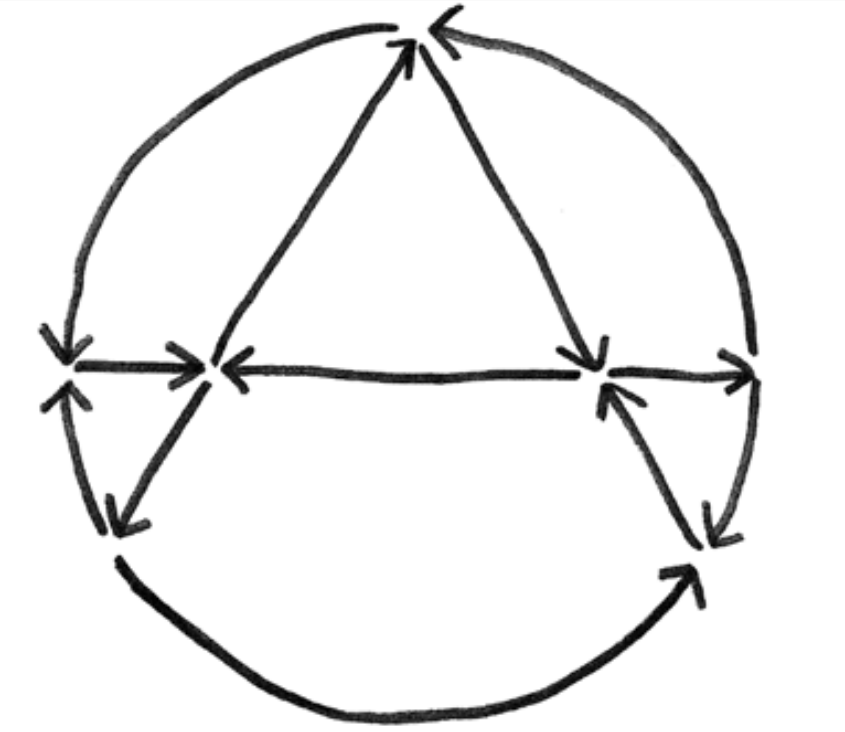


How to stop the emergence of hierarchy?

Evo Busseniers

Intro

- Who and why:
  mathematics $\approx$ radicality
- Content:
  - What is hierarchy and freedom
  - Evolution in both directions

How?

- Game
- guess mechanism
- explanation
- examples $\rightsquigarrow$ post-its!

Application at the end

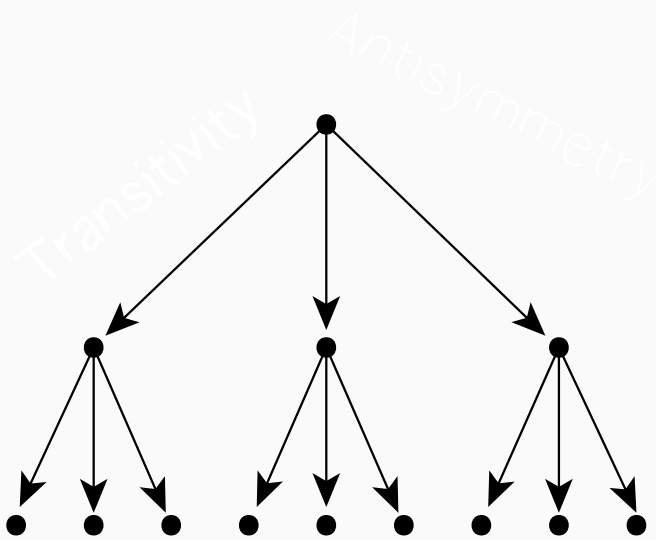
Signal if unclear, questions!

Lets play!

Structure

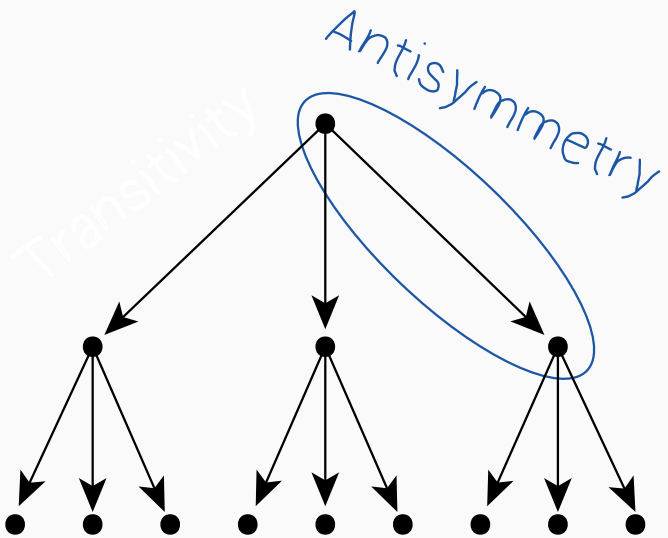
Structure

One-directionality



Structure

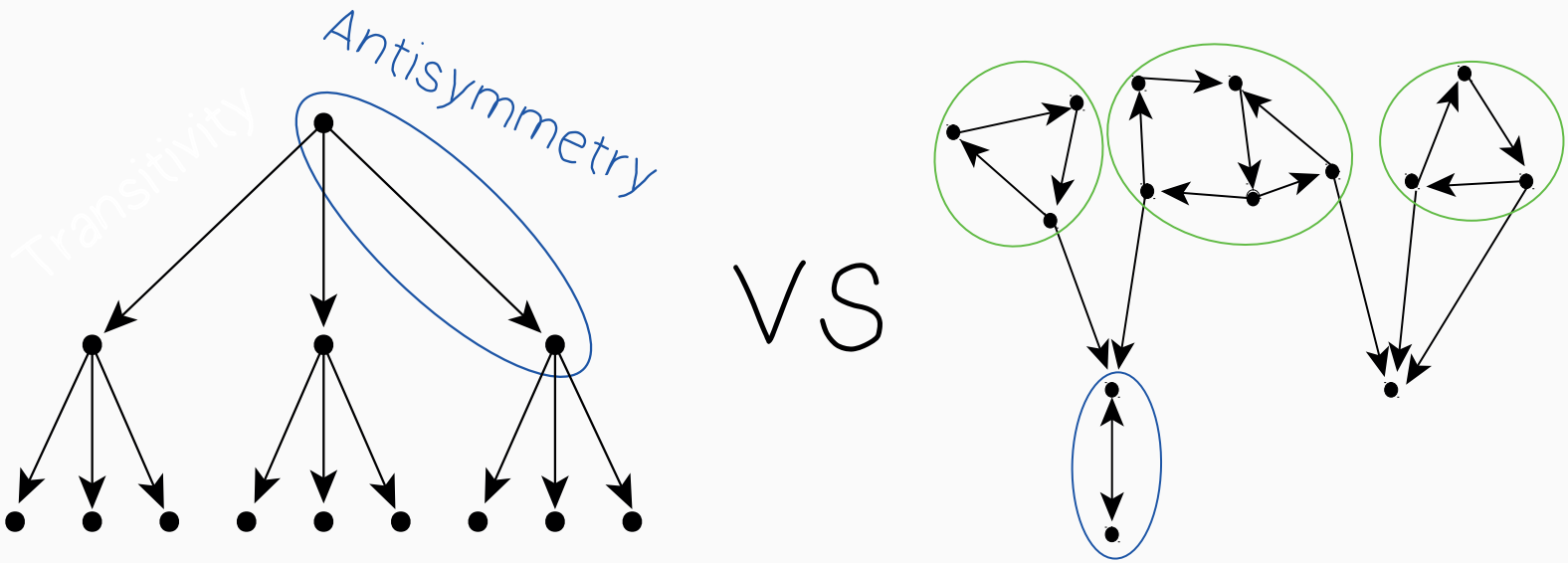
One-directionality



Structure

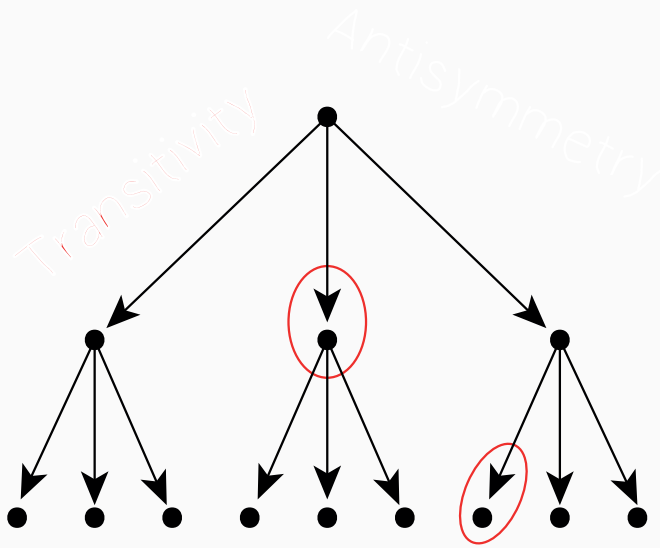
One-directionality

$\Rightarrow$ no cycles



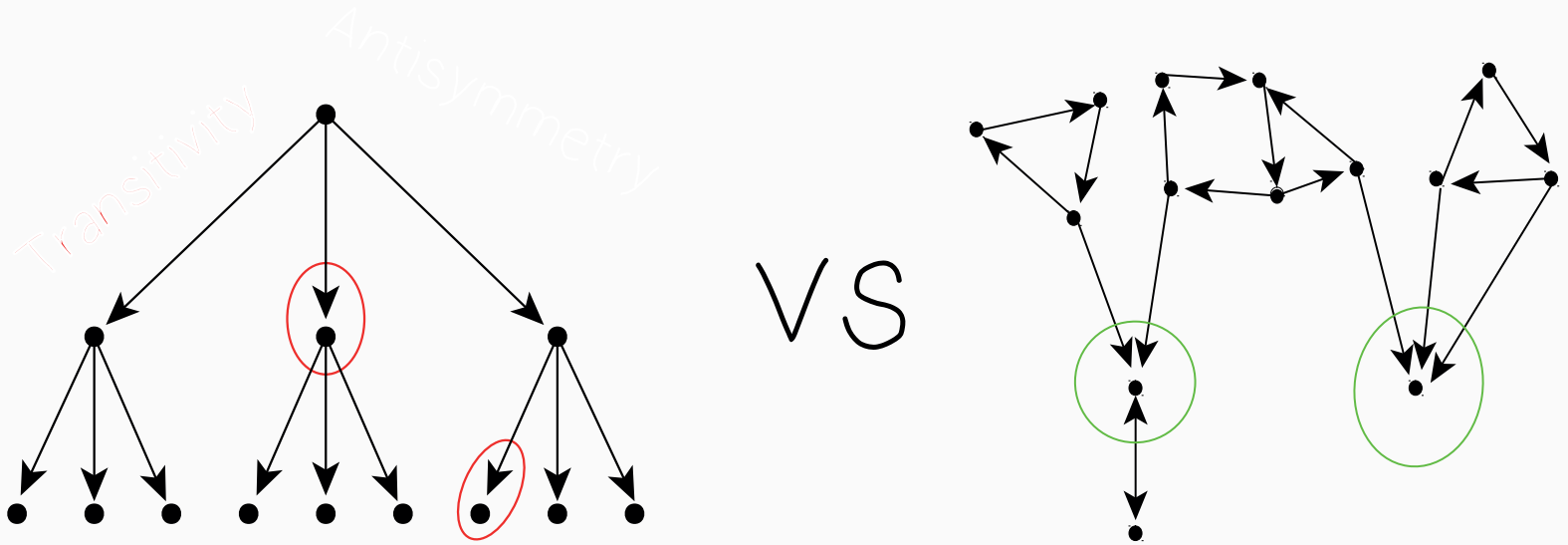
Structure

2) only 1 influence



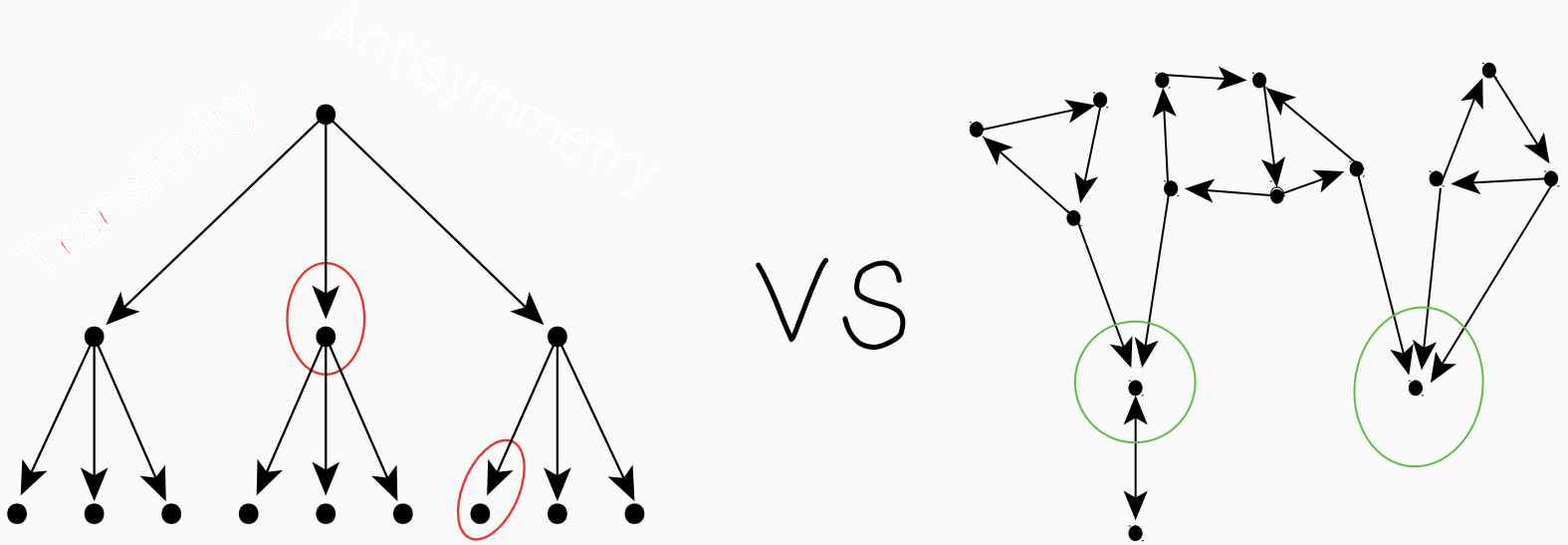
Structure

2) only 1 influence



Structure

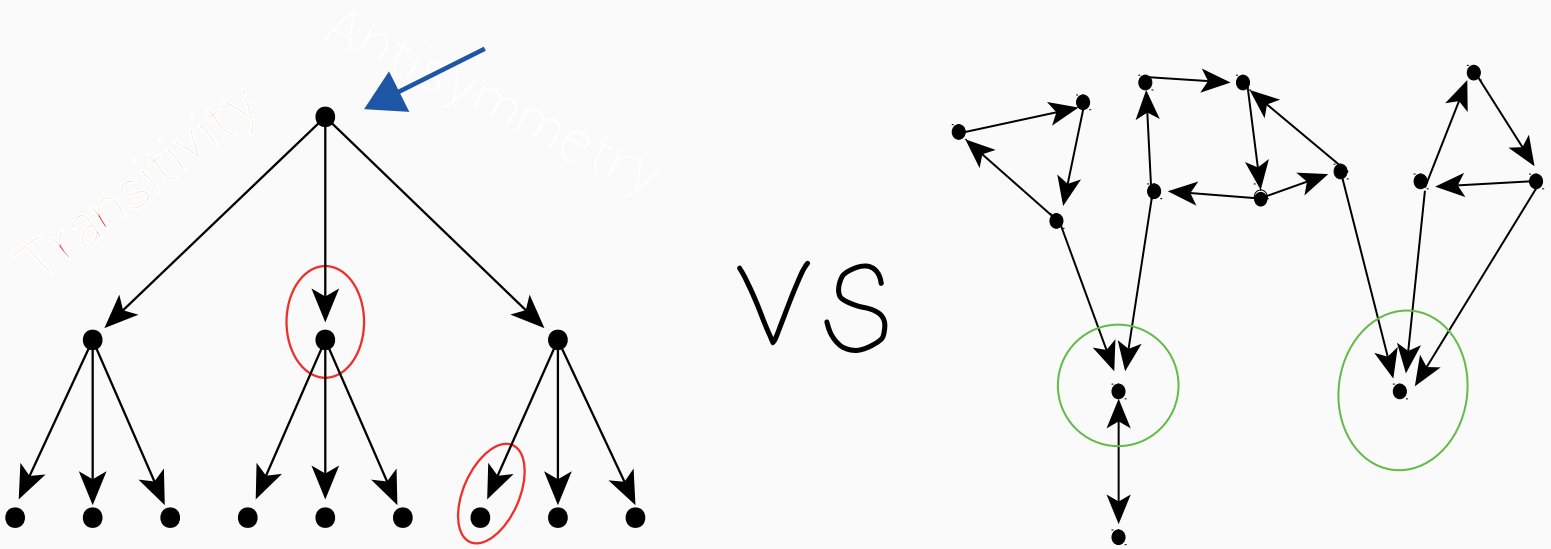
2) only 1 influence



$\Rightarrow$ can get 'determined' by this influence

Structure

2) only 1 influence

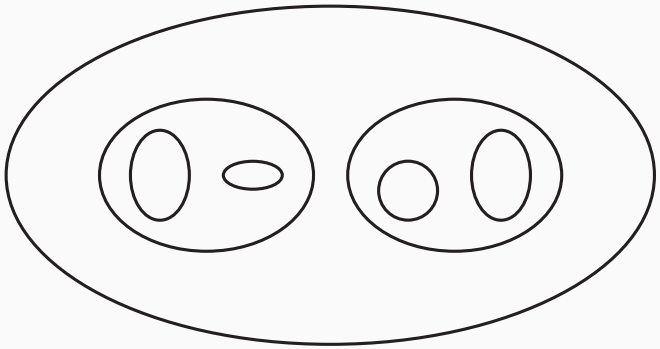


$\Rightarrow$ can get 'determined' by this influence

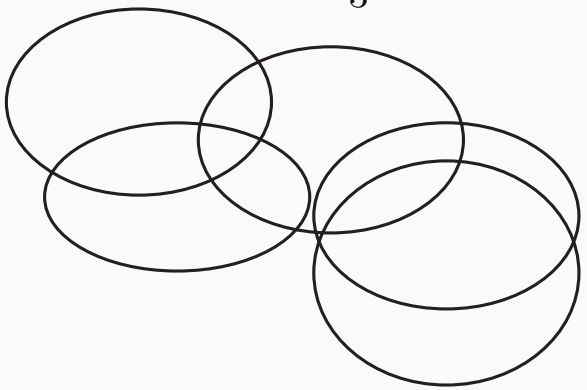
UNIVERSALITY

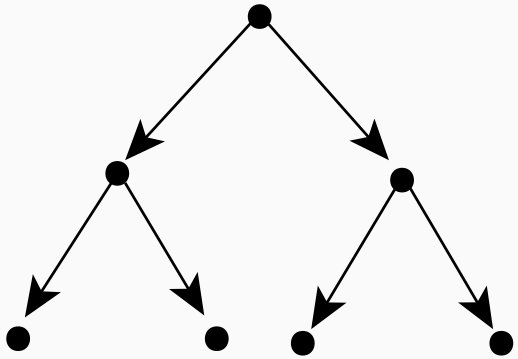
LOCAL COHERENCE

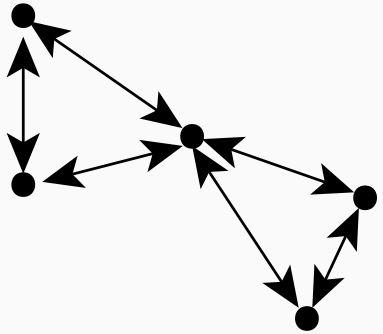
F_2



F_3







$$A \to B \Leftrightarrow A \cap B \neq 0 \wedge A \not\subset B$$

structure, ♋

'The One'

Connected multiples

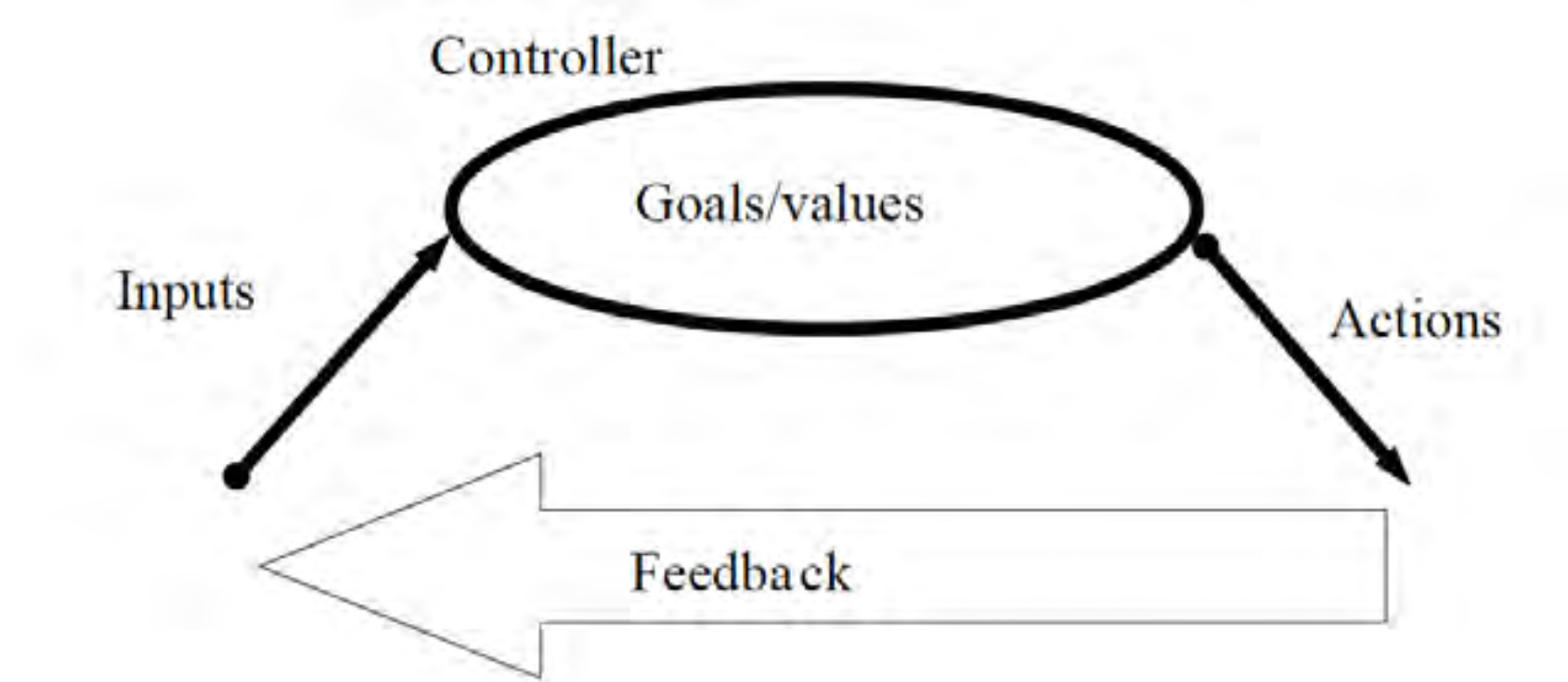
Lets play!

Cycles

Feedback

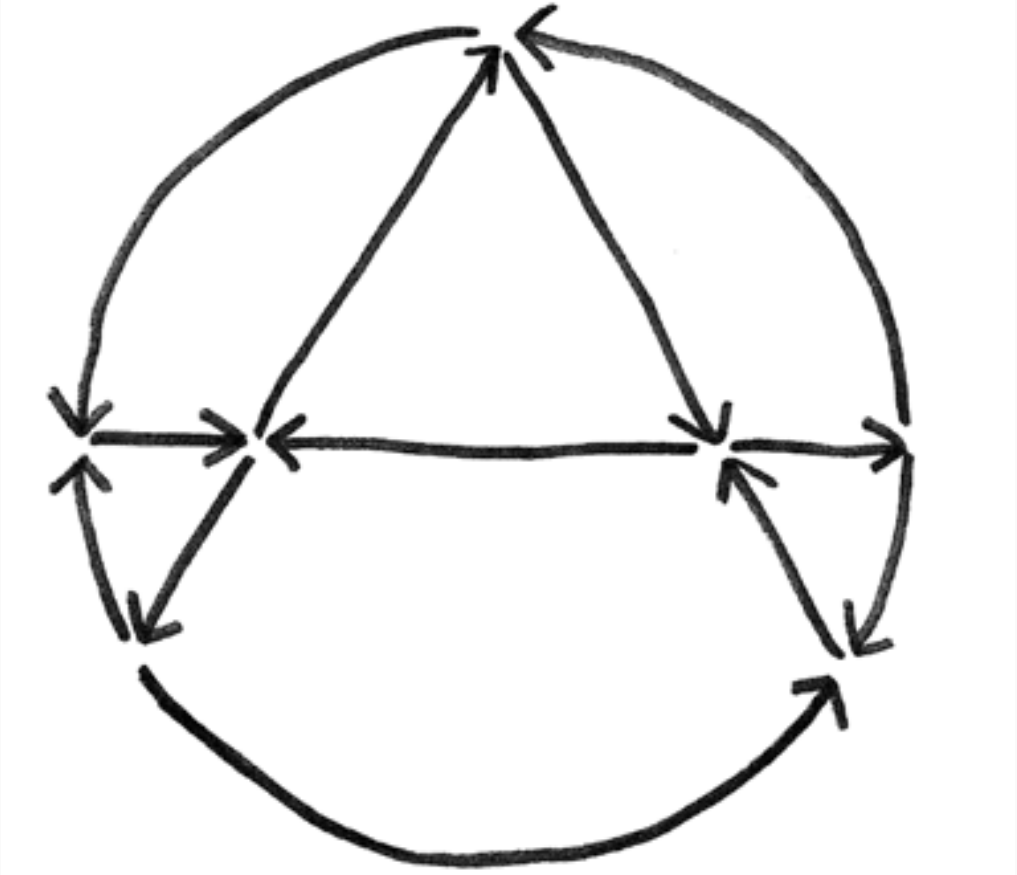
- Positive feedback: growth
  - Butterfly effect
  - Rich getting richer
- Negative feedback: stability

Control



internal and external control, higher-order controller, constraint vs coercion, ♋

Self-creation

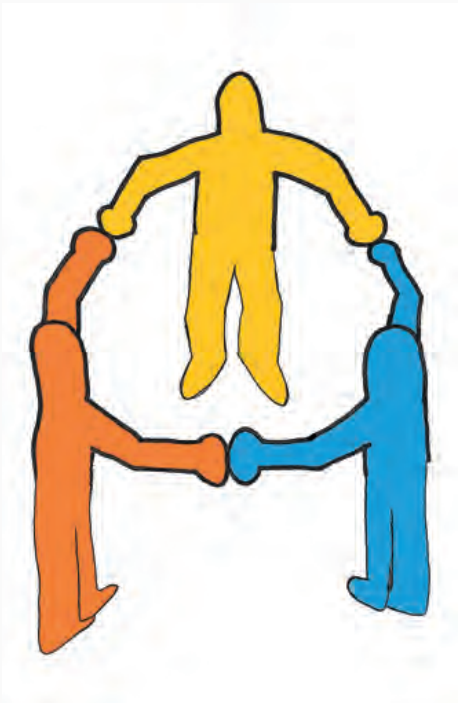


Autopoiesis

Lets play!

Evolution

Formation of a controller



$\Rightarrow$

Coordination

Self-organization

Control:

higher order goal

$\Rightarrow$ can get unaligned

idée fixe, social power, ♋

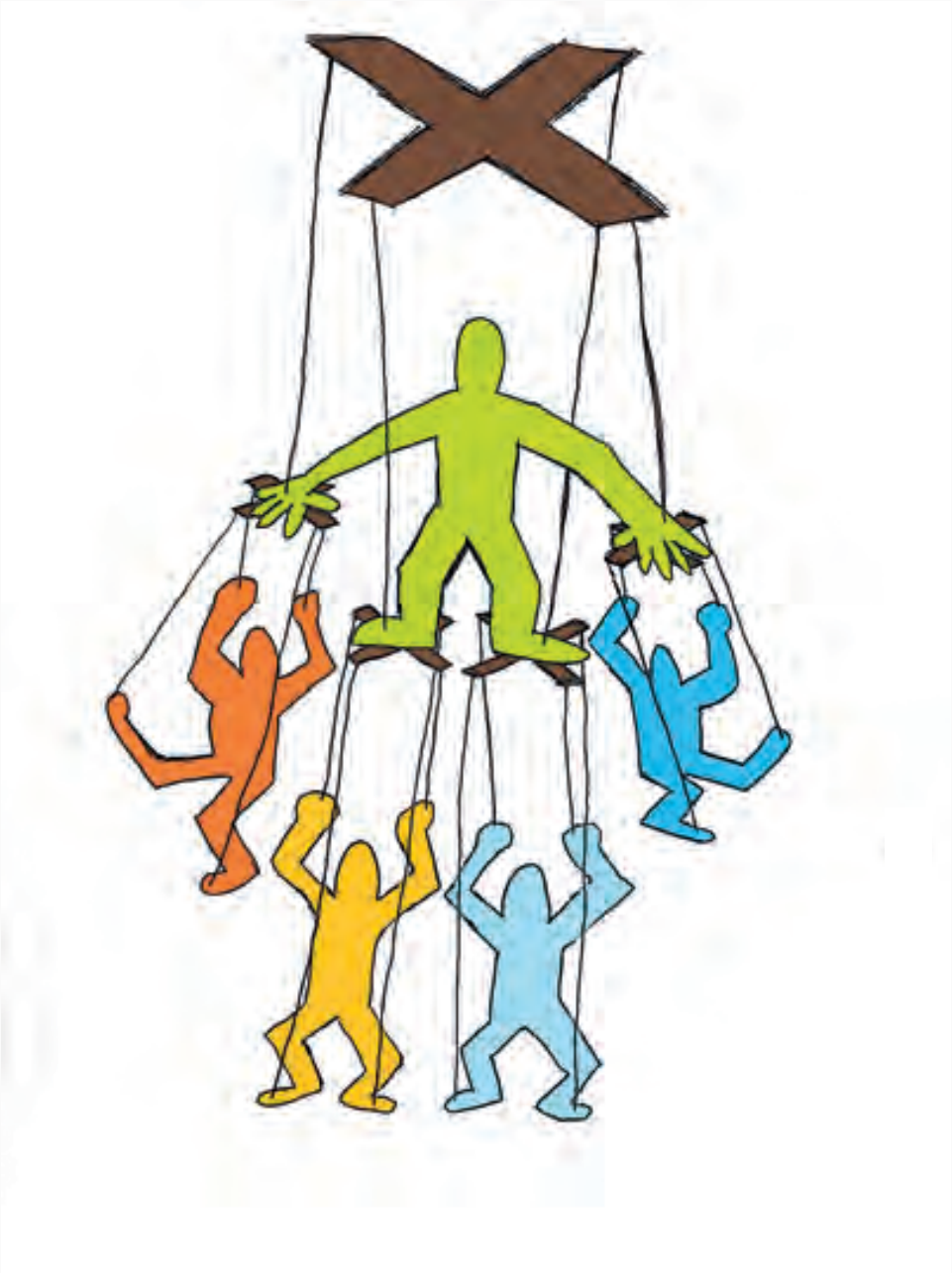
Constant opposition

No hierarchy when mechanism to prevent it

$\Rightarrow$ Focus on human agency

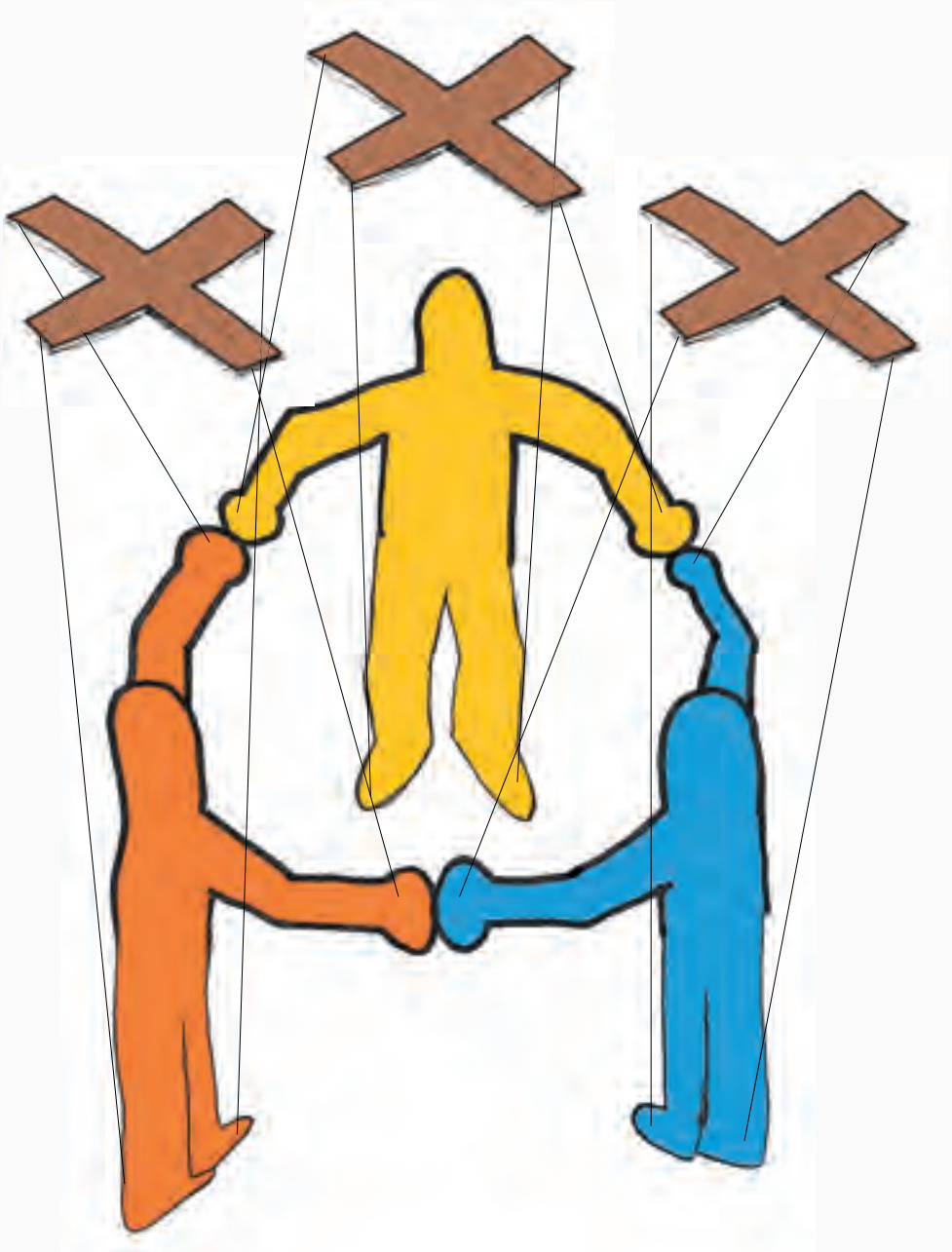
determinism vs co-evolution, negative feedback, skip,

Constant opposition



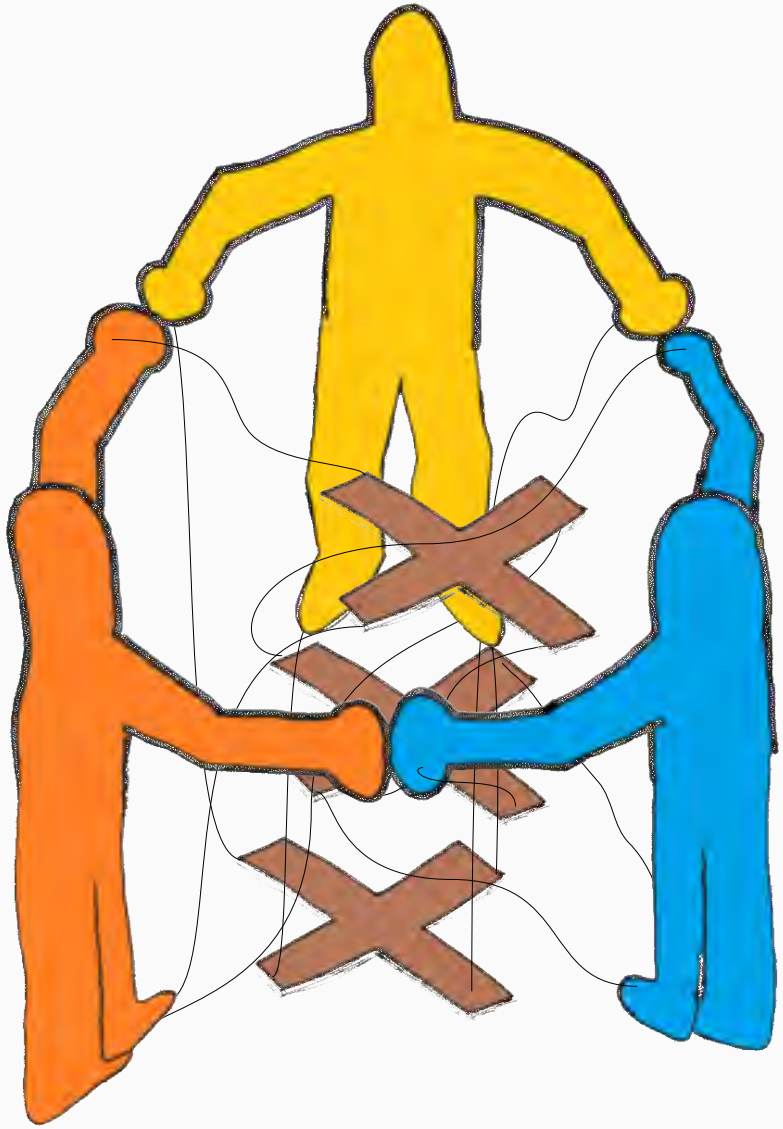
skip, ♋

Constant opposition



skip, ♋

Constant opposition



skip, ♋

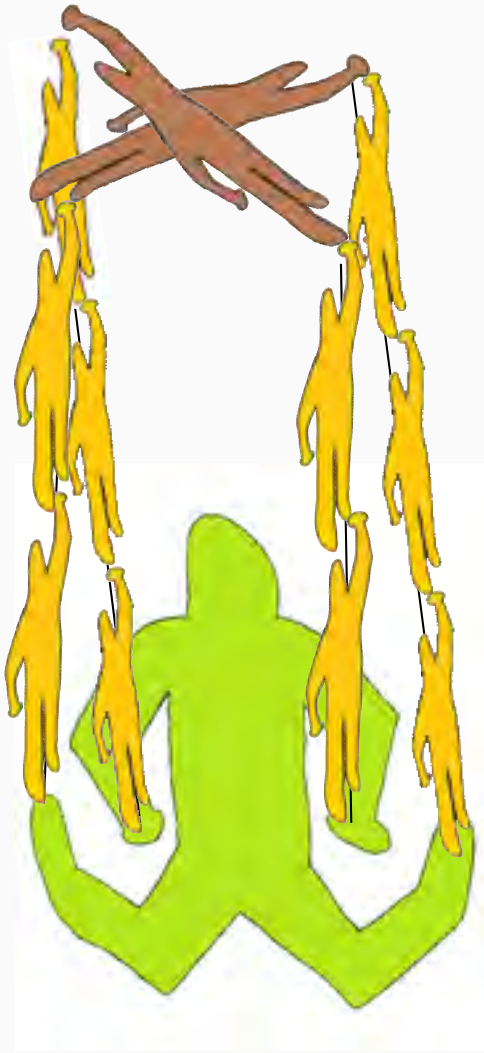
Constant opposition

skip, ♋

Constant opposition

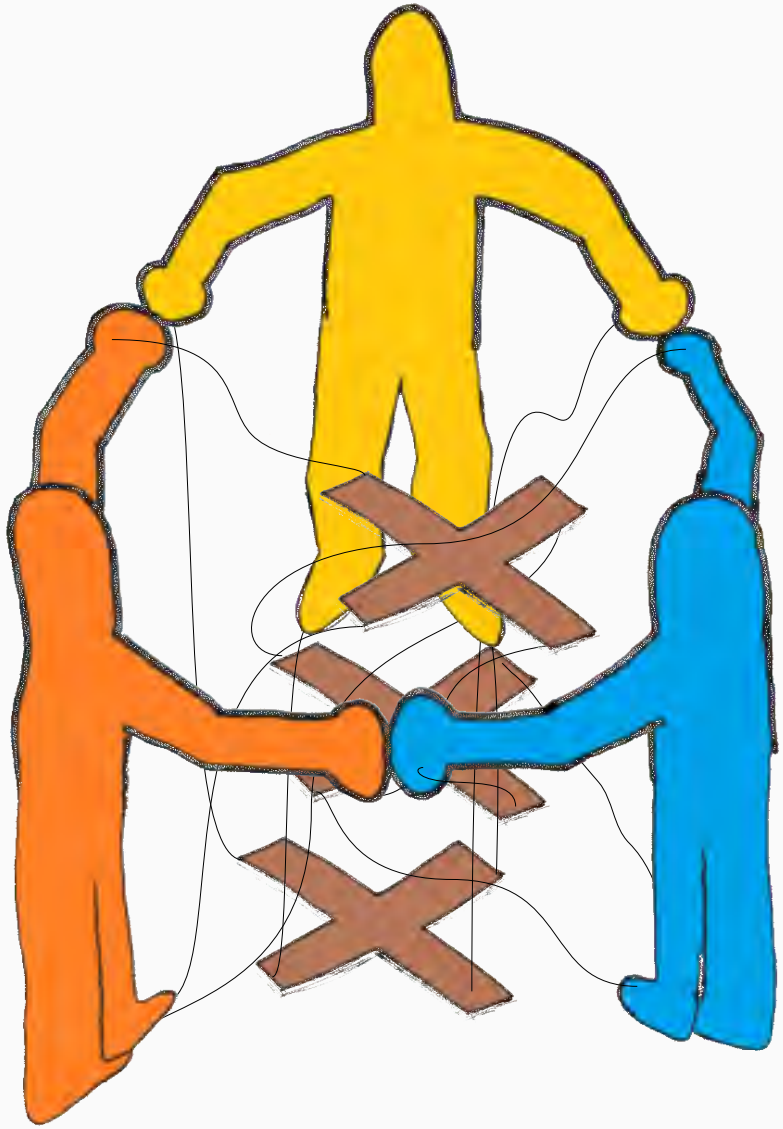
skip, ♋

Constant opposition



skip, ♋

Constant opposition



skip, ♋

Lets play!

Methods of self-organization

Stigmergy

Leave traces in the environment on which there can be build on

$\Rightarrow$ Not necessary:

- direct interaction
- centrality

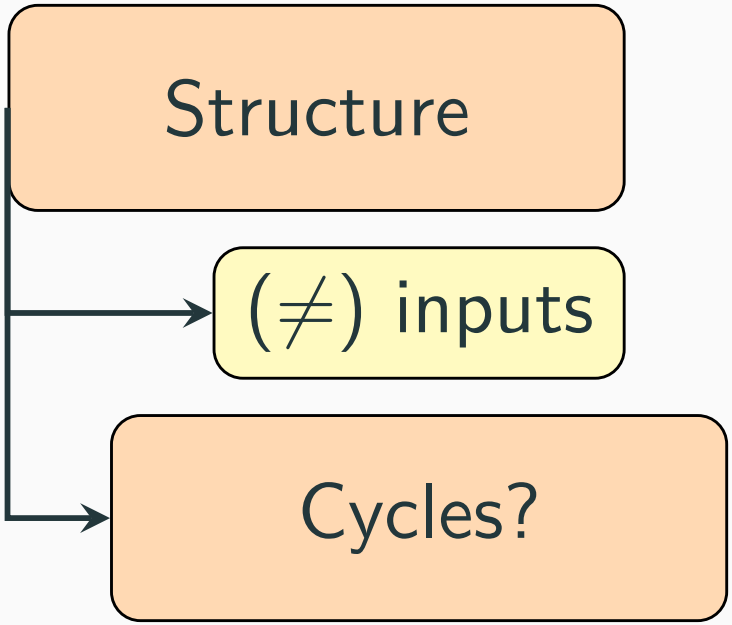
Methods of self-organization

Variation and selection

$\Rightarrow$ allows getting stronger through shocks (=antifragility)

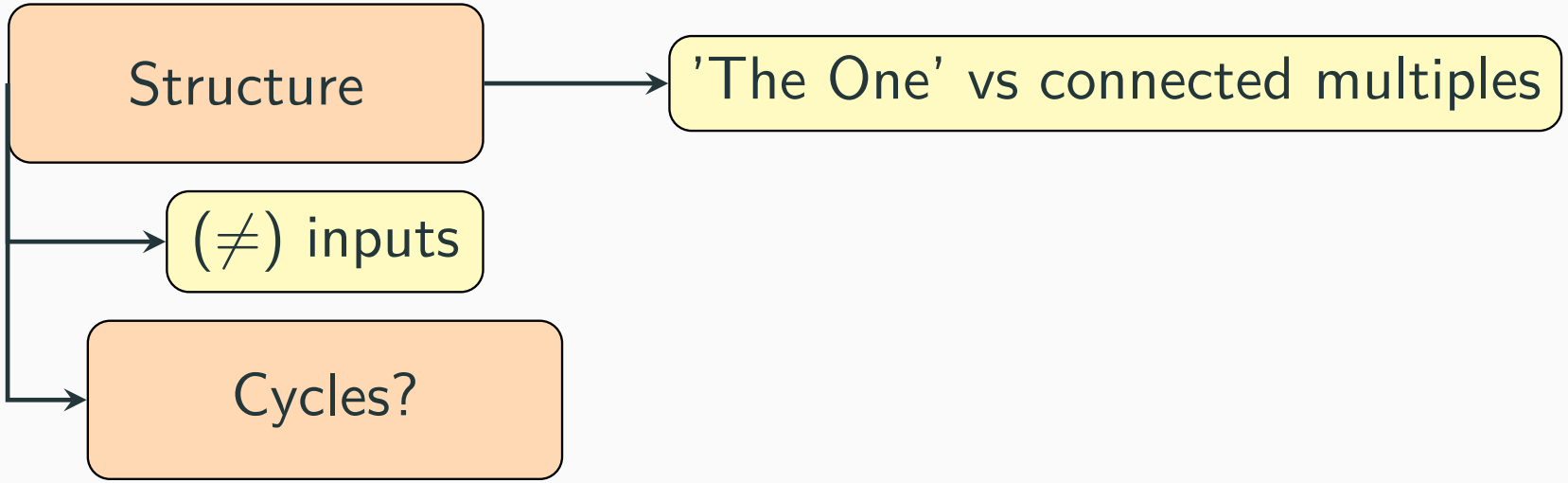
Conclusion

Scheme



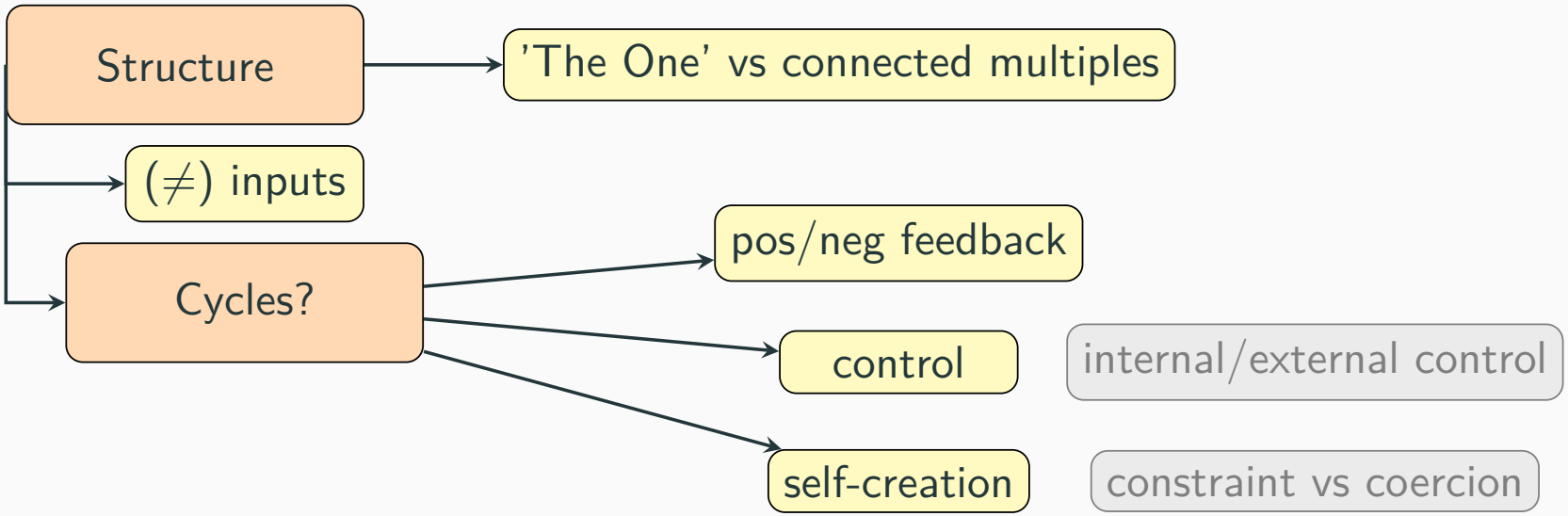
another summary, tabular summary, functional, structural, relation function-structure, evaluation, ♋

Scheme



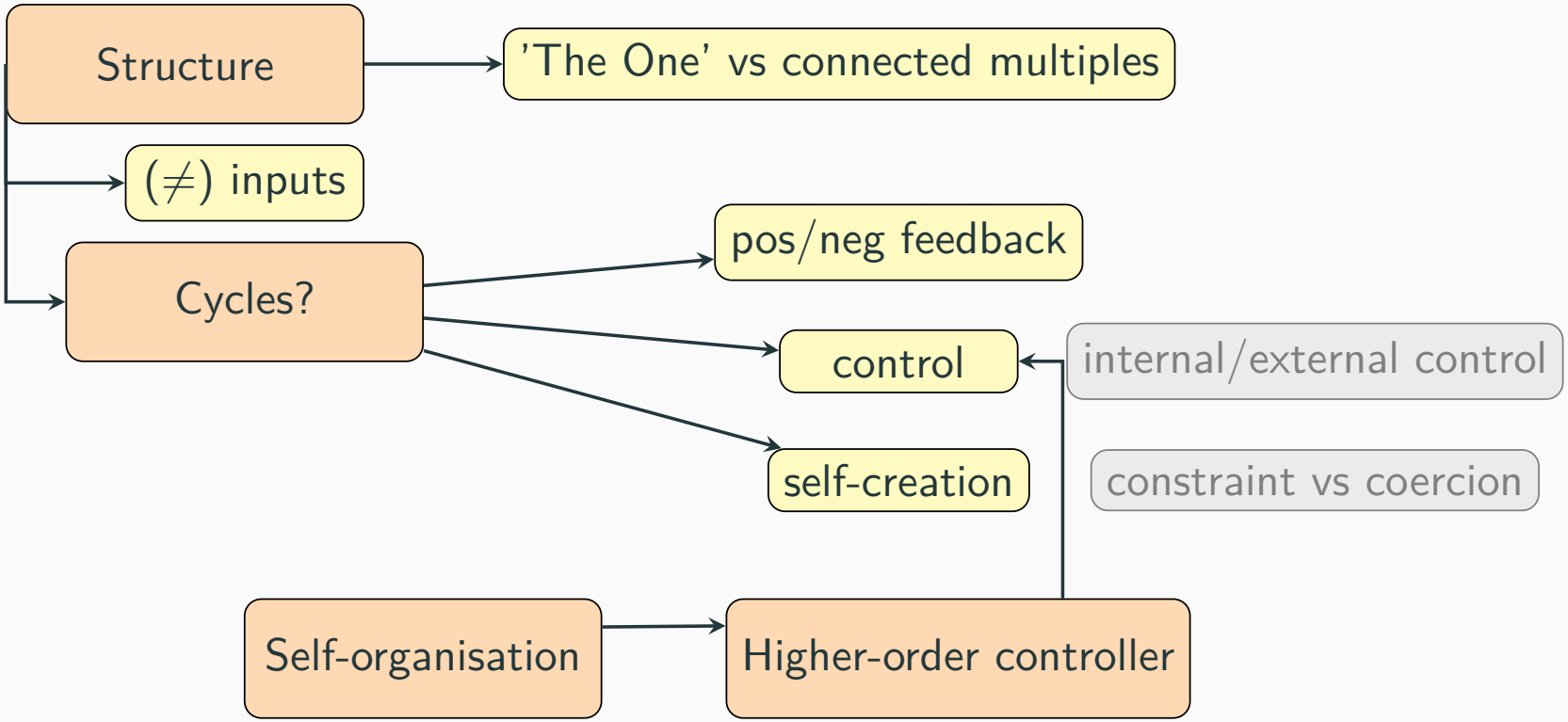
another summary, tabular summary, functional, structural, relation function-structure, evaluation, ♋

Scheme



another summary, tabular summary, functional, structural, relation function-structure, evaluation, ♋

Scheme



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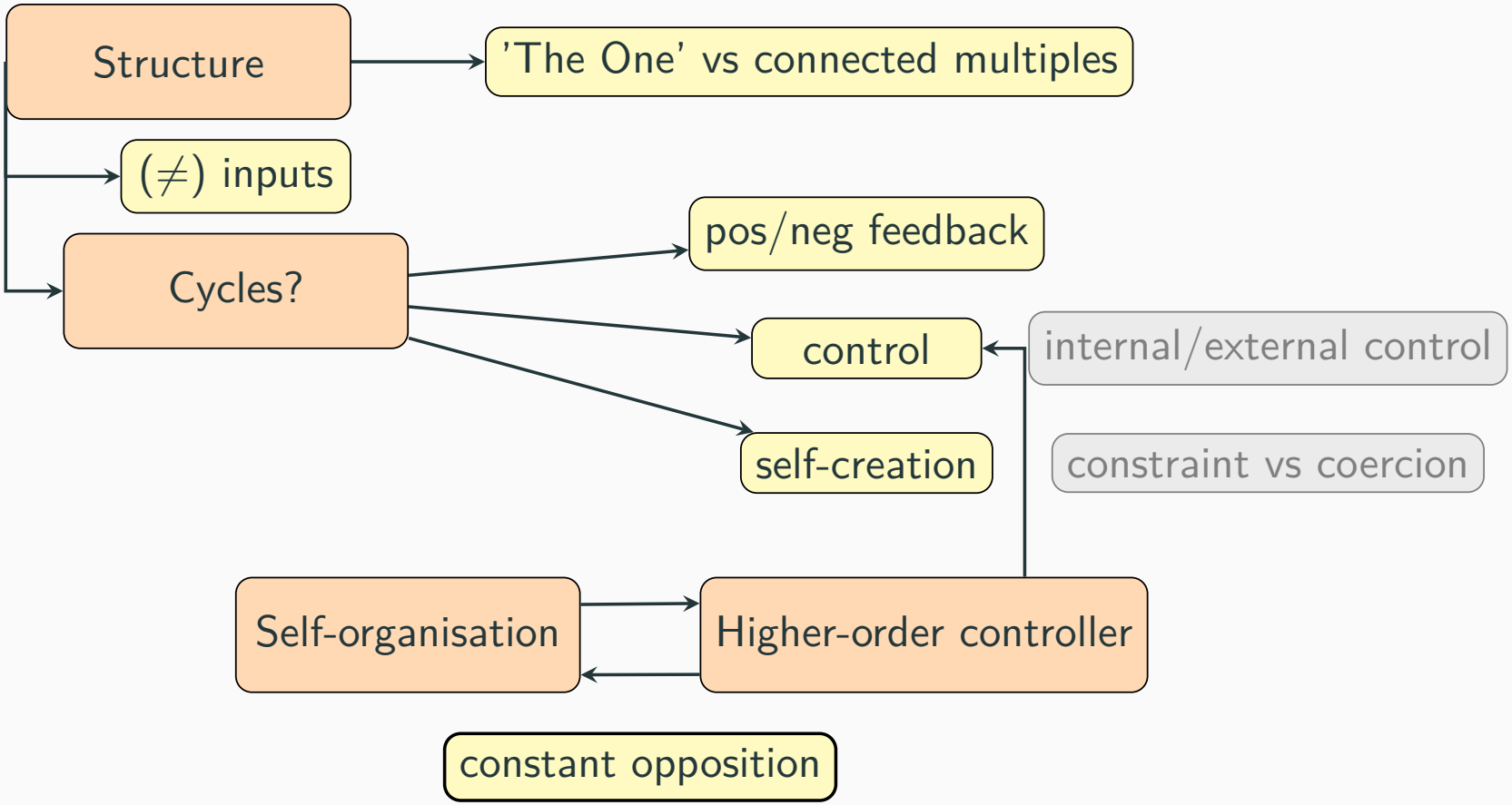
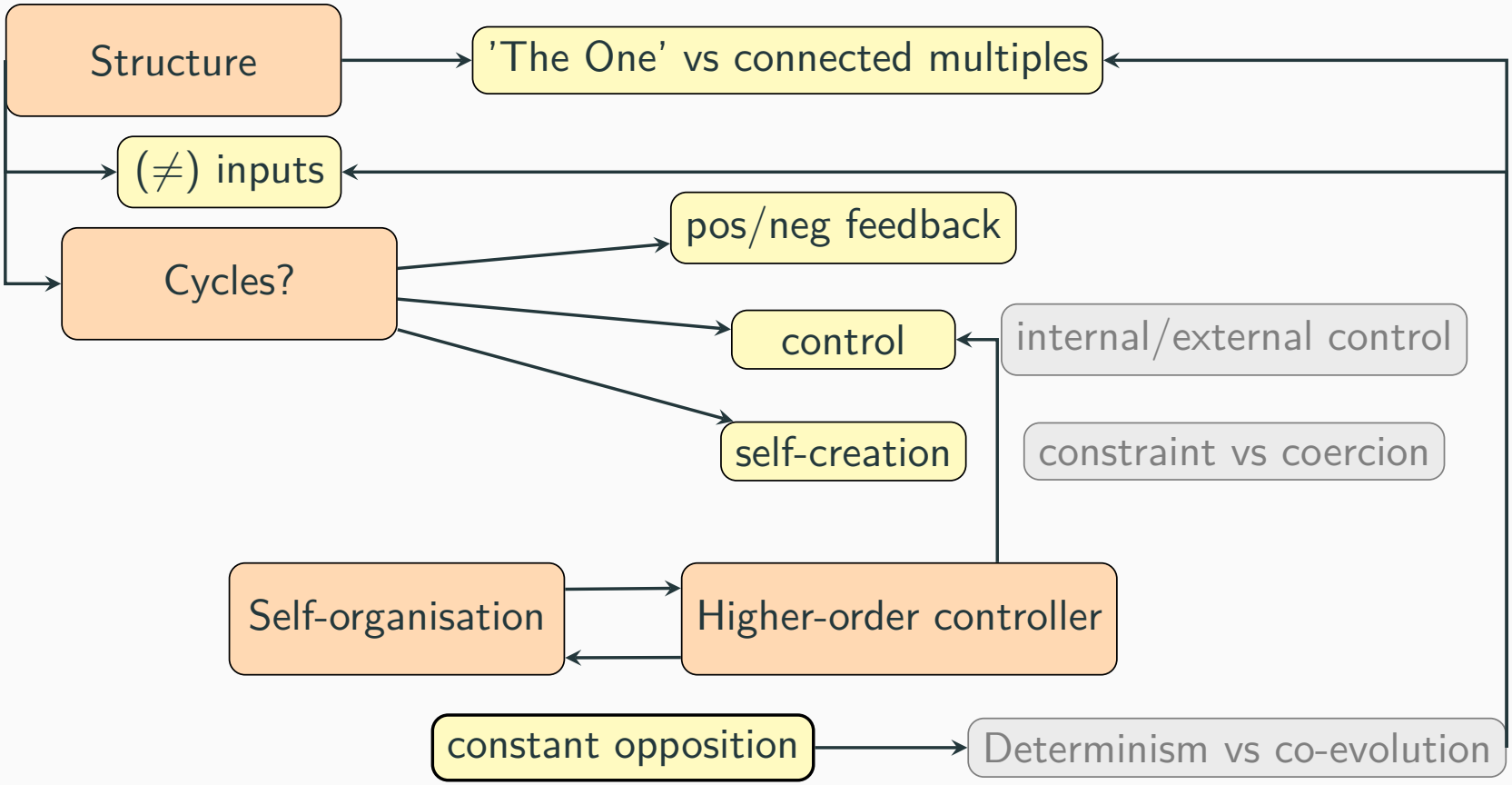
Scheme



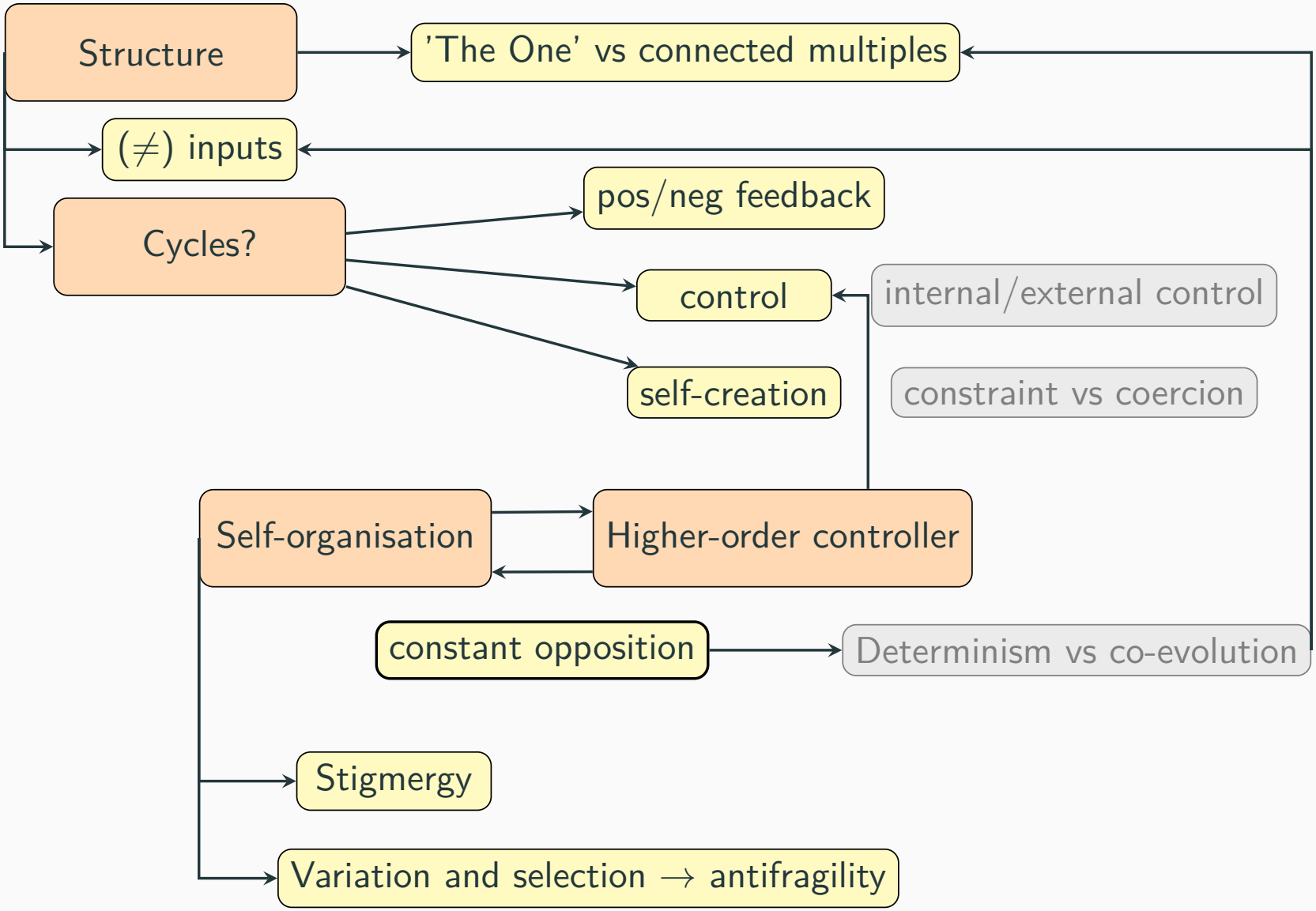
another summary, tabular summary, functional, structural, relation function-structure, evaluation, ♋

Scheme



another summary, tabular summary, functional, structural, relation function-structure, evaluation, ♋

Scheme


Structure
'The One' vs connected multiples
(≠) inputs
Cycles?
pos/neg feedback
control
internal/external control
self-creation
constraint vs coercion
Self-organisation
Higher-order controller
constant opposition
Determinism vs co-evolution
Stigmergy
Variation and selection → antifragility

Application in smaller groups

(Write and) put your post-its to the corresponding post:

Examples in

- your own struggles
- daily life
- ...

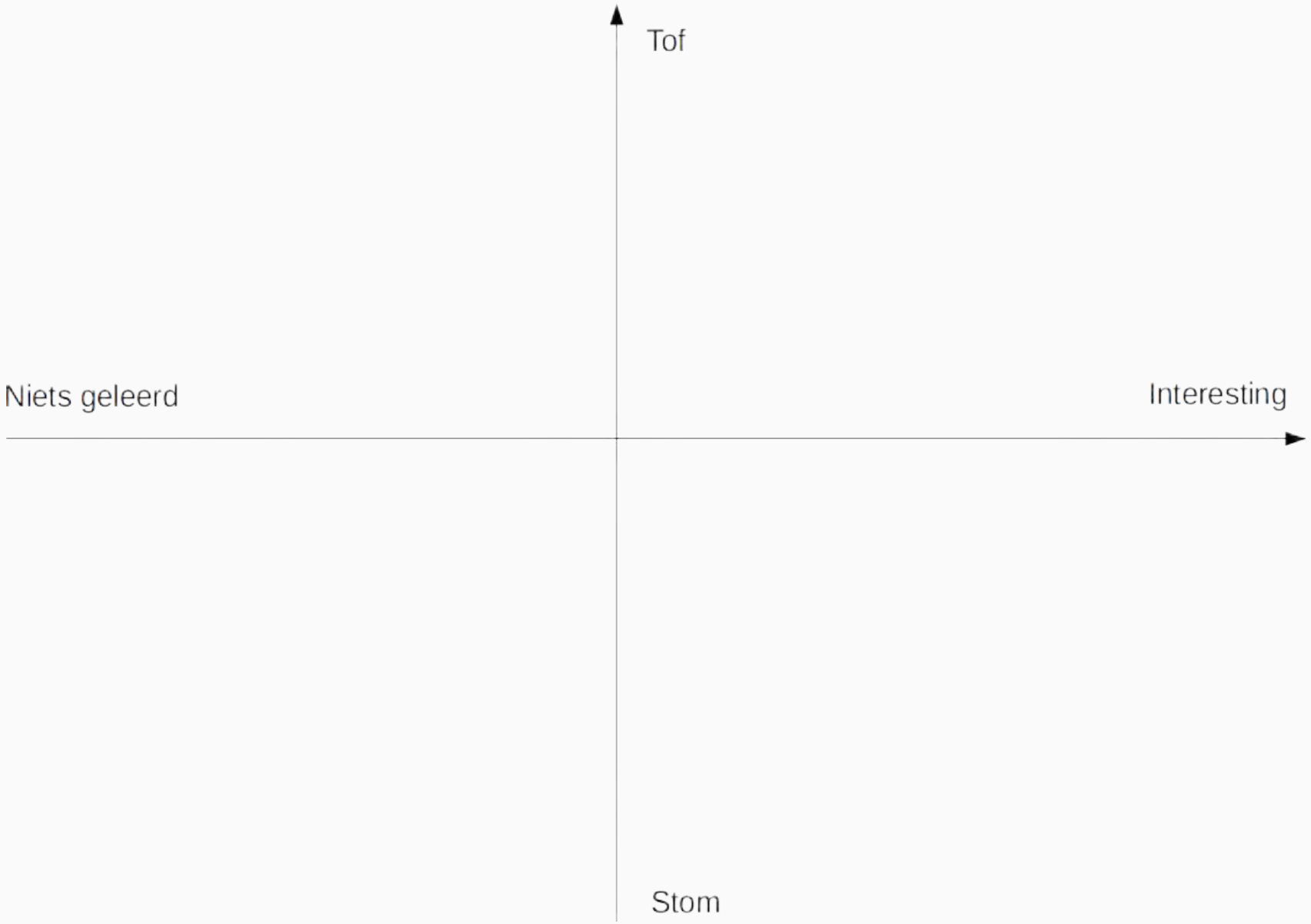
Of:

- existing mechanisms (good or bad)
- possibilities for change

Then discuss in 'open space' way.

Internal moderation: let everybody speak! + 'law of 2 feet'

Evaluation



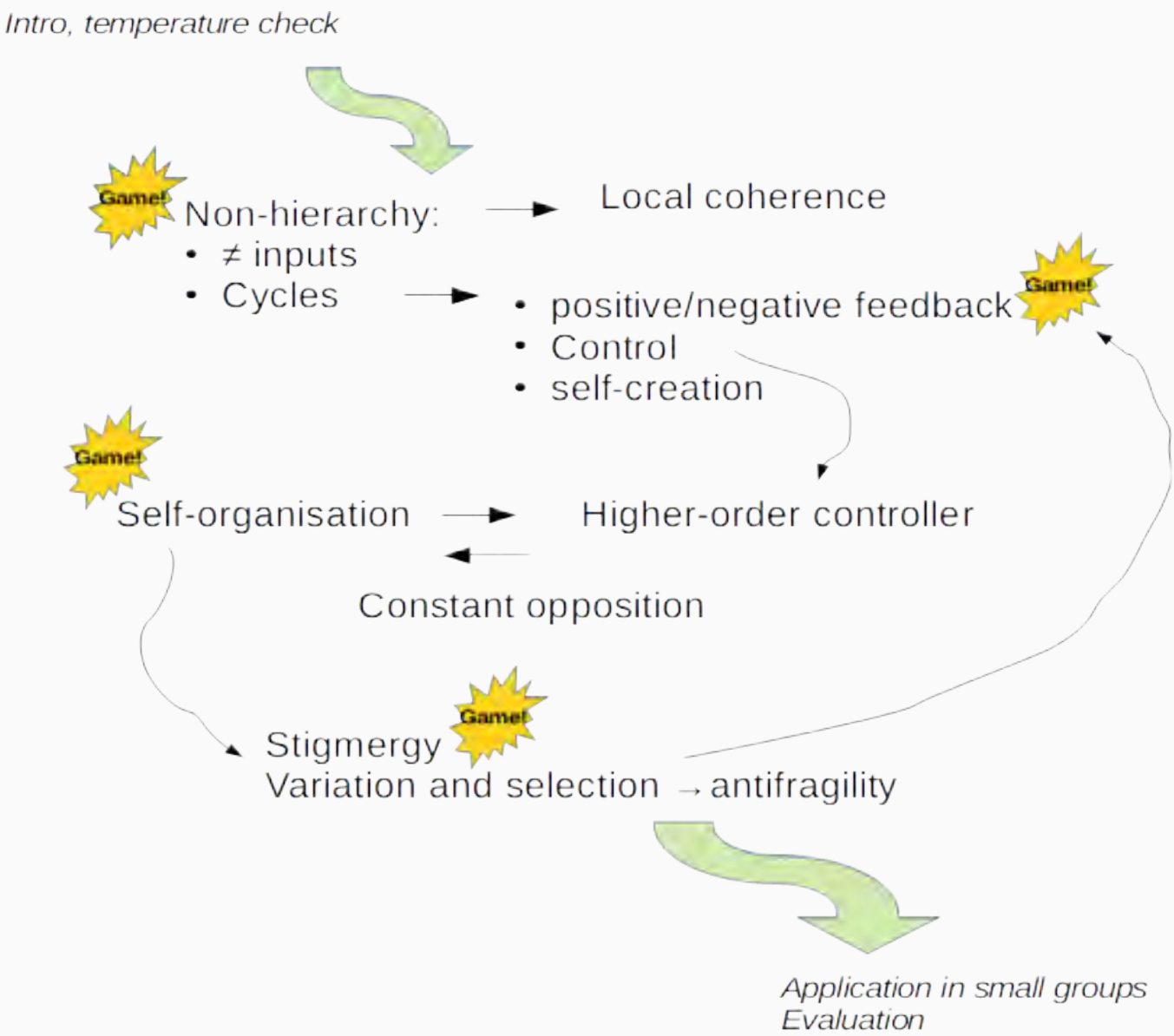
Support

- Aim: independent from state or corporate funding, bureaucracy; community based
- alternative economy bottom up
- Support, exchange however you want

Links:

- `mathematicalanarchism.wordpress.com`
- `patreon.com/mathematicalanarchism`
- `donorbox.org/mathematical-anarchism`

Summary


Intro, temperature check
Game!
Non-hierarchy:
• ≠ inputs
• Cycles
Local coherence
• positive/negative feedback
• Control
• self-creation
Game!
Game!
Self-organisation
Higher-order controller
Constant opposition
Game!
Stigmergy
Variation and selection → antifragility
Application in small groups
Evaluation

Extra's

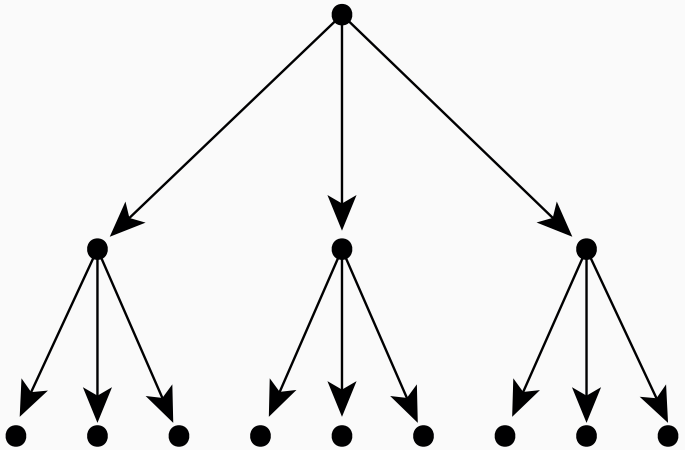
Hierarchy

Structural and functional

Functional

$\approx ?$

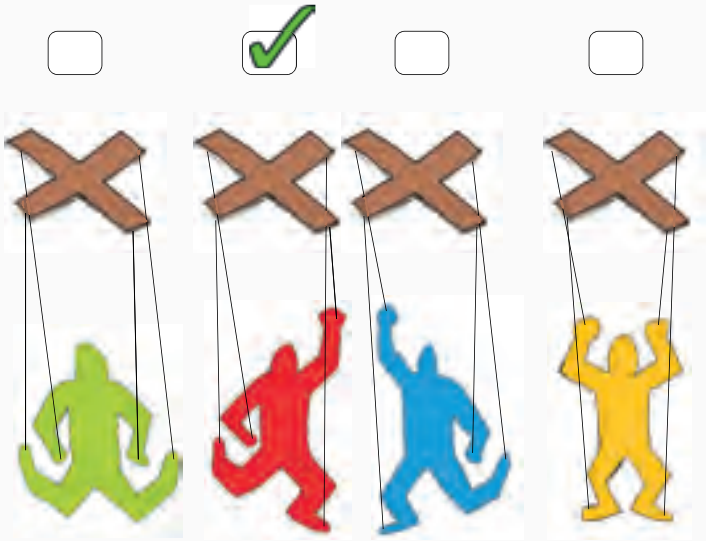
Structural



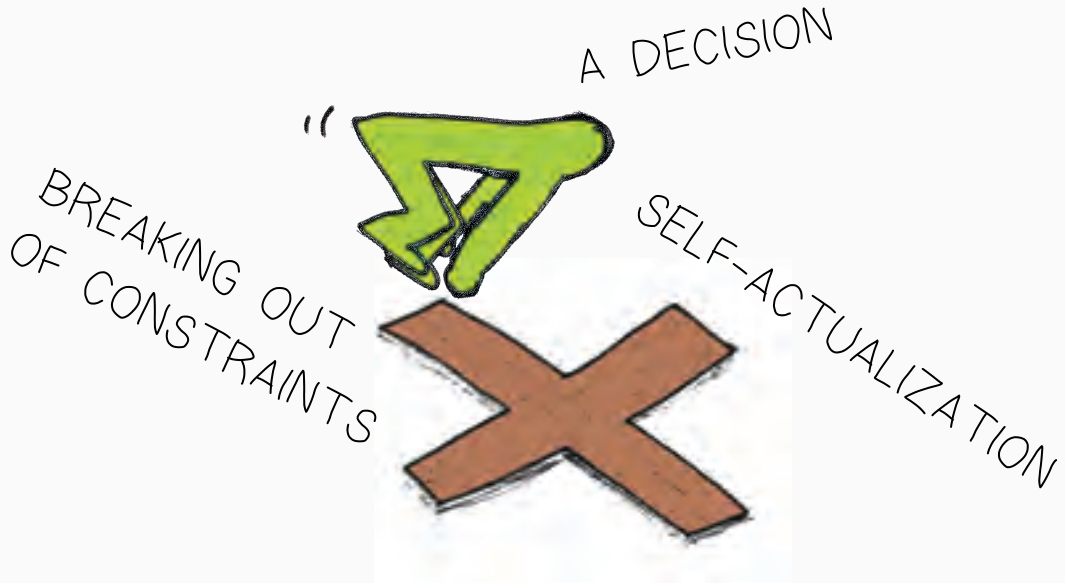
1a Functional

- Freedom
- Constraint and coercion
- Internal and external control
  - mathematical
  - basic idea

Freedom



AS A RIGHT (TO CHOOSE)



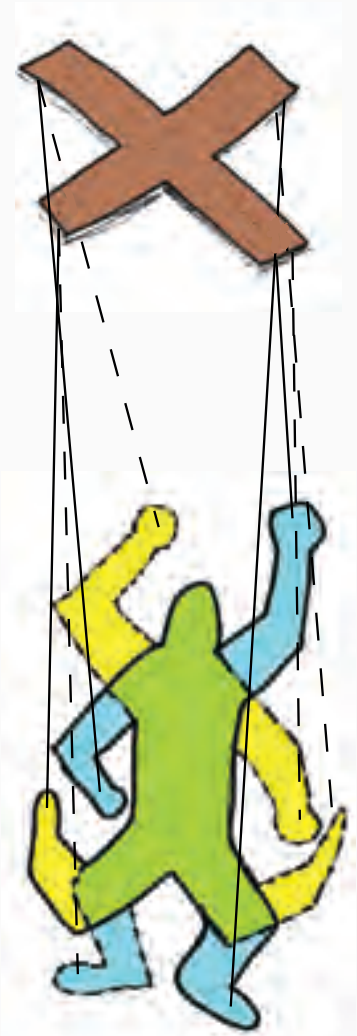
Constraint and coercion

Constraint:
limits possibilities

Coercion:
when forced to do something
one does not want

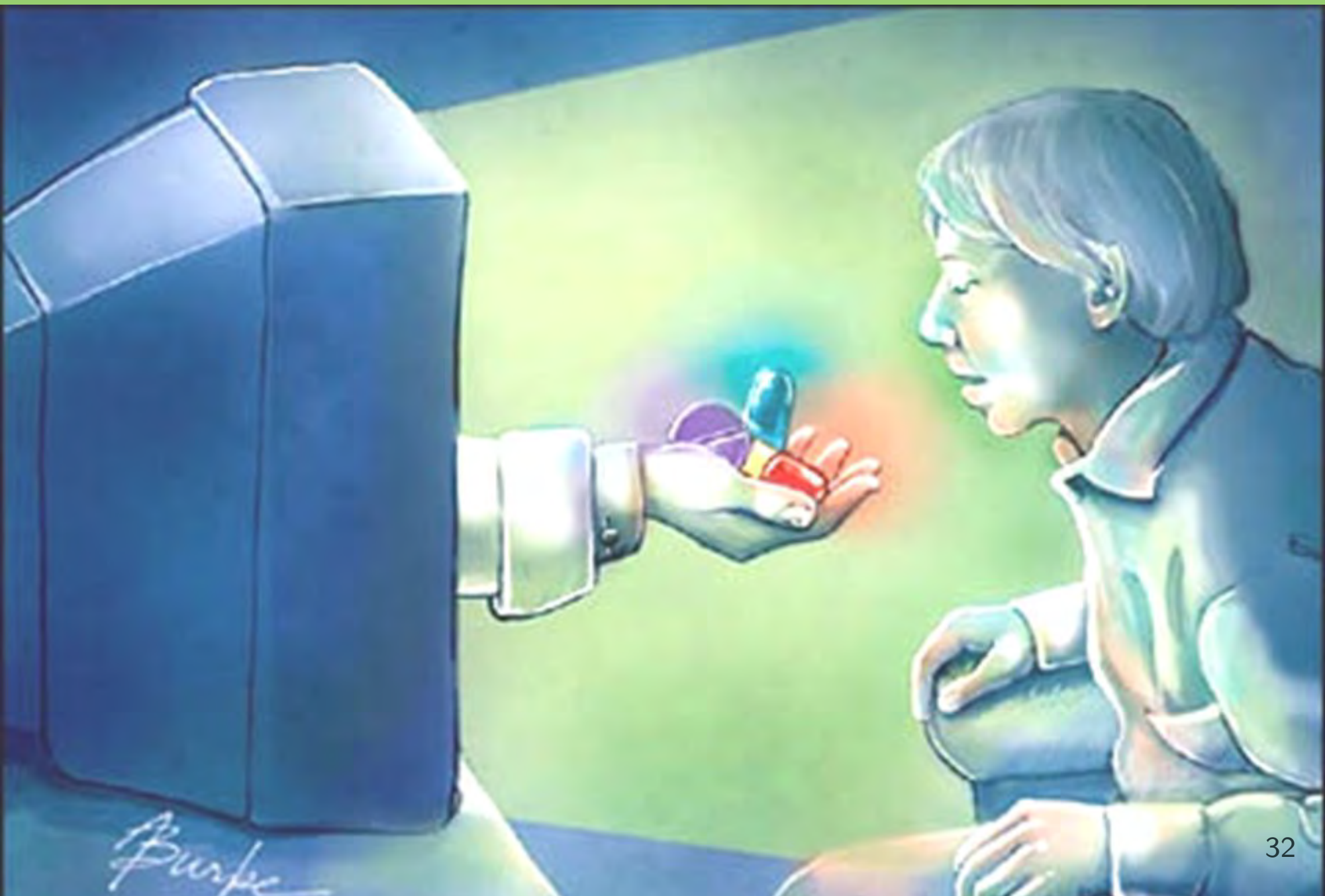
Non-coercive constraint

Non-constraint coercion



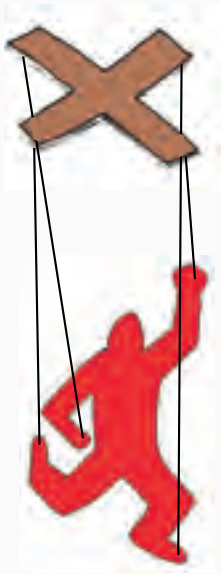
Coercion can increase possibilities

When coerced?



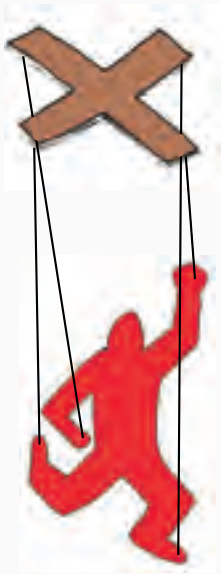
Determination

Vulnerable for coercion



Determination

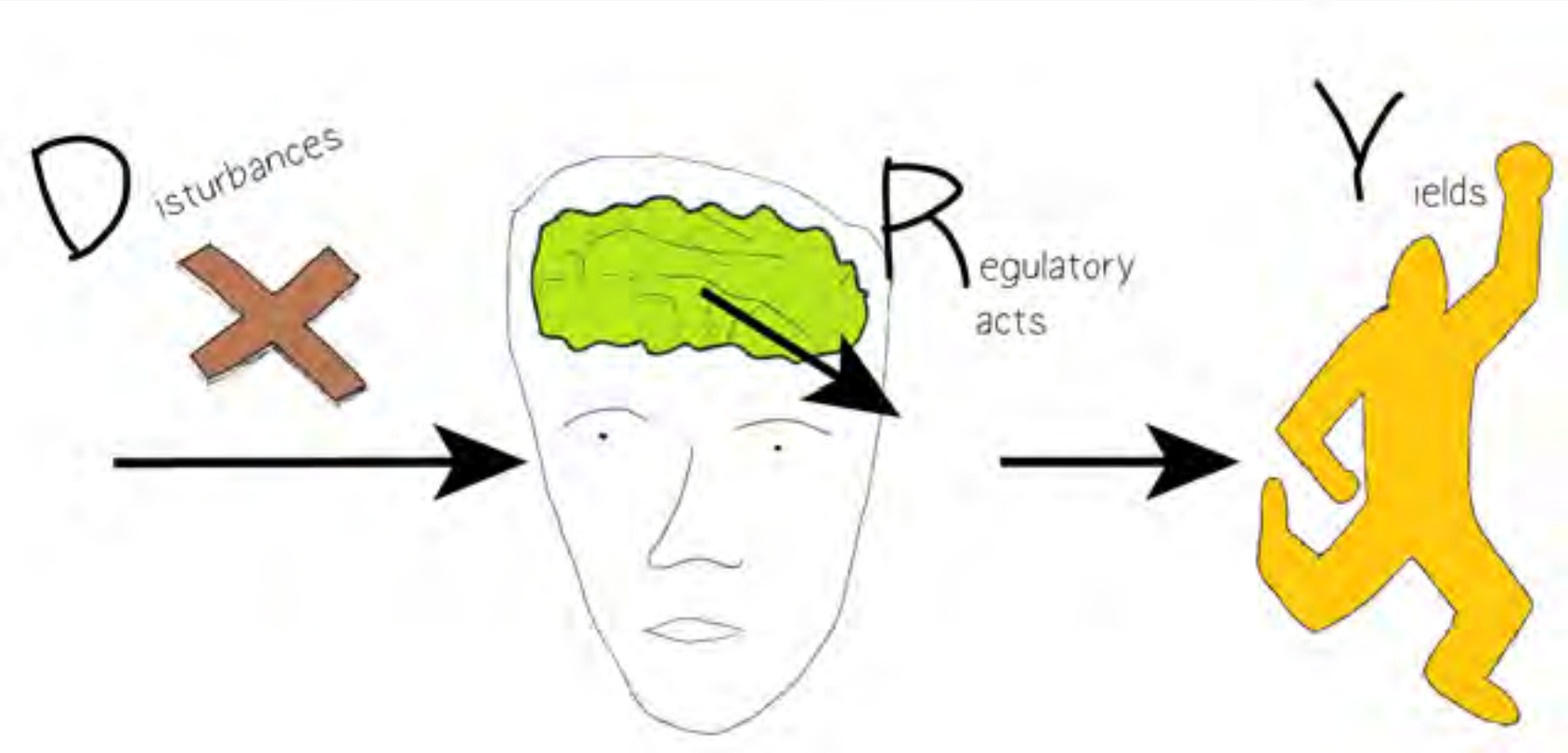
Vulnerable for coercion



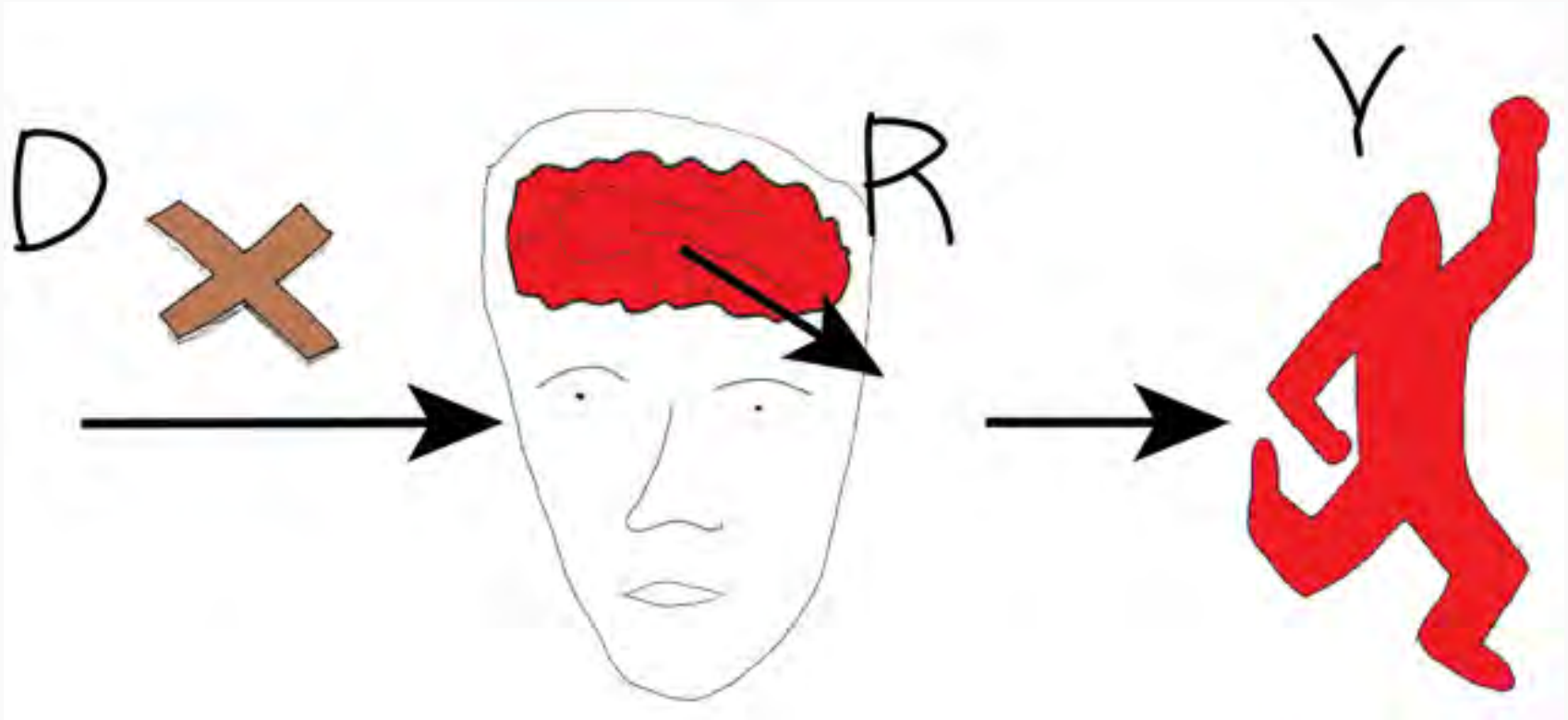
DEPENDENCE

Can be wanted

Internal or external control?

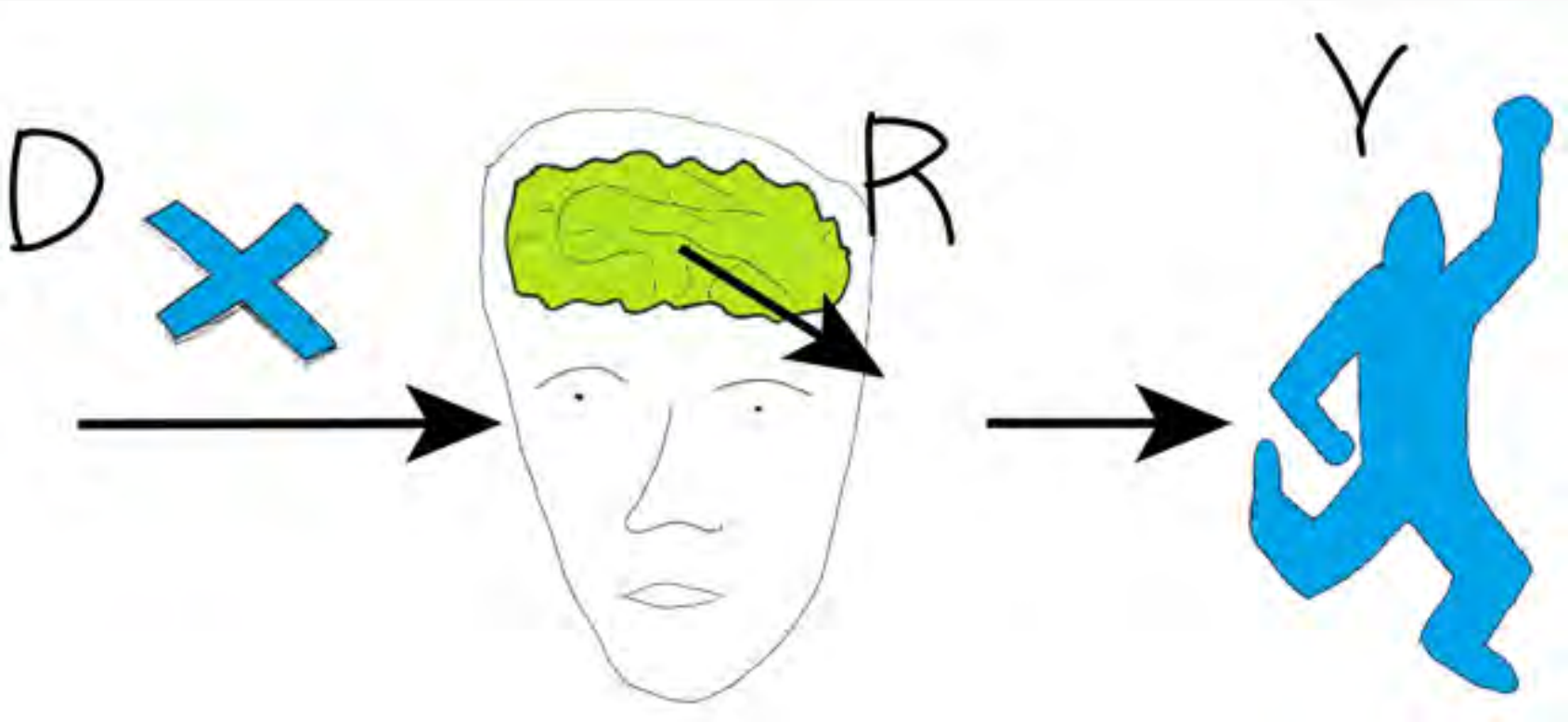


Internal or external control?



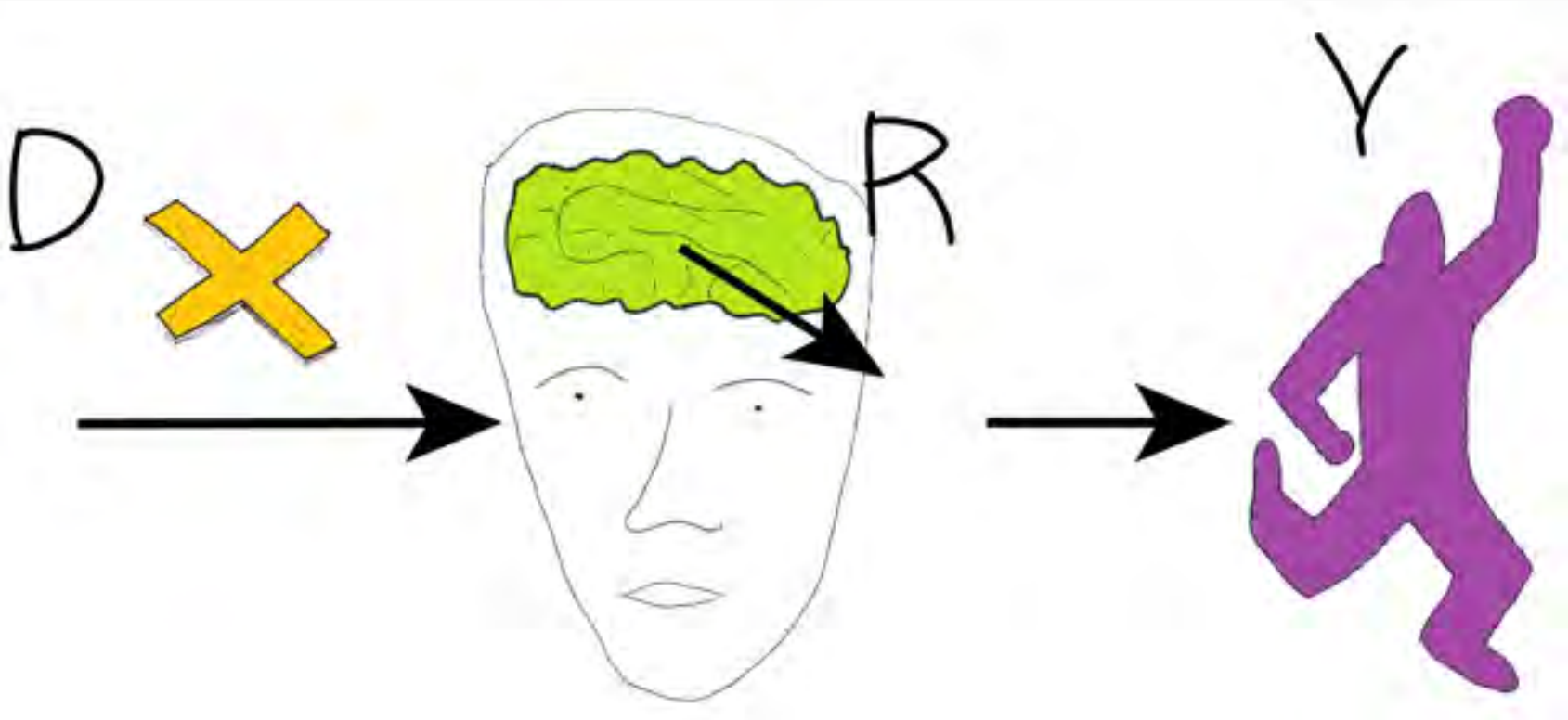
Internal control: change of R causes change in Y

Internal or external control?



External control: change of D causes change in Y

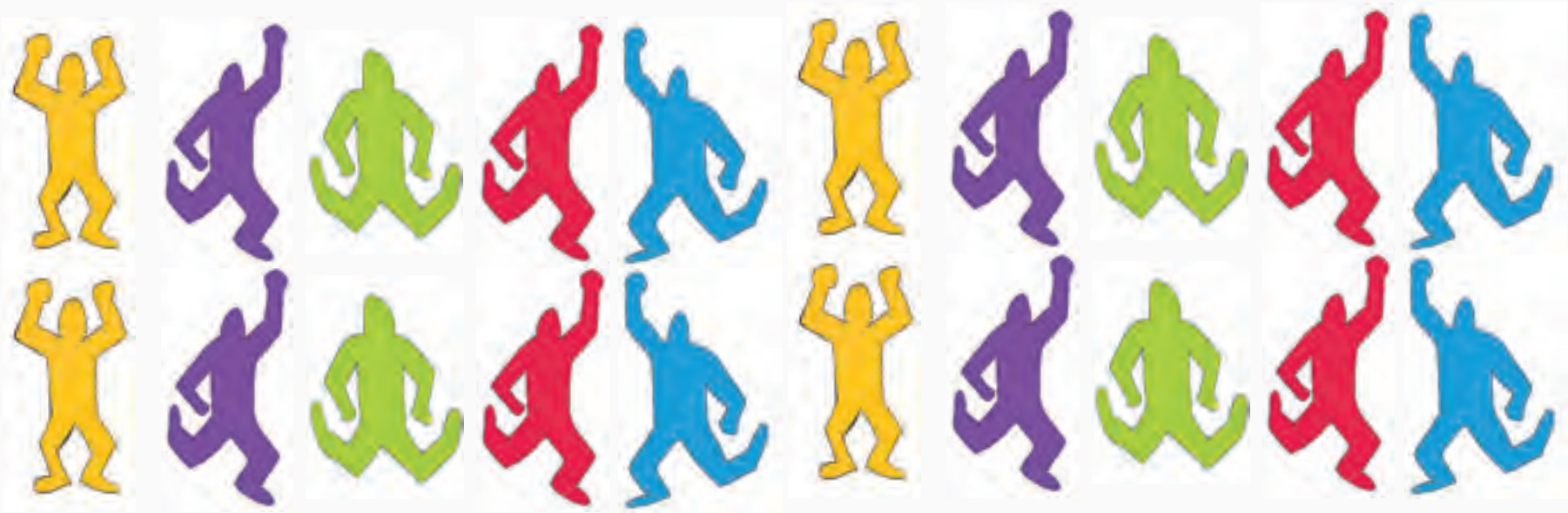
Internal or external control?



External control: change of D causes change in Y

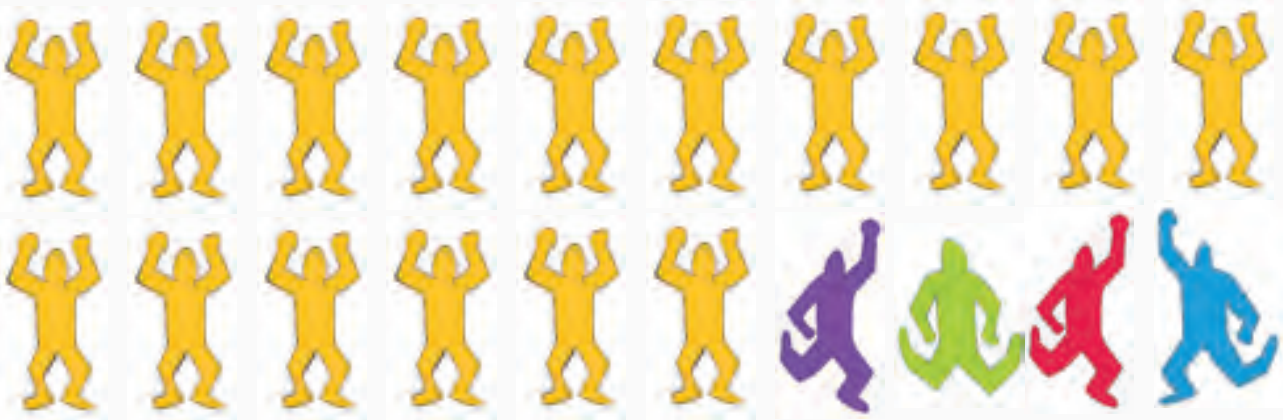
Variation

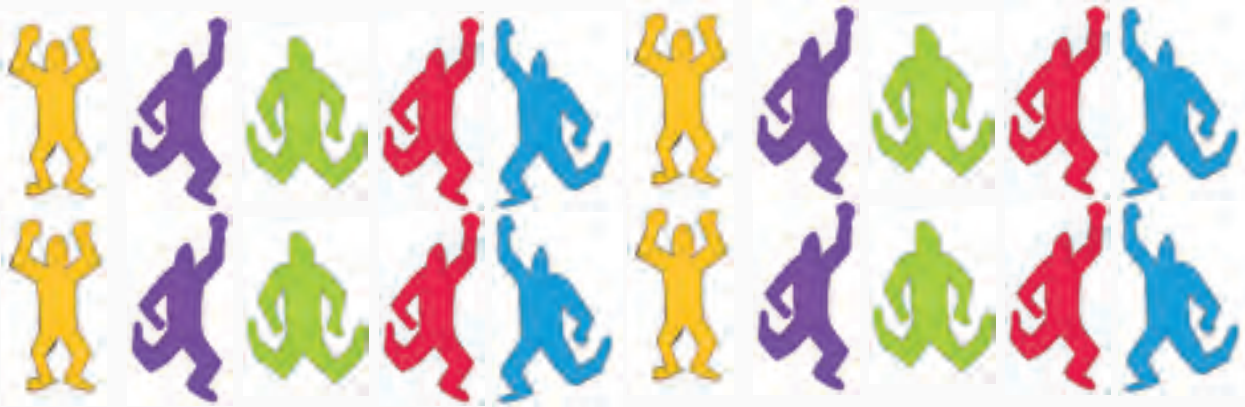
Measurement of variation



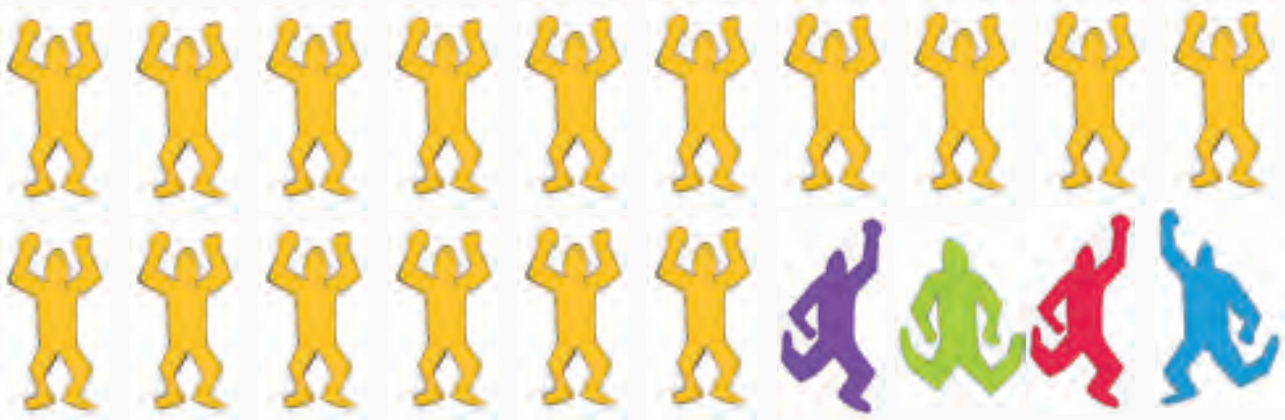
In how far choosing R/D can decrease variation Y

Entropy

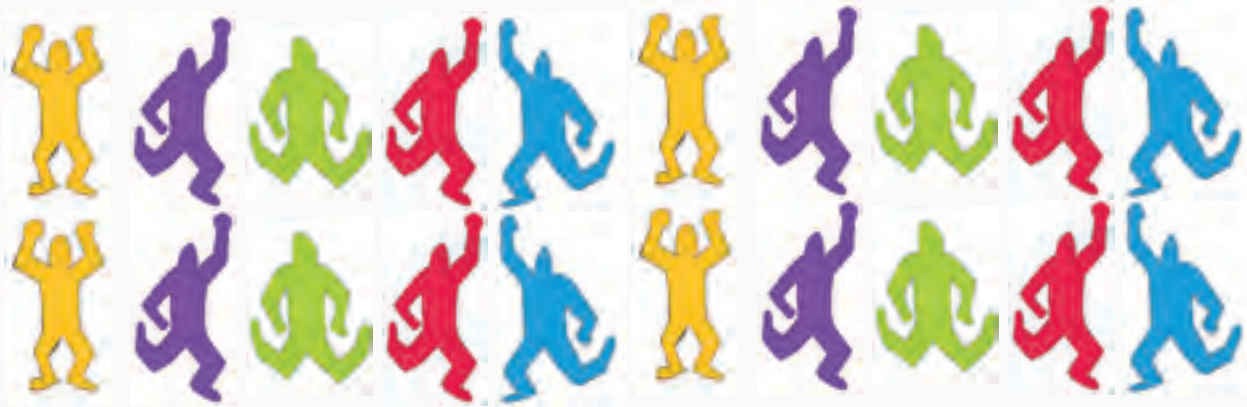




Entropy



VARIETY



Entropy

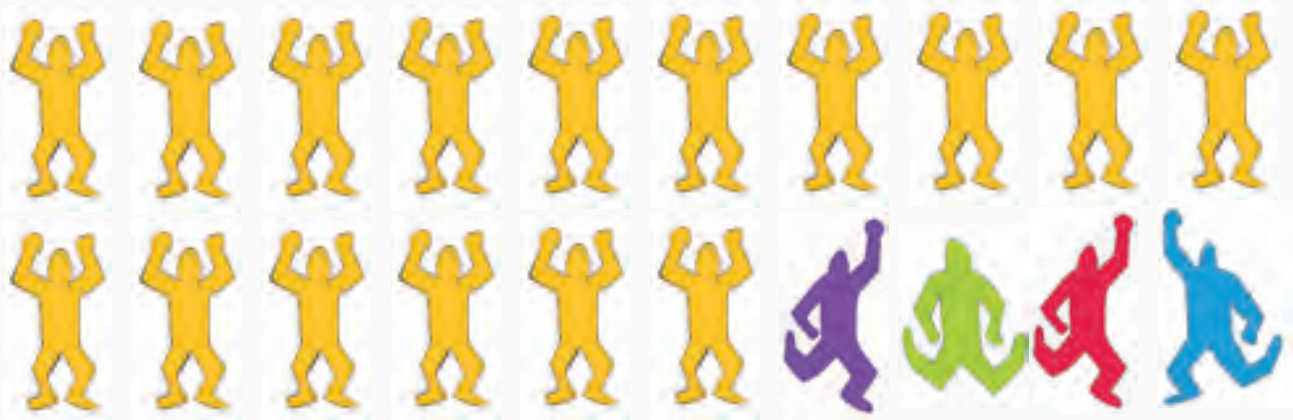
VARIETY

5

=

5

Entropy



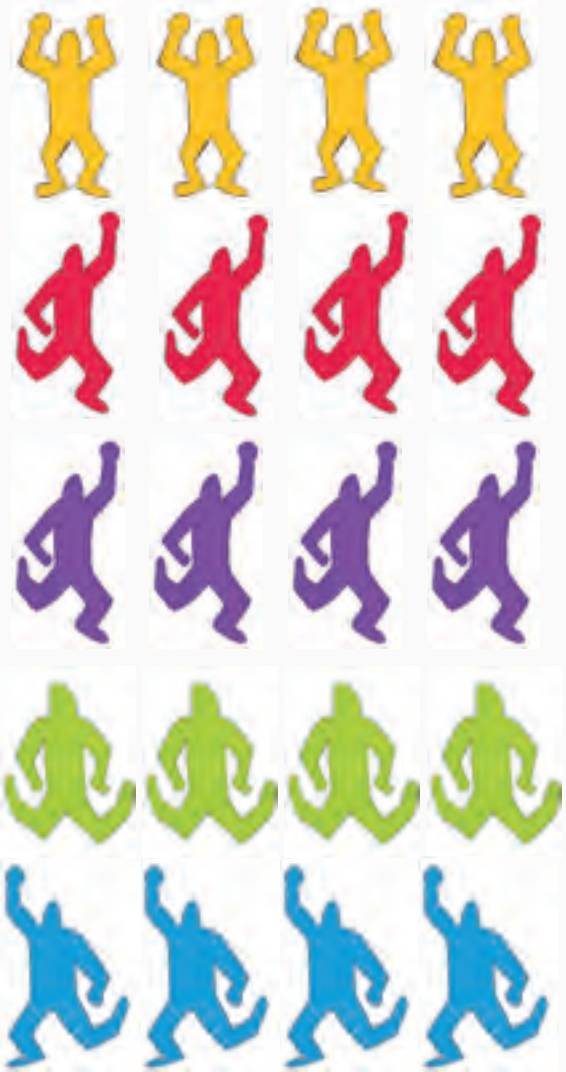
LOW ENTROPY

HIGH ENTROPY

$$H(A) := -\sum_{a \in A} p(a) \log p(a)$$

Conditional entropy

Variation of variable B (e.g. limb position) when other variable A is known (e.g. color)



$$H_A(B) = 0$$

Conditional entropy

Variation of variable B (e.g. limb position) when other variable A is known (e.g. color)

$$H_A(B) = H(B)$$

Determination

How much of $H(B)$ gets reduced when A is known:

$$Det_A(B) = \frac{H(B) - H_A(B)}{H(B)}$$

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- $H_A(B) = 0 \Rightarrow B = f(A)$: A determines B, $Det_A(B) = 1$
- $H_A(B) = H(B) \Rightarrow A$ and B independent: no determination, $Det_A(B) = 0$

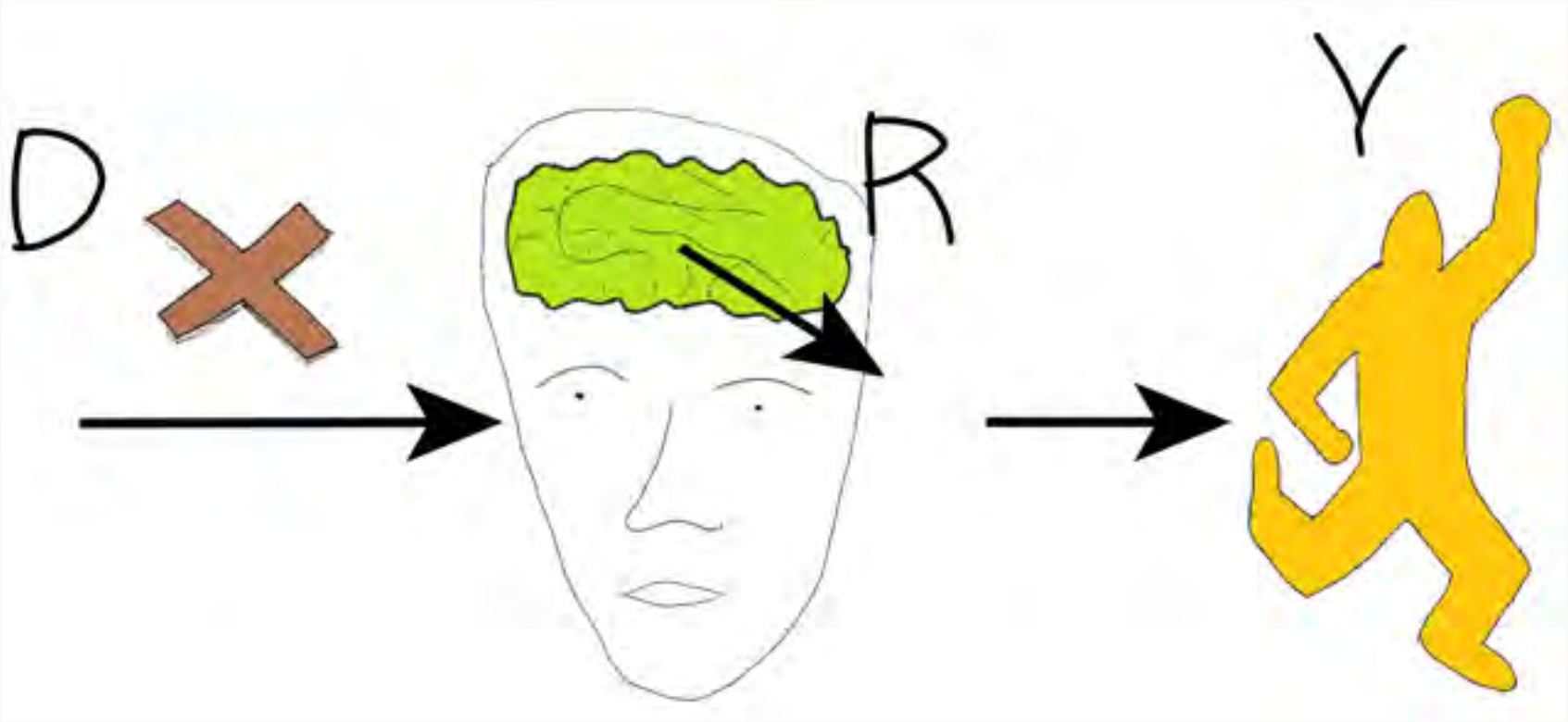
Internal and external control

Internal control:

$$Det_R(Y)$$

External control:

$$Det_D(Y)$$



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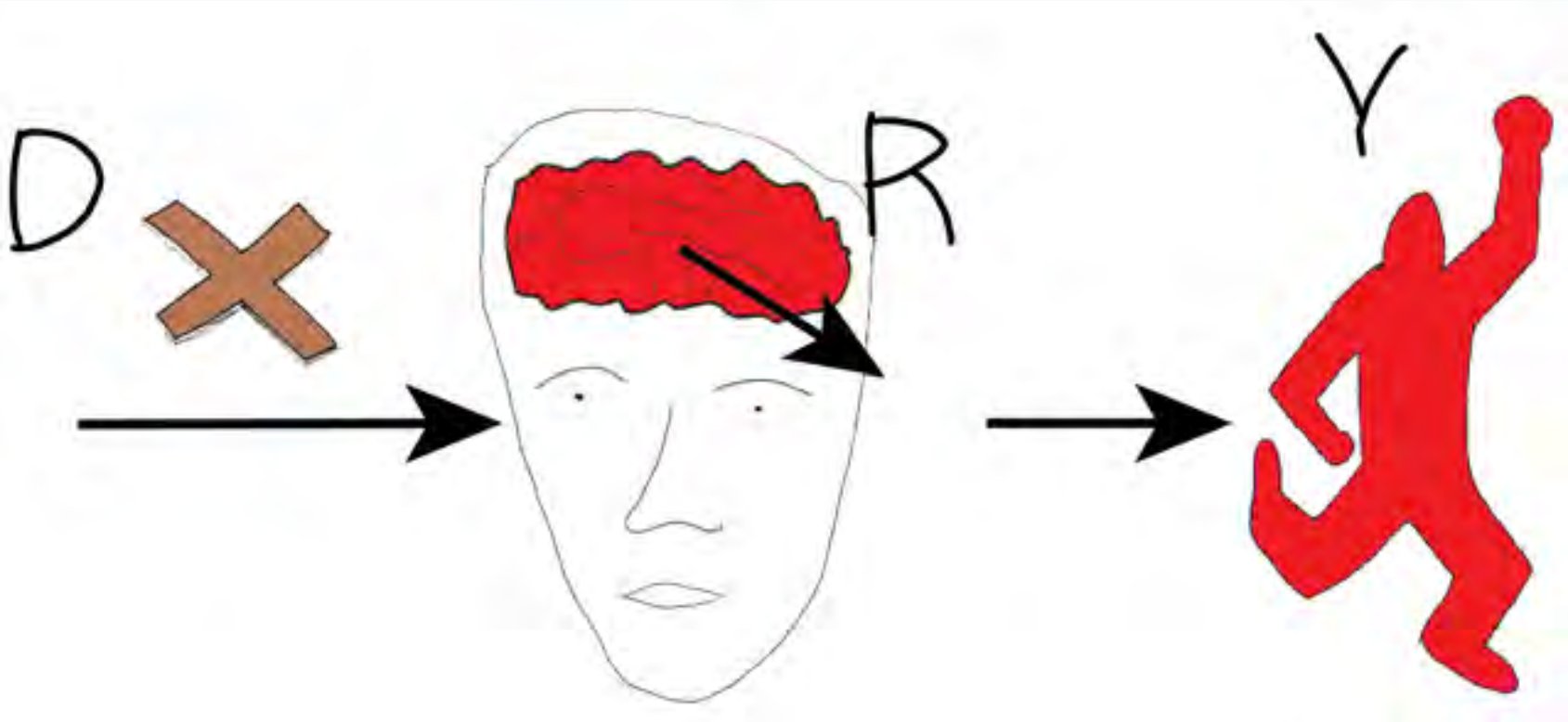

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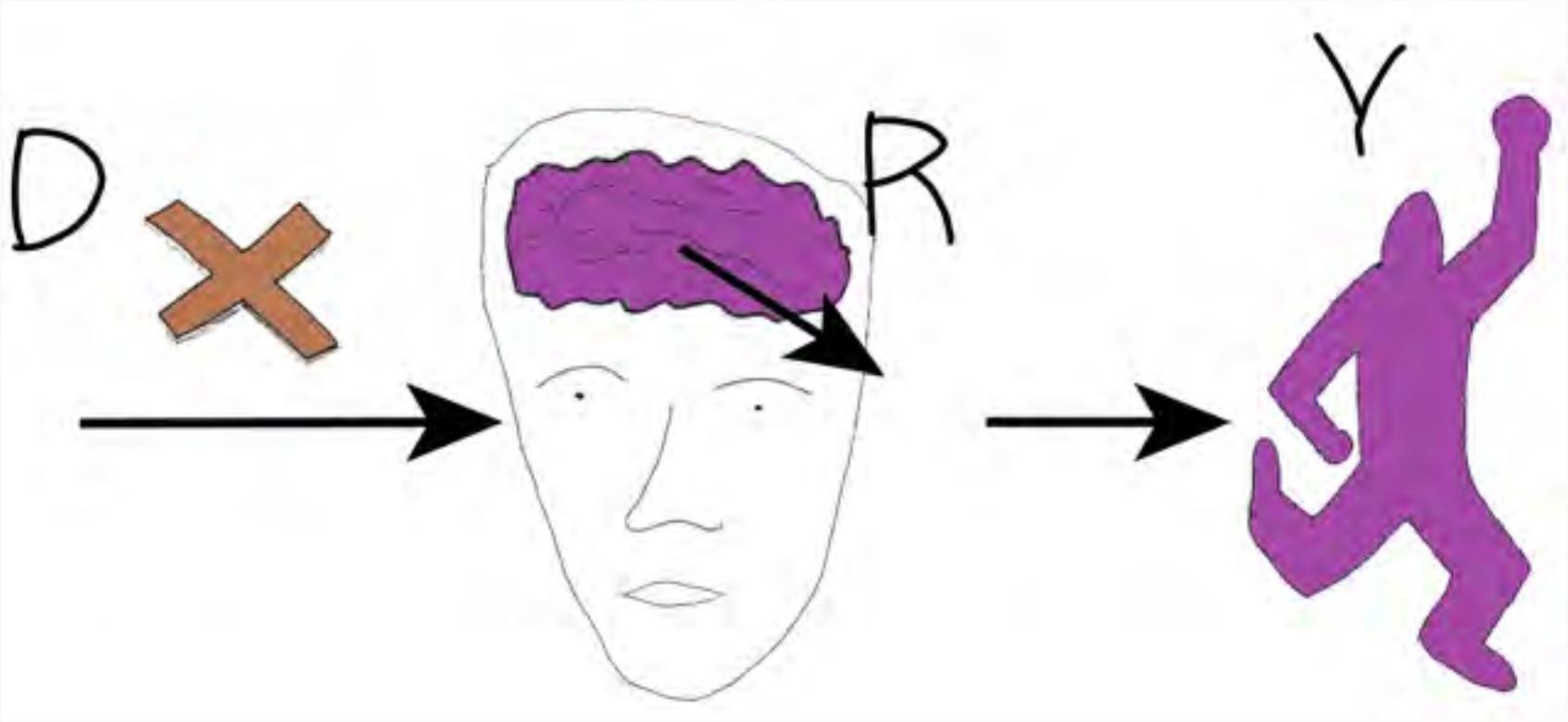

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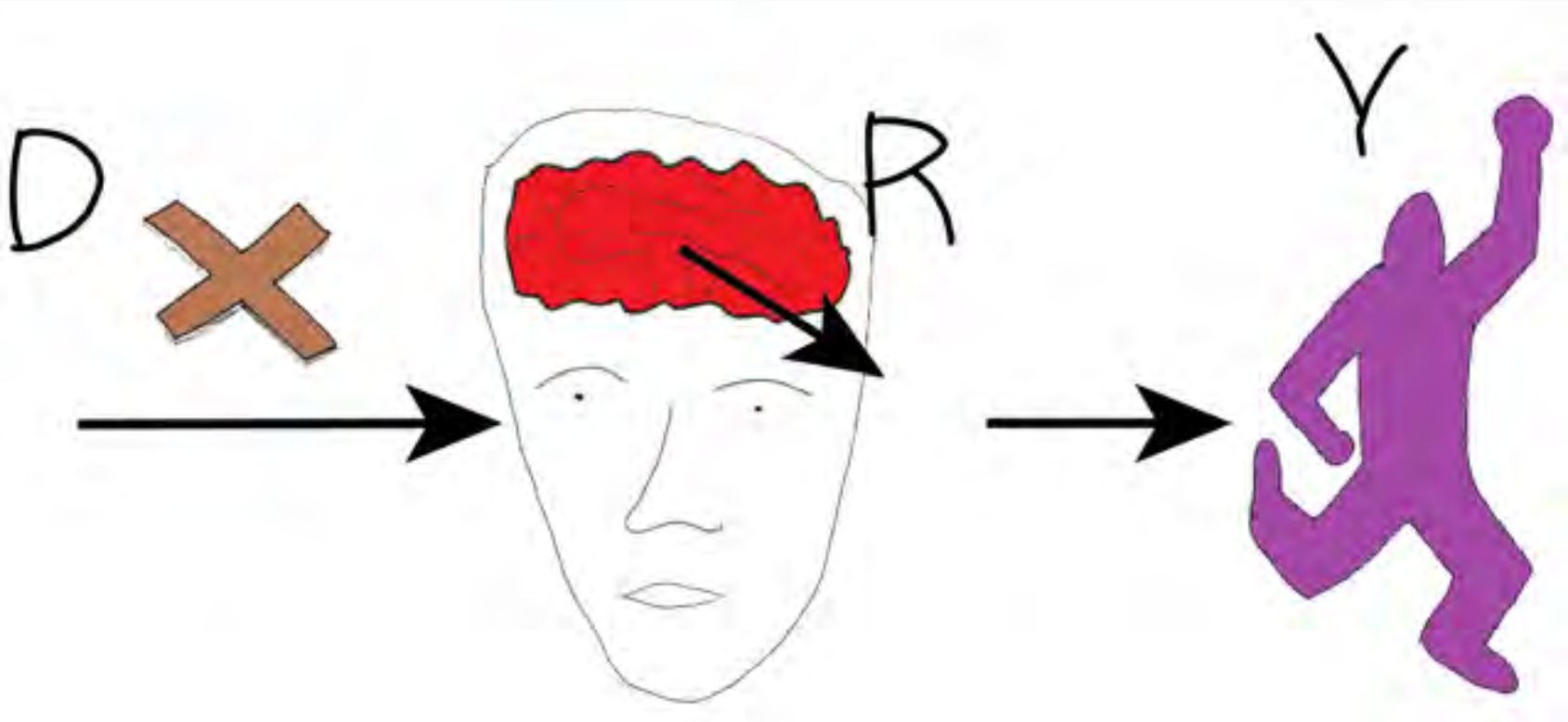

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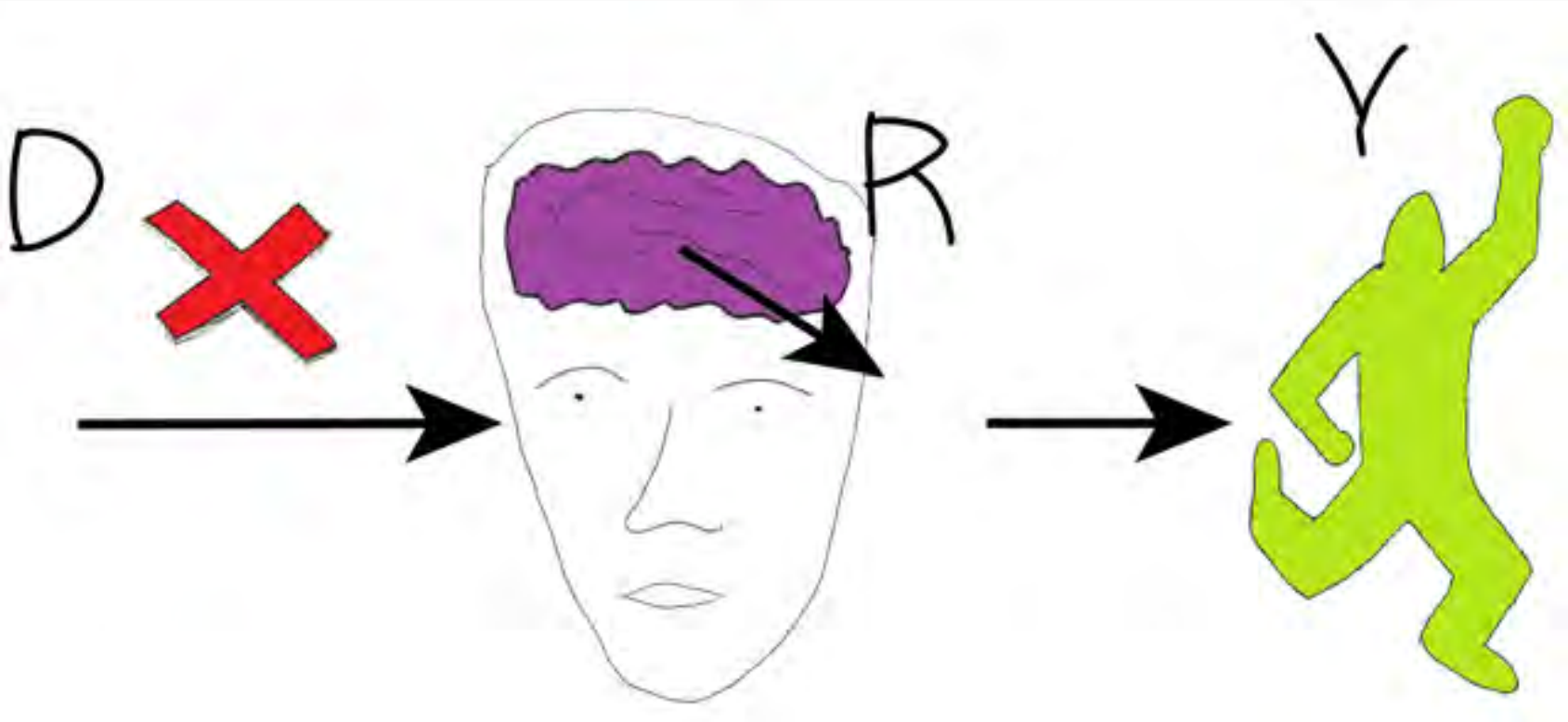

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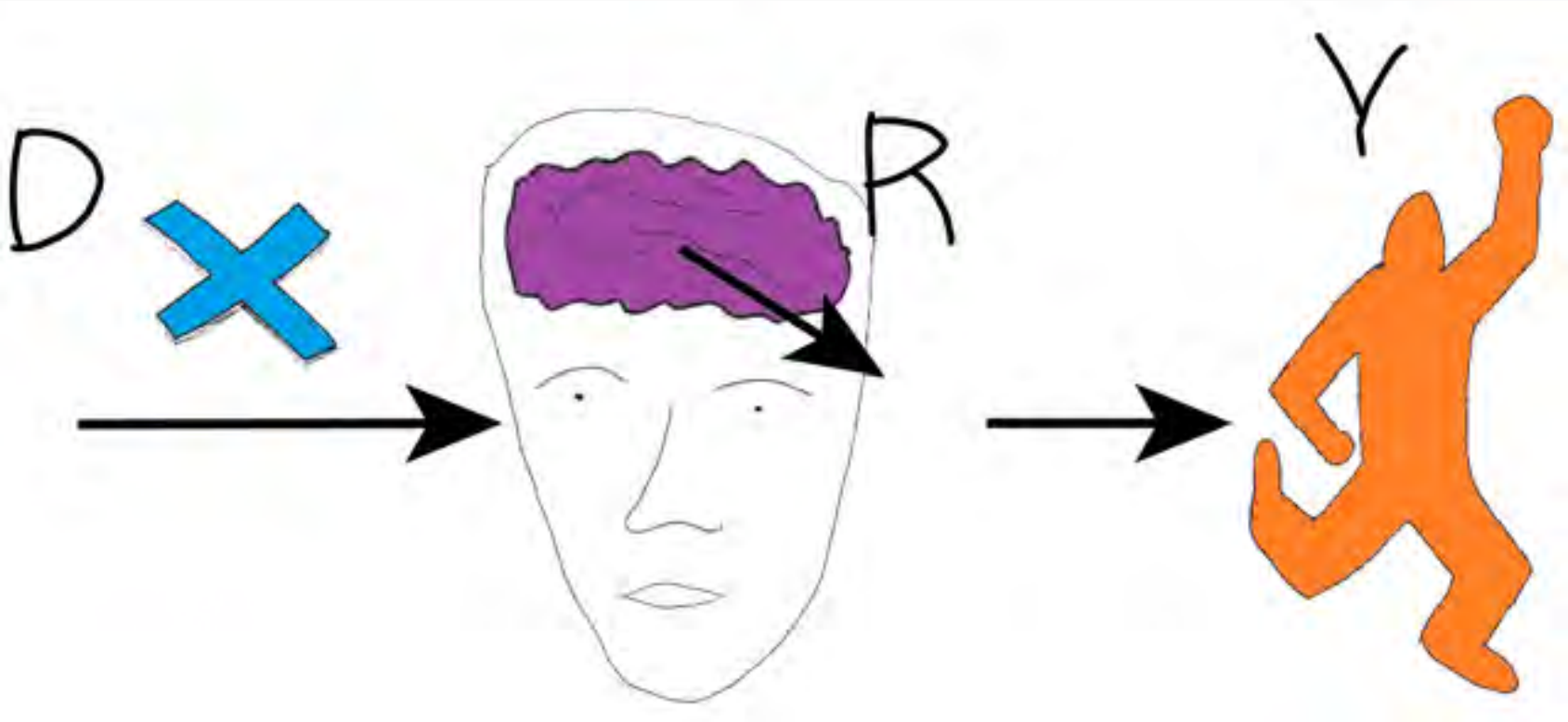

Internal and external control

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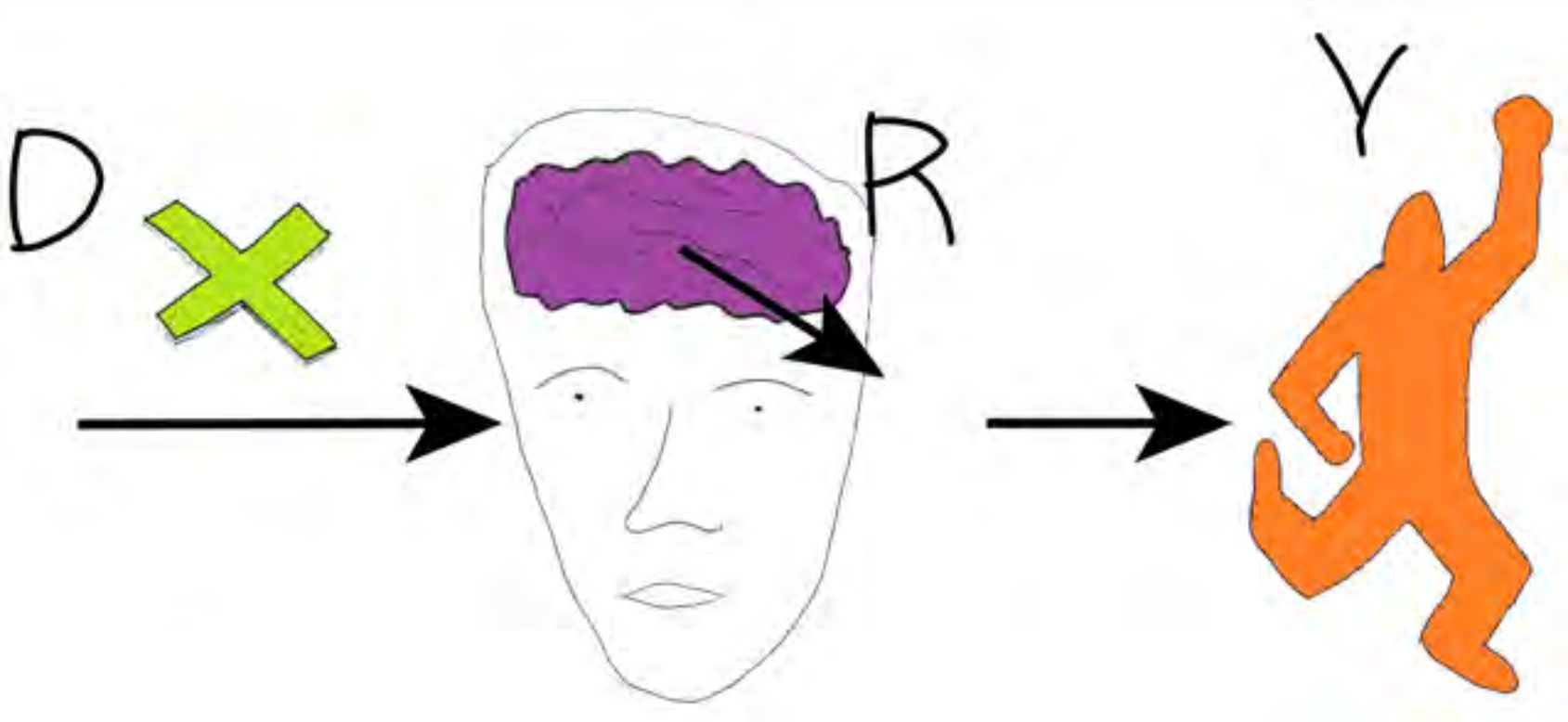


Internal and external control

INTERNAL CONTROL

EXTERNAL CONTROL

Internal and external control

INTERNAL CONTROL

EXTERNAL CONTROL

Internal and external control

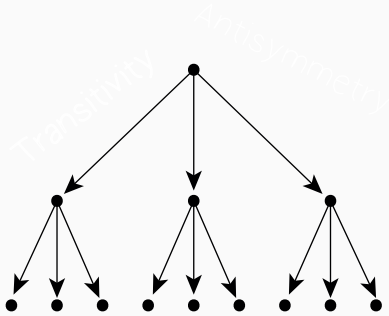
Internal control

External control

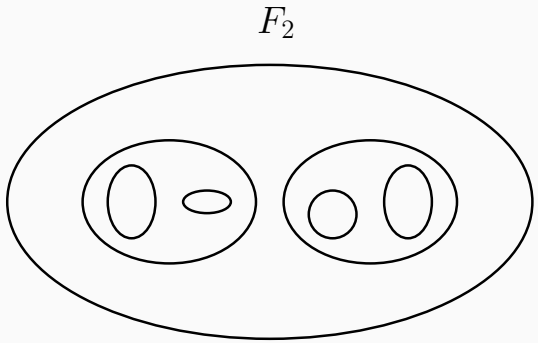
1b Structural

'The One' vs connected multiples

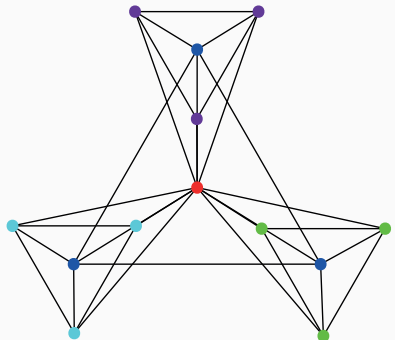
- Directed



- Sets



- Undirected



Hierarchy does not follow from assumptions

In

- Law of Requisite Hierarchy ($\leftarrow$ Law of Requisite Variety)
- Perceptual control hierarchy
- Mesarovic's model

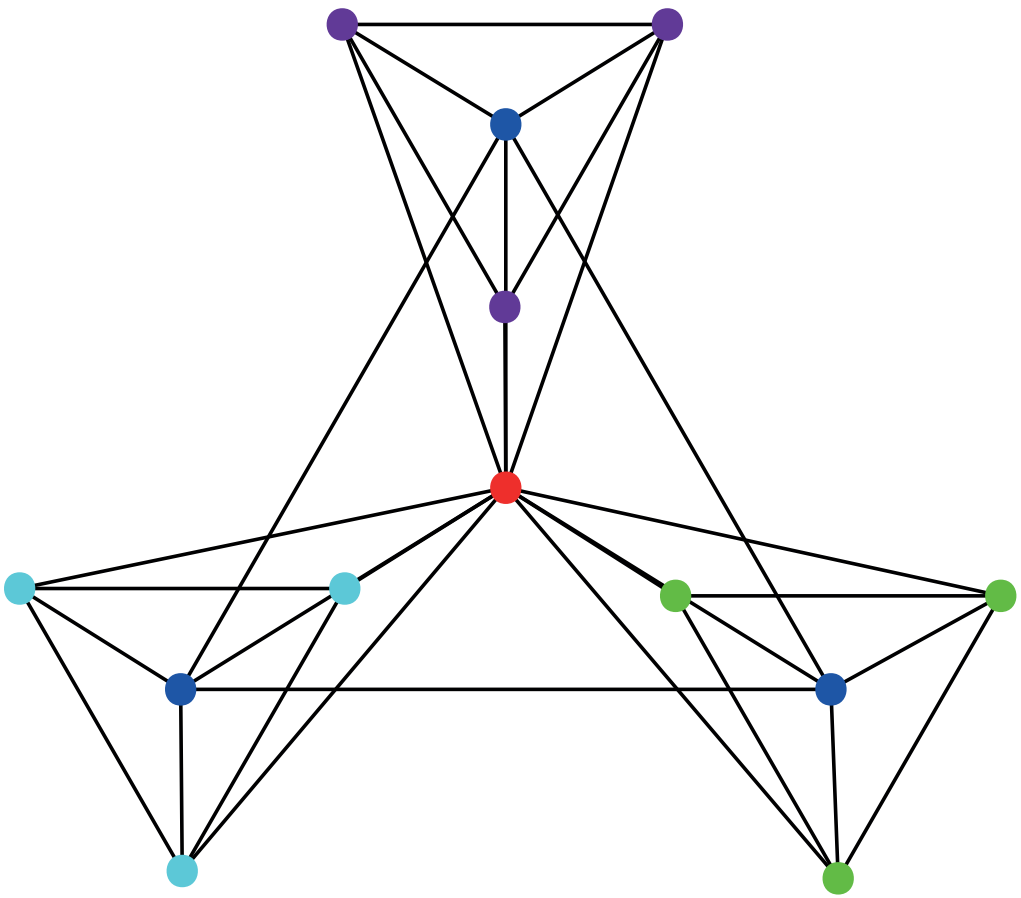
hierarchy was implicit belief: hierarchy did not follow from assumptions

$$\text{Directionality} \not\Rightarrow \text{Hierarchy}$$

Asymmetry can arise while local relation is symmetrical

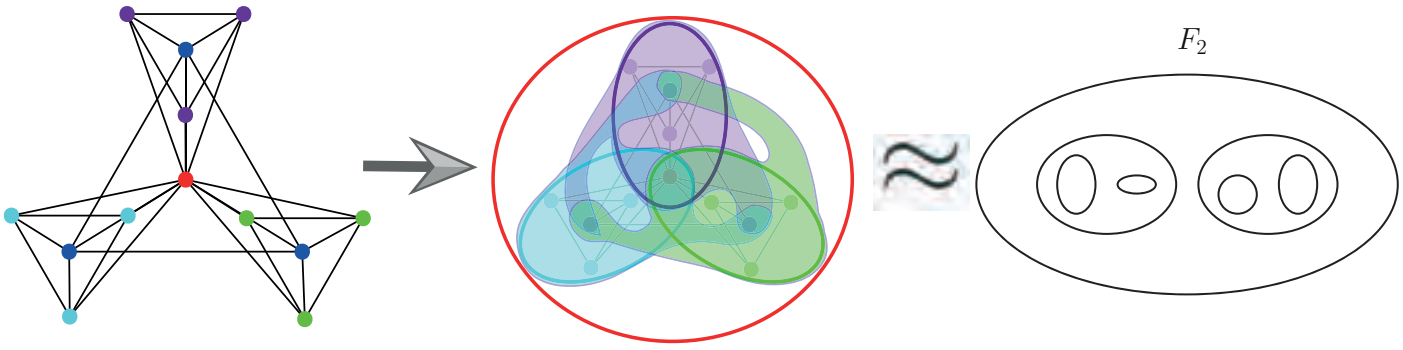
Undirected network

Hierarchical network: low-degree nodes cluster together; high-degree nodes connect clusters



Via sets to directed case

HIERARCHICAL



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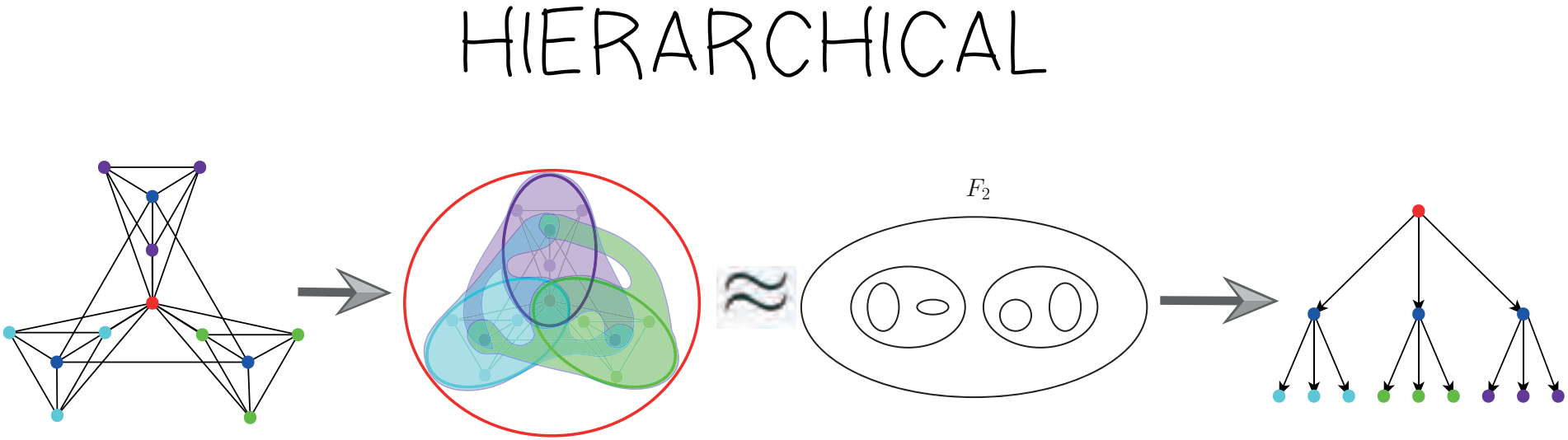
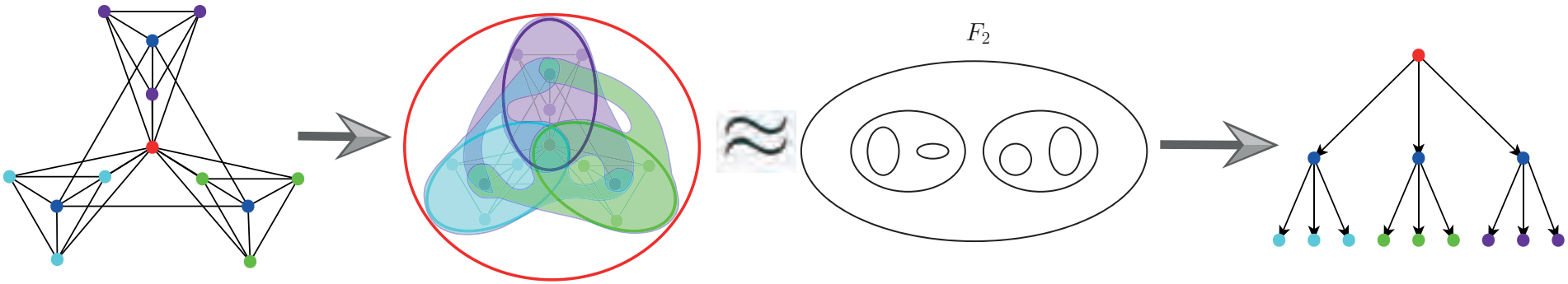
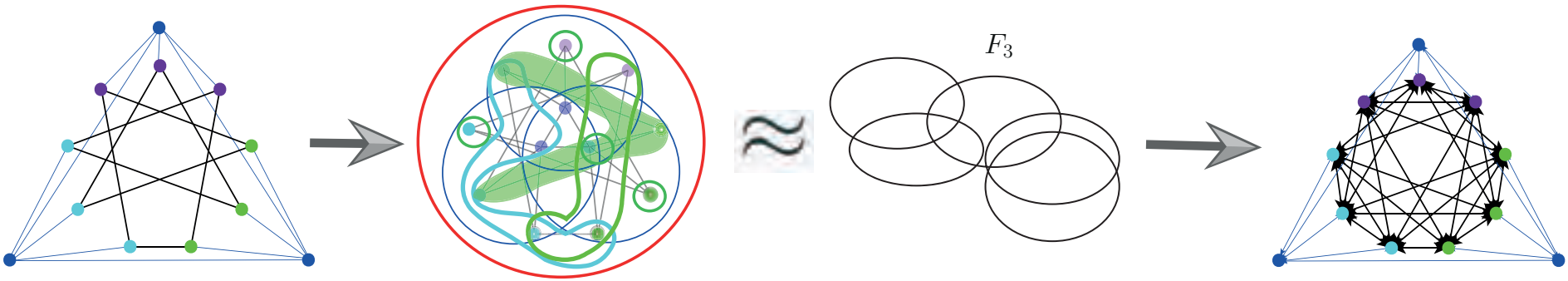


Via sets to directed case

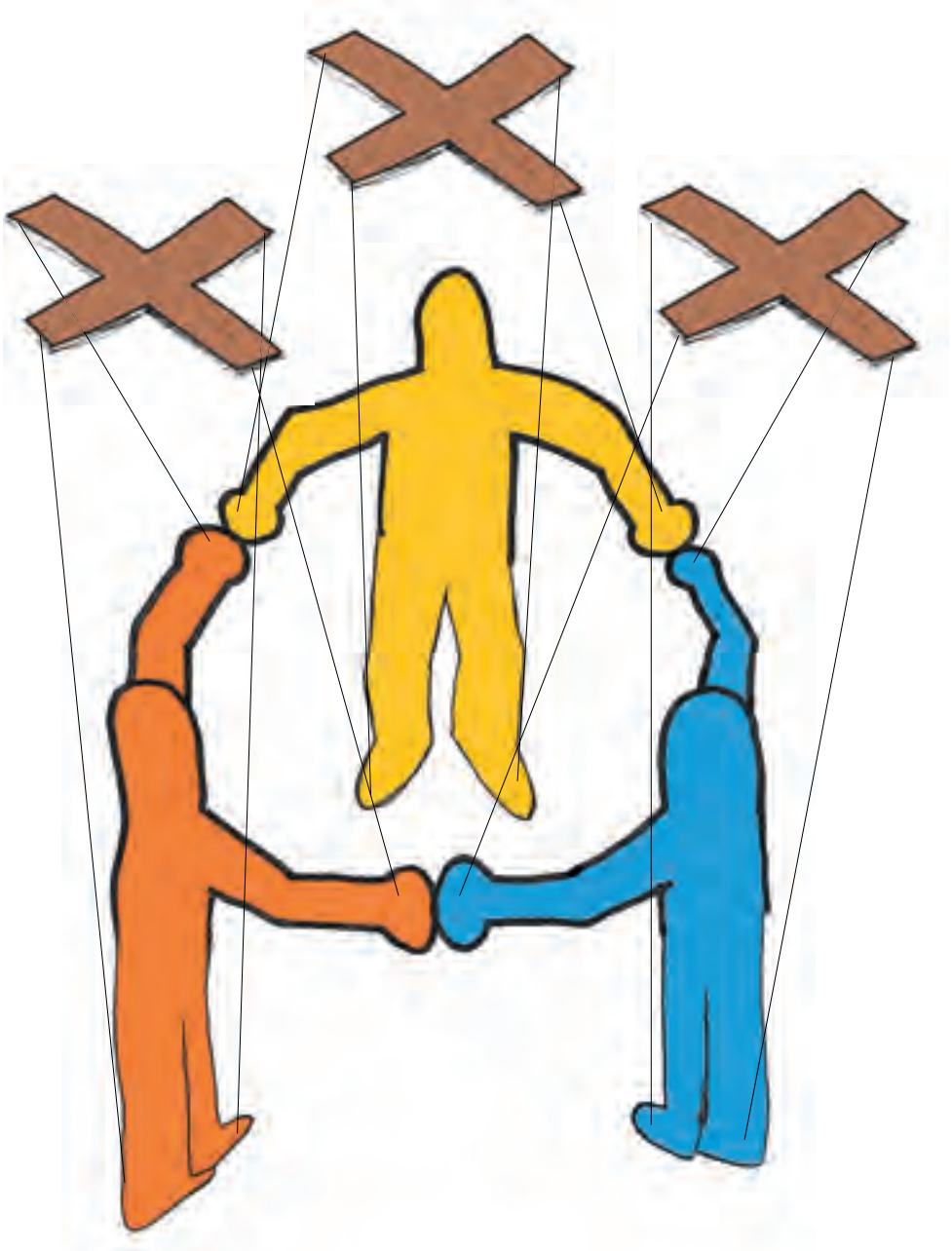
HIERARCHICAL



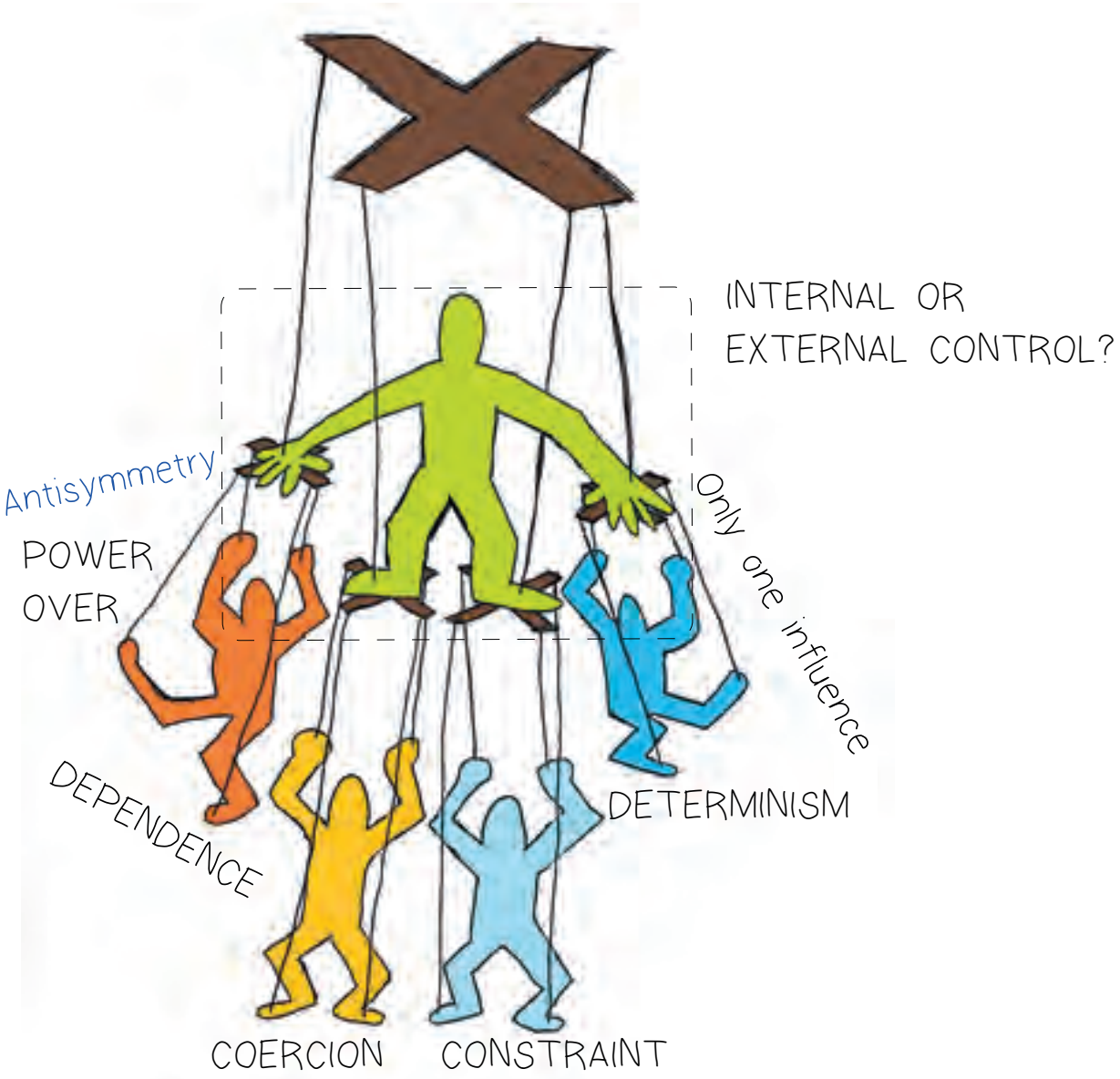


NON-HIERARCHICAL

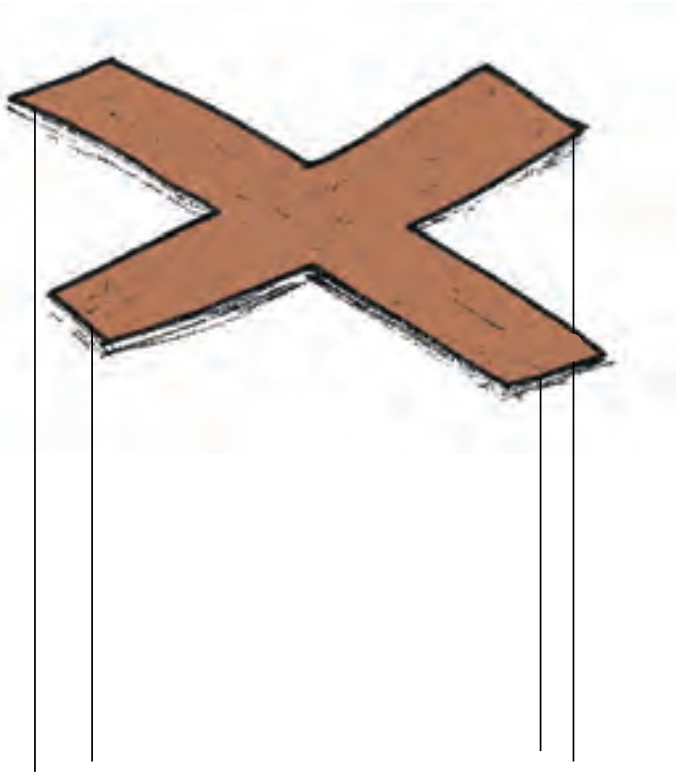
Change



Summary- relation function-structure



Aspect



Not necessarily in 1 person/group

Examples:

- society
- economy

Idée fixe

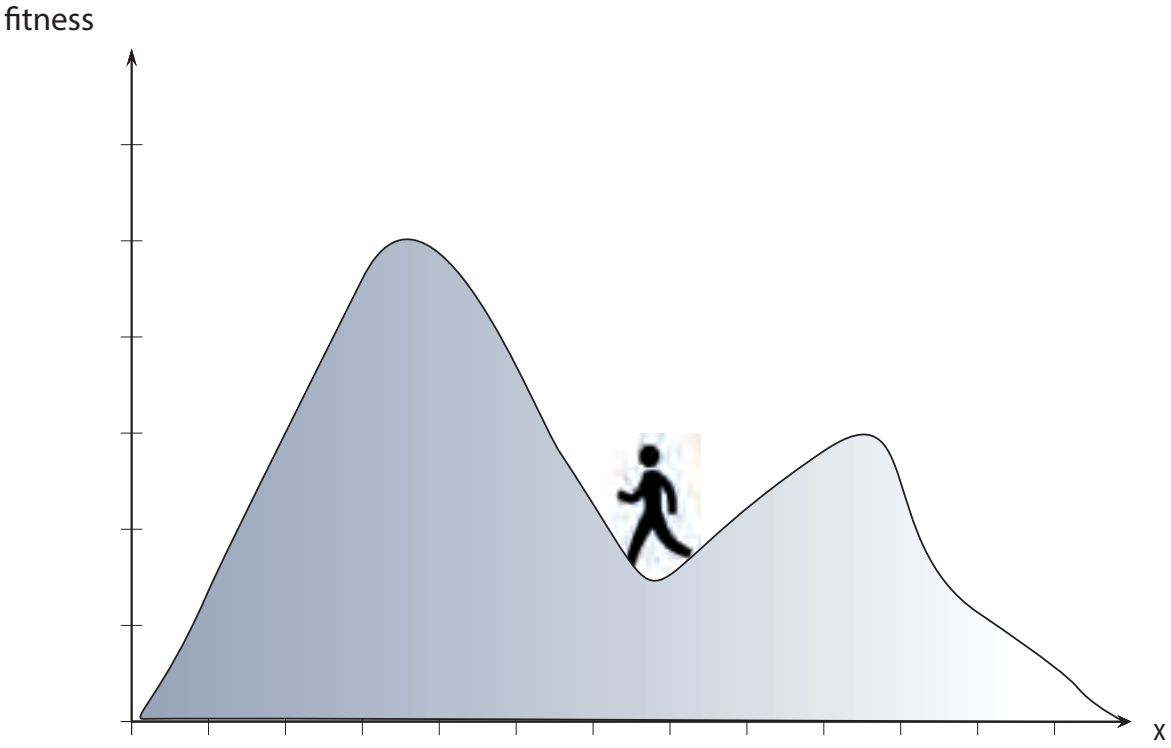
Social power

formation of a controller

determinism vs co-evolution

Constant opposition

'The One' vs connected multiples



determinism vs co-evolution

Constant opposition

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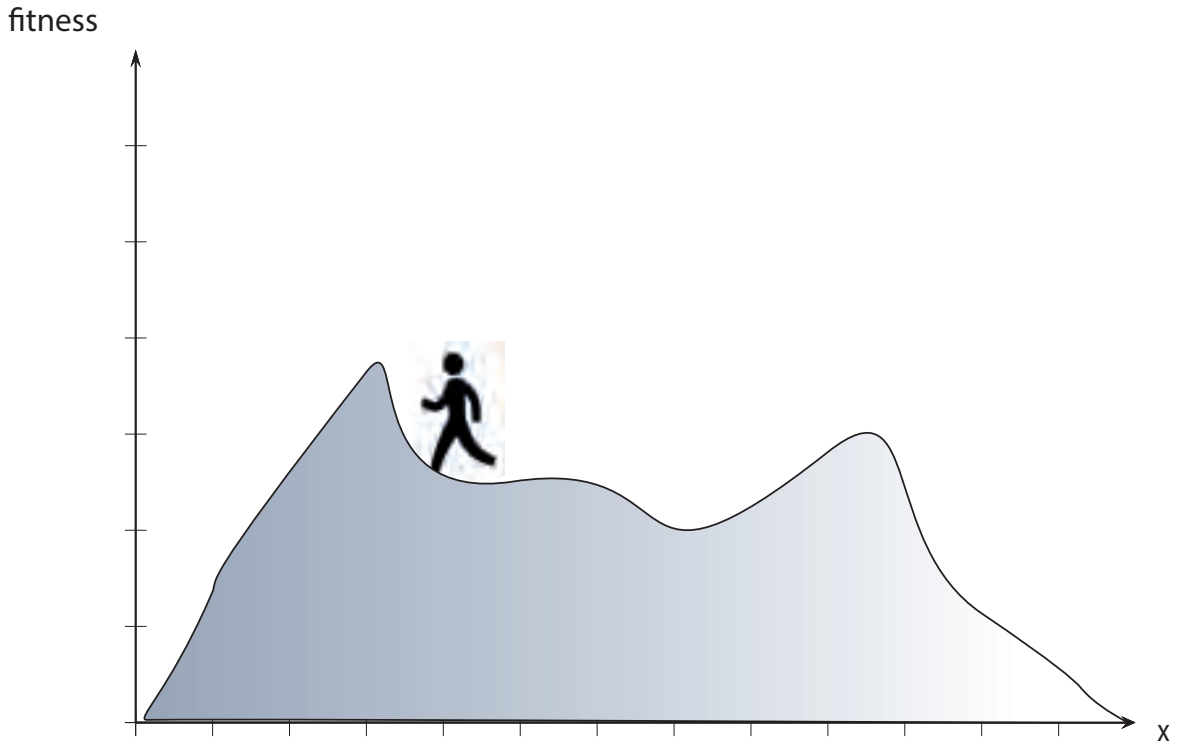

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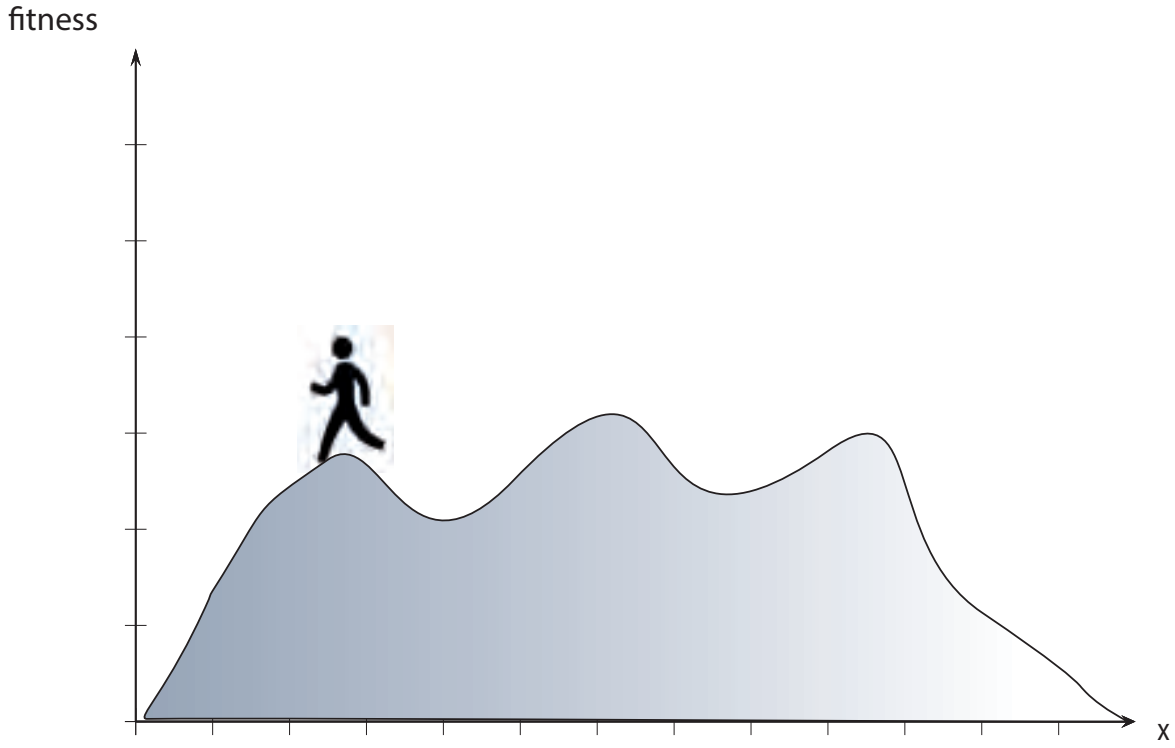
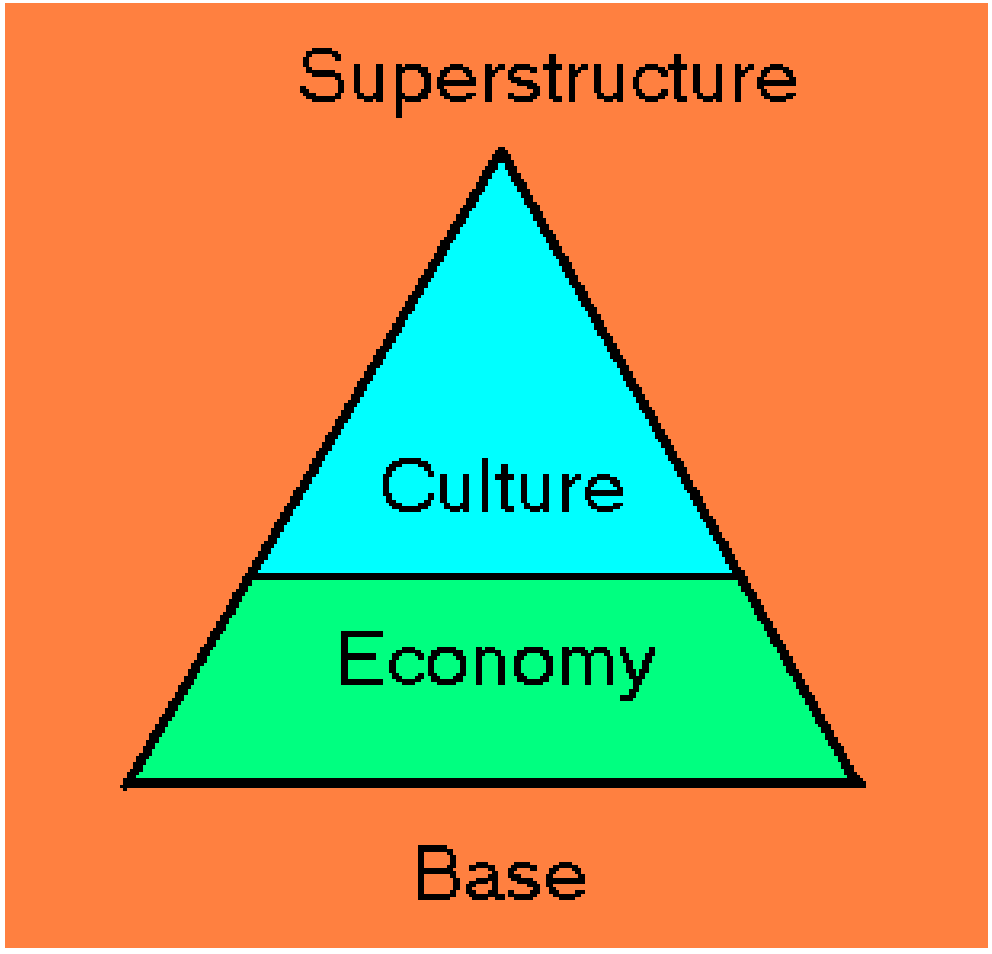


Human environment

How to change

First view: by changing the material base (economy, technology)
one-directional - economic determinism



How to change

Second view: focus on human agency

no hierarchy when mechanism to prevent it

Constant opposition

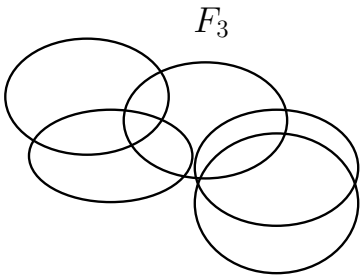
Constant opposition - simulation

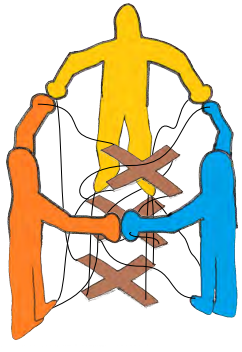
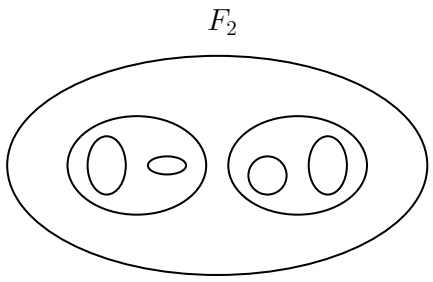
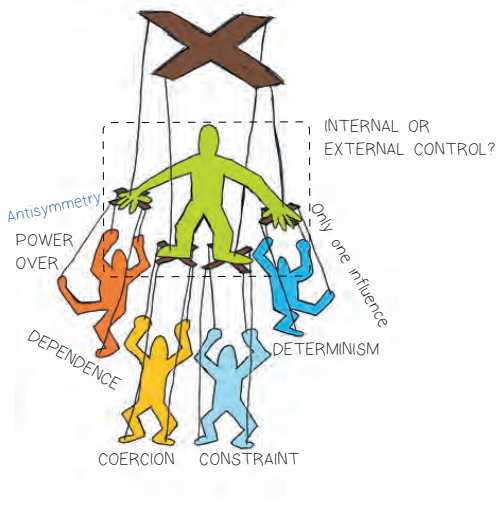
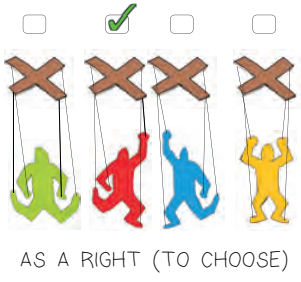
Rich-getting-richer effect

Constant opposition - simulation

Take from agent with most

Conclusion





Connected multiples	'The One'
Non-hierarchical	Hierarchy
Cycles	Antisymmetry
Power-to	Power-over
Internal control	External control
Co-evolution	Determinism
Human agency	Changing the material base
Anarchism	Marxism
Constant opposition	Formation of controller
Freedom as decision	Freedom as right (to choose)