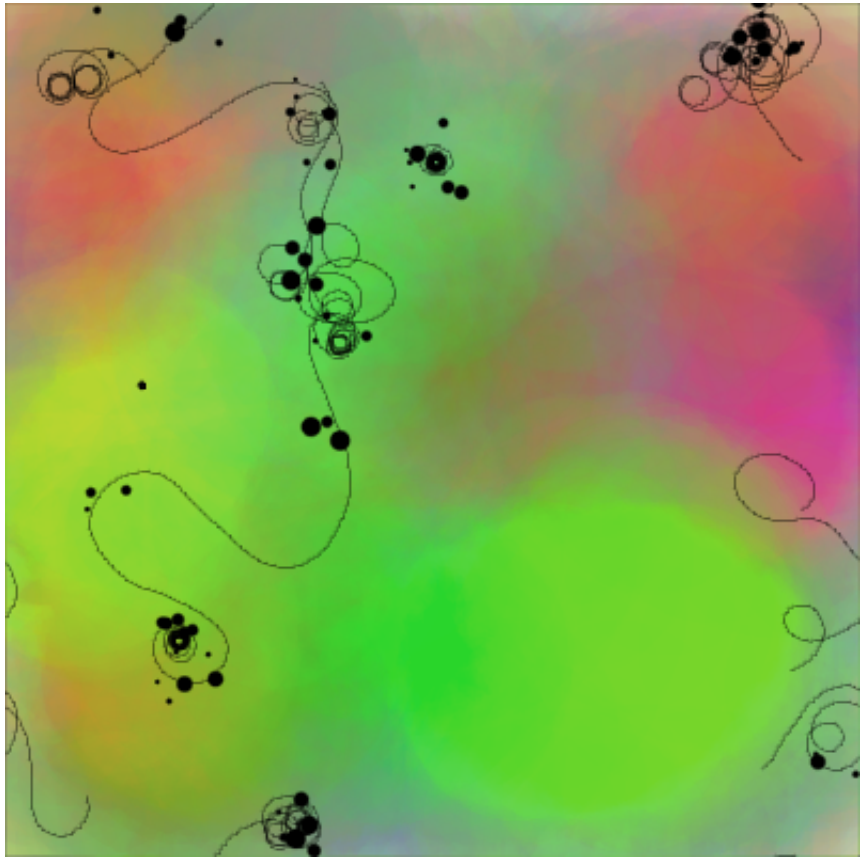
The Individiual

Requirements of an Agent

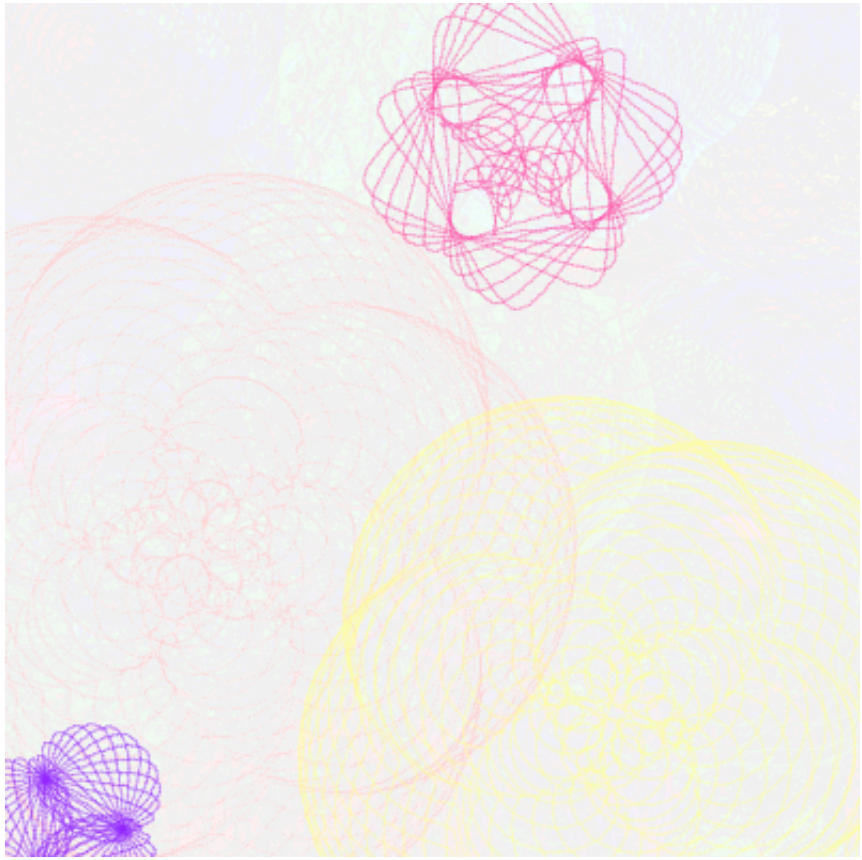


Generative Systems

Direct Manipulation

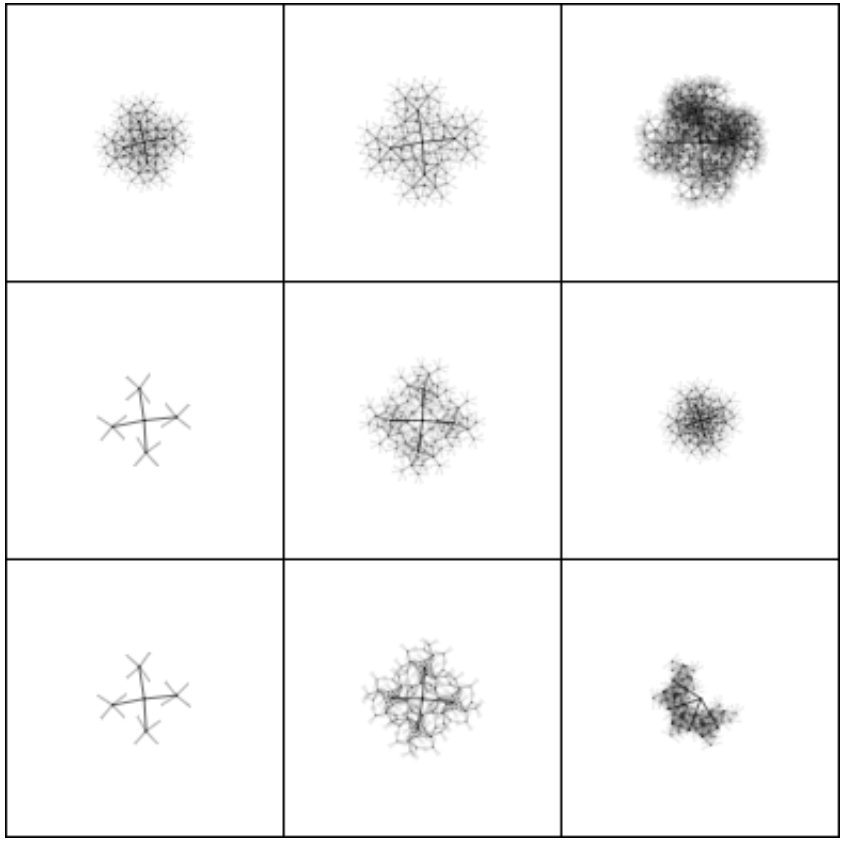


Parametric Design



Spirograph(ish)

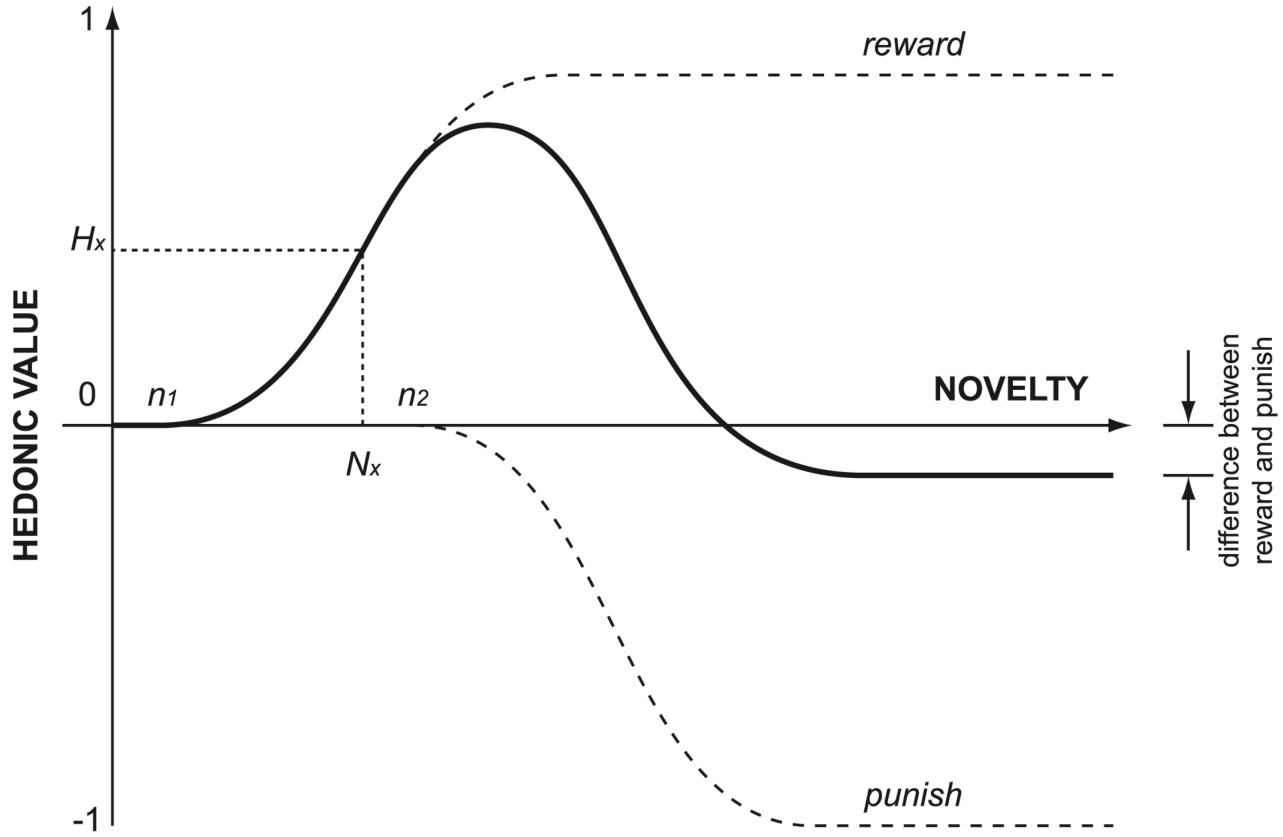
Tool-Use



Biomorphs

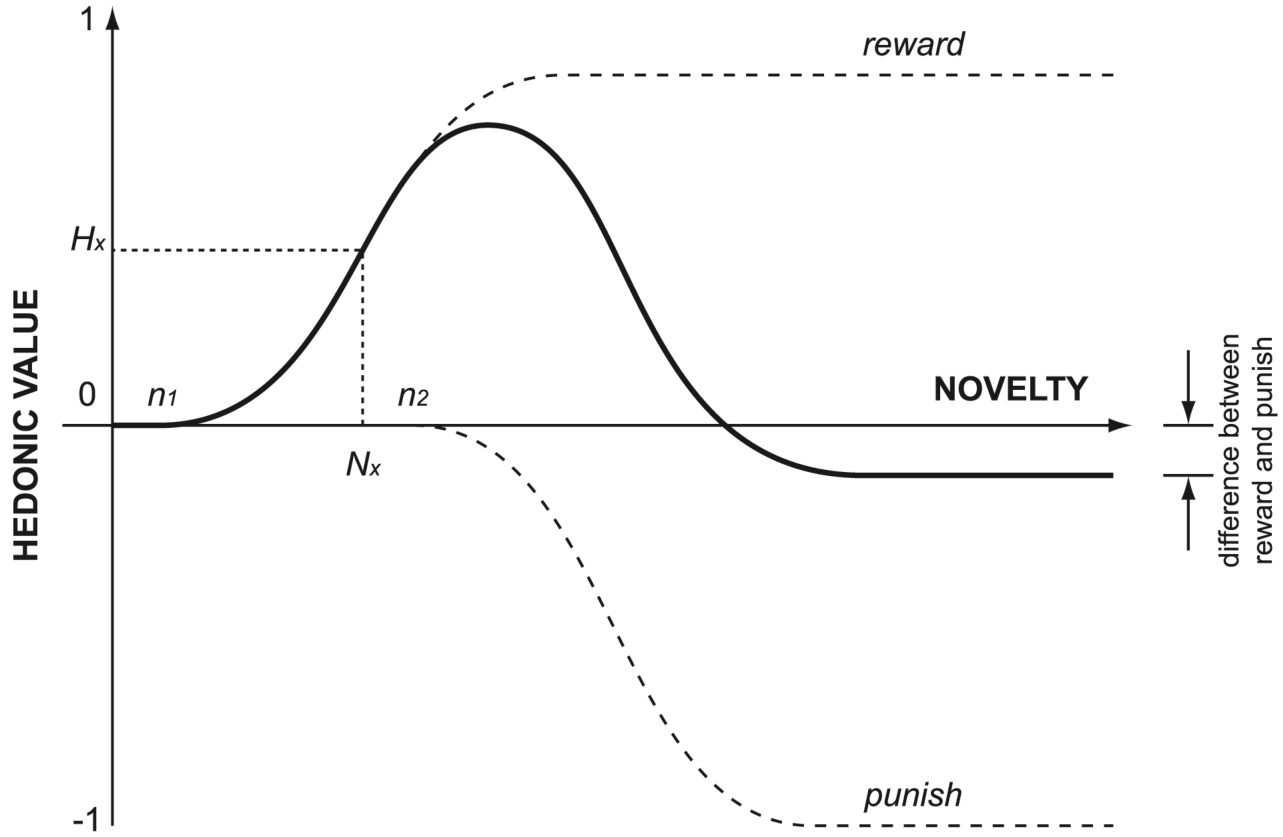
Evaluation Systems

Evaluating Novelty



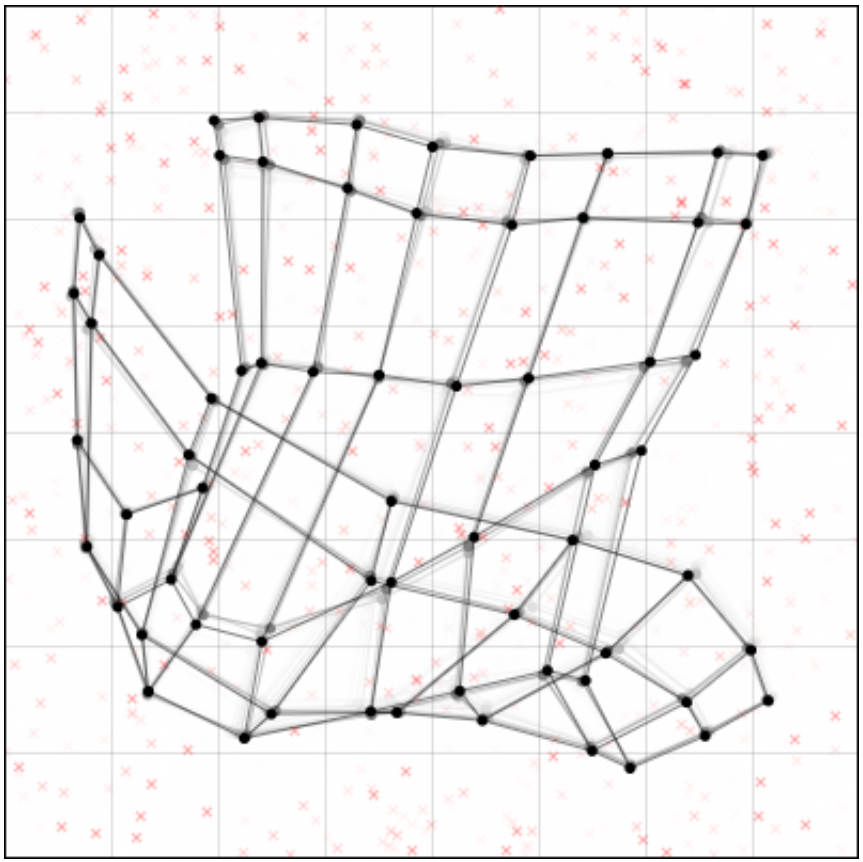
The Wundt Curve (after Berlyne)

Evaluating Valuable Novelty

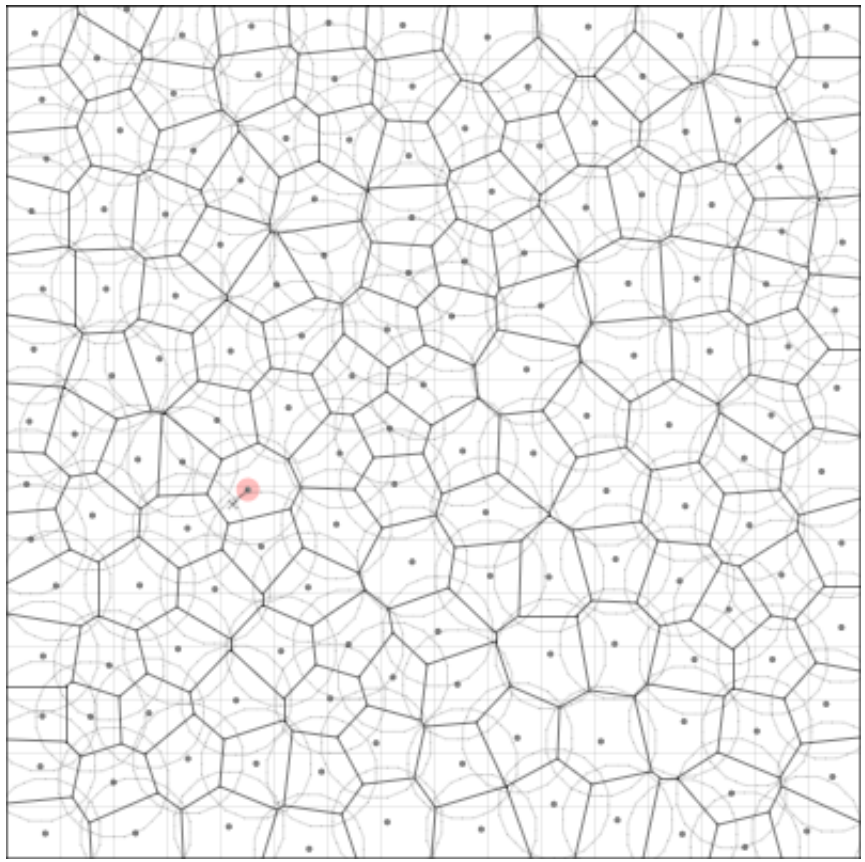


The Wundt Curve (after Berlyne)

Memory Model



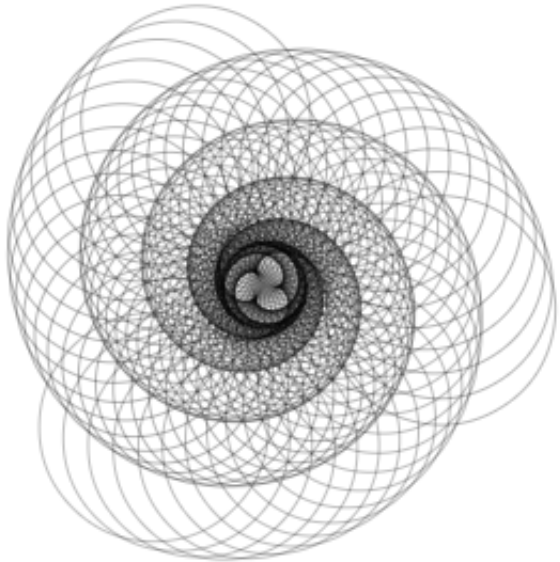
Self Organising Map



Adaptive Resonance Theory (ART) Networks

The Domain

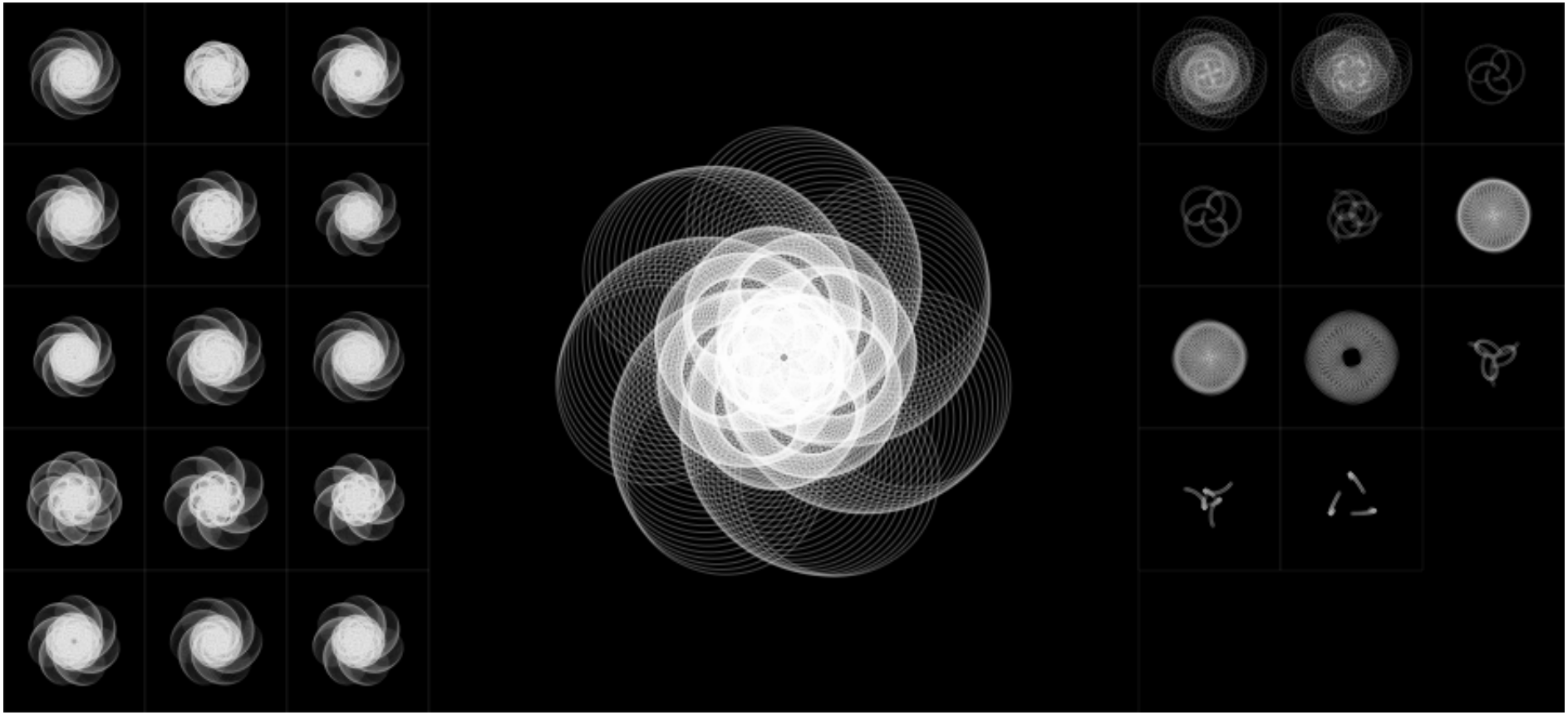
The Domain



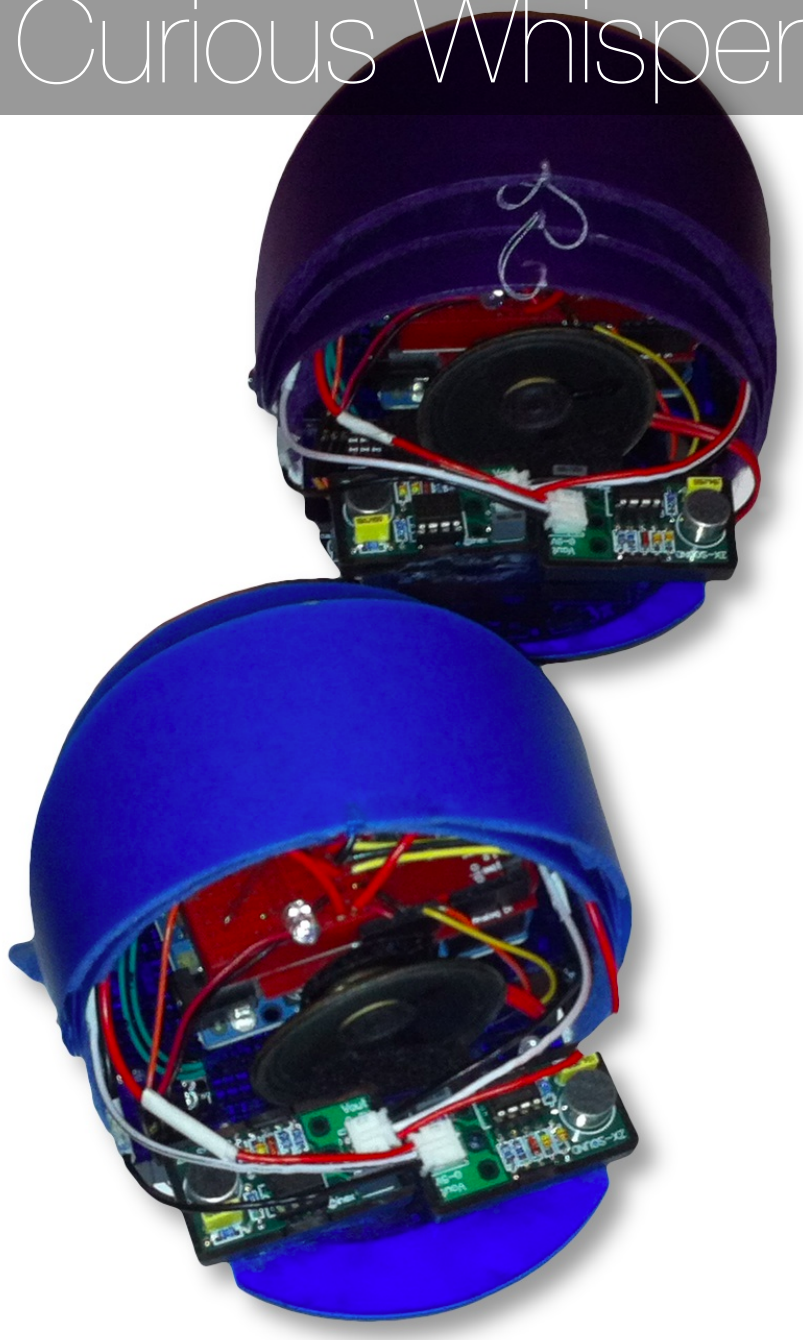
William Latham (via Marius Watz) style 2D "horns"

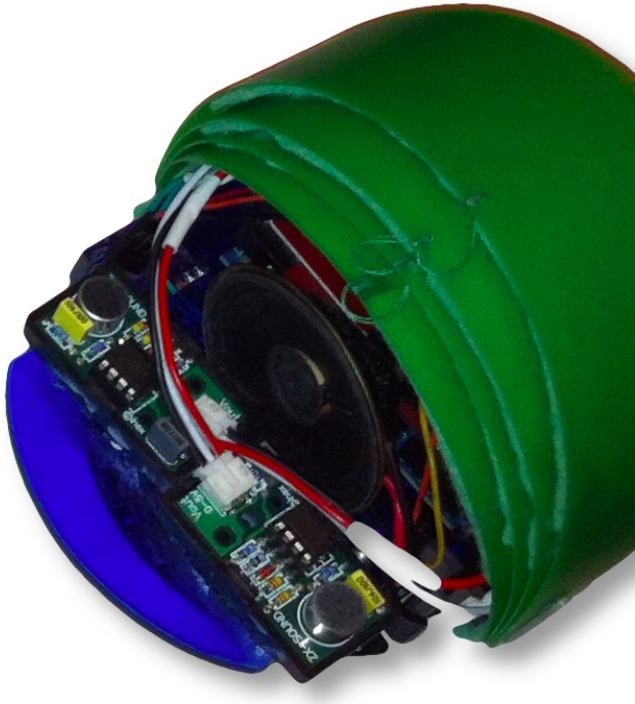
Demo Time

The Digital Clockwork Amusement



Curious Whispers





Thank You!

THE UNIVERSITY OF SYDNEY

Modern (well-behaved) browsers: Chrome, Safari, Firefox

The Wizard of Oz, Back to the Future, Universal Pictures