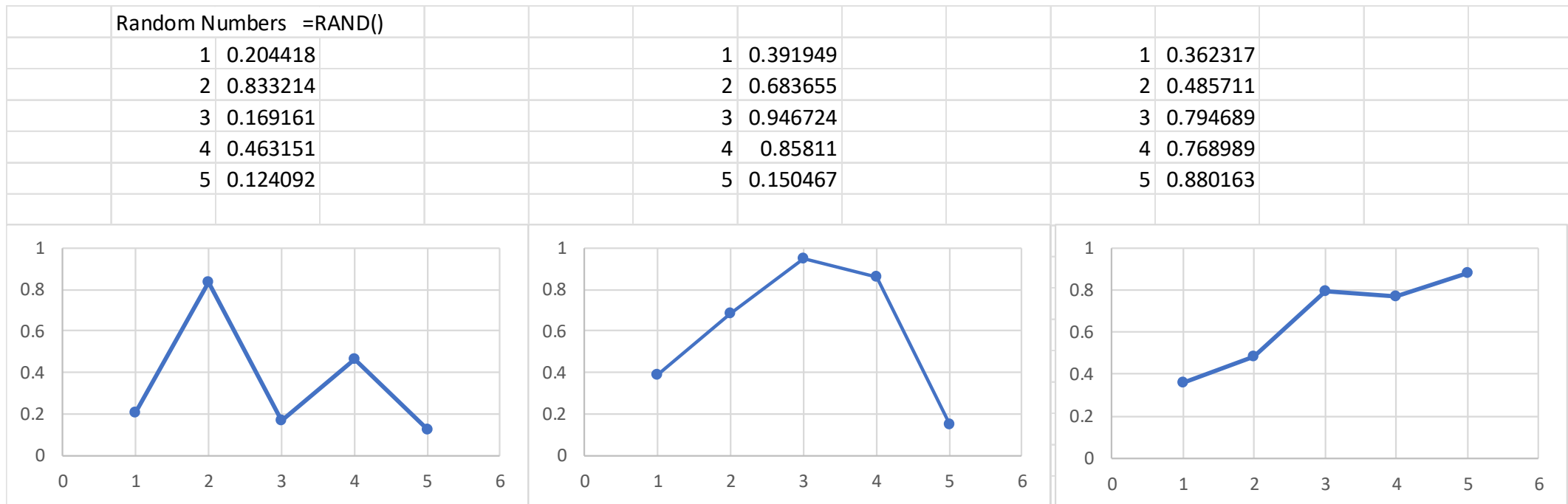


Véletlen és törvényszerű mintázatok élelmiszerbiztonsági kockázat- és döntés- elemzésekben

Baranyi József
tudományos tanácsadó

**Debreceni Egyetem,
Táplálkozástudományi Intézet**

A few random numbers can easily produce perceived patterns



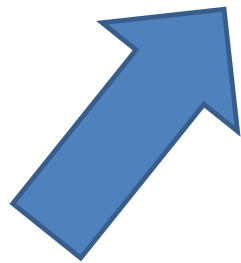
Pattern → Law ???

Én fölnéztem az est alól az eget fogaskerekére –
csilló véletlen szálaiból törvényt szőtt a mult szövőszéke.
És megint fölnéztem az égre álmaim gőzei alól
s láttam, **a törvény szövődése mindig fölfeslik valahol.**

József Attila: Eszmélet

Cognitive fiction space

Observations , descriptions, conclusions



World around us

Observations → descriptions

Descriptive science

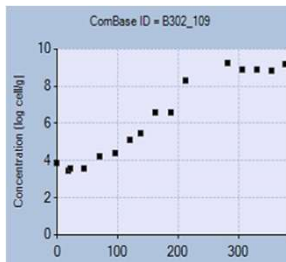
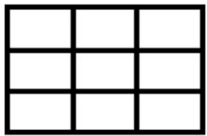


Extrapolations

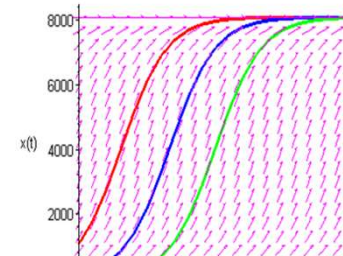
Predictions, decisions

Predictive science

Predictive science



$$\frac{d}{dt} x(t) = \mu_{\max} x(t) u(x)$$



**Data,
database**

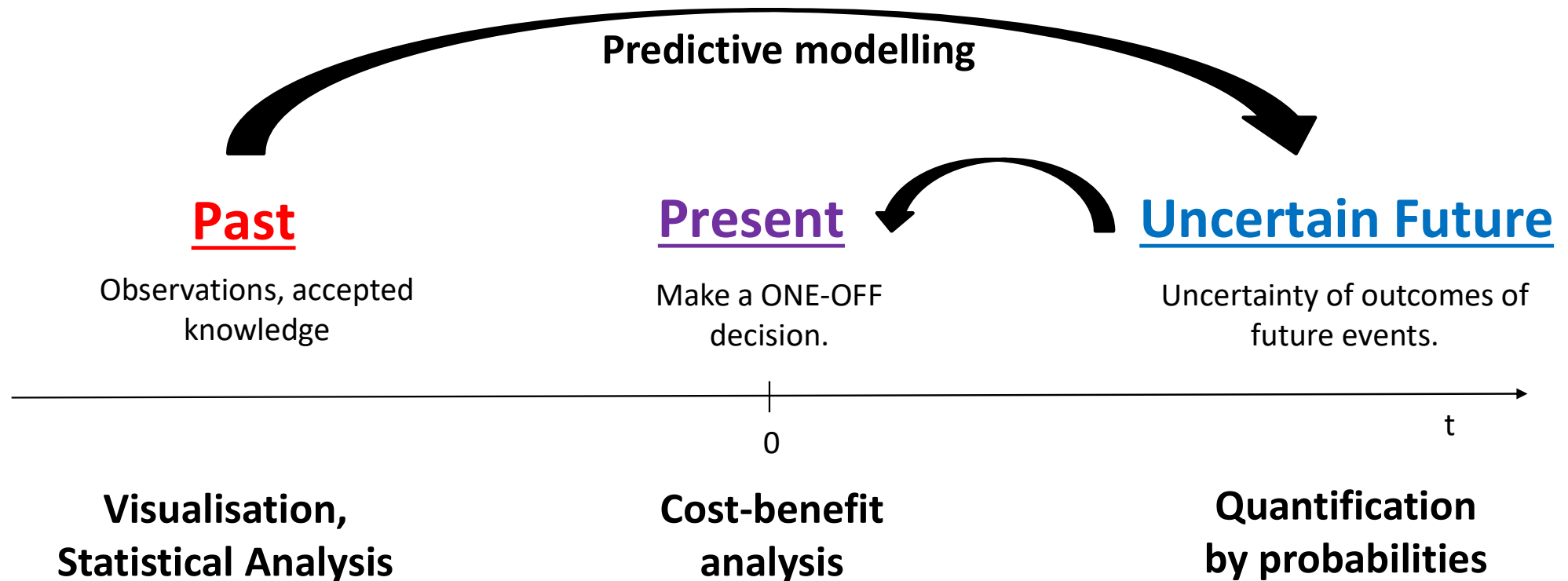
**Visualization,
Statistics**

**Mathematical
model**

**Prediction,
Alternatives, Cost**

Decision

A risk-minimizing strategy to make decisions

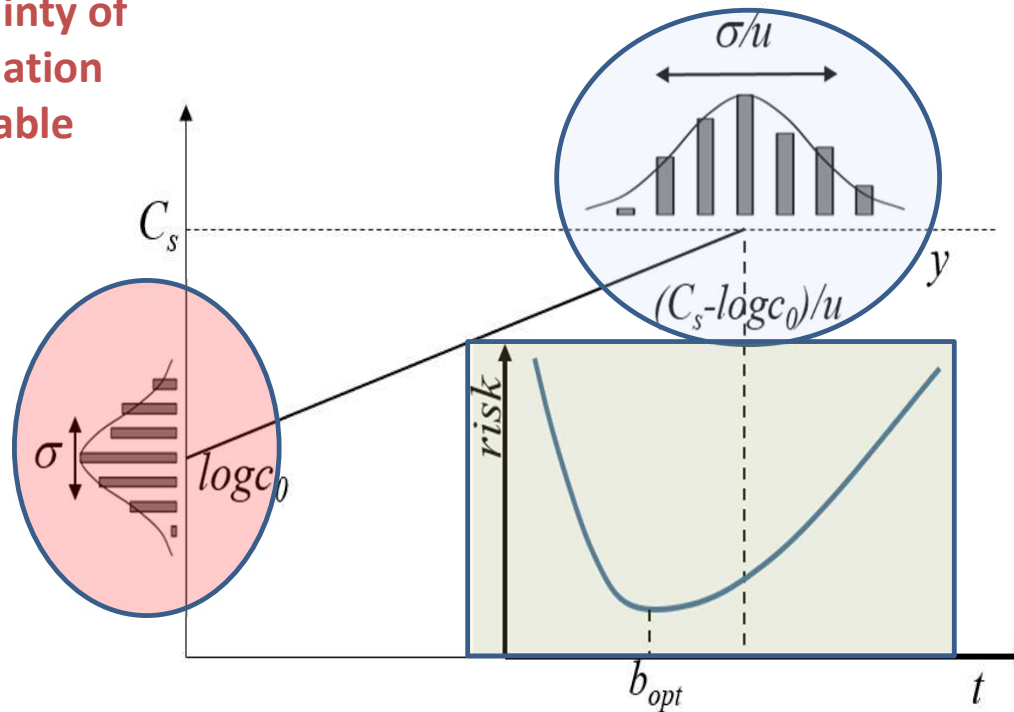


Basis of decision: minimize the mean cost of the discrepancy between expected outcome and reality.

An example: when to take a product off the shelf?

Inaccuracy of the predictor

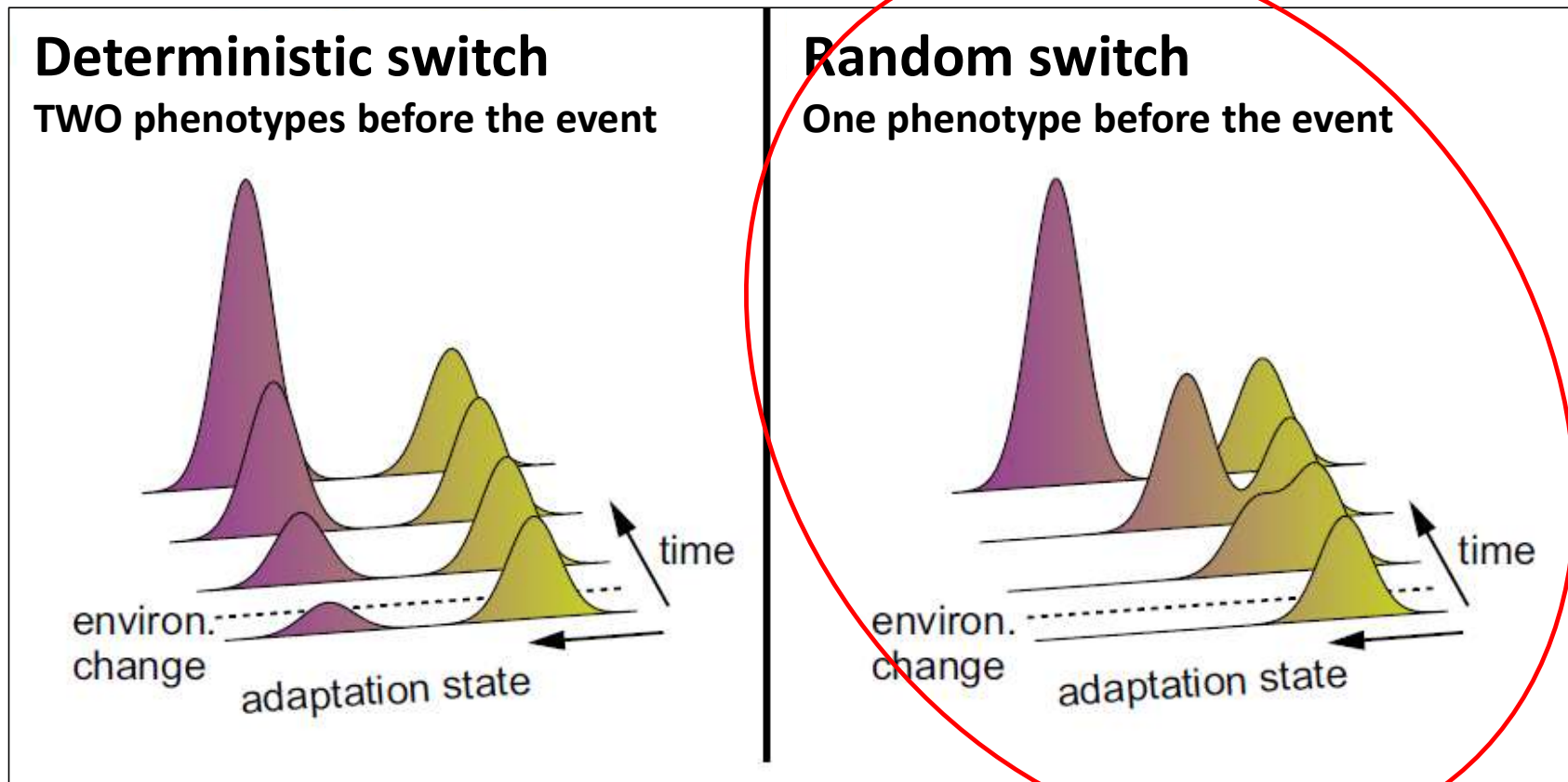
Uncertainty of
information
available



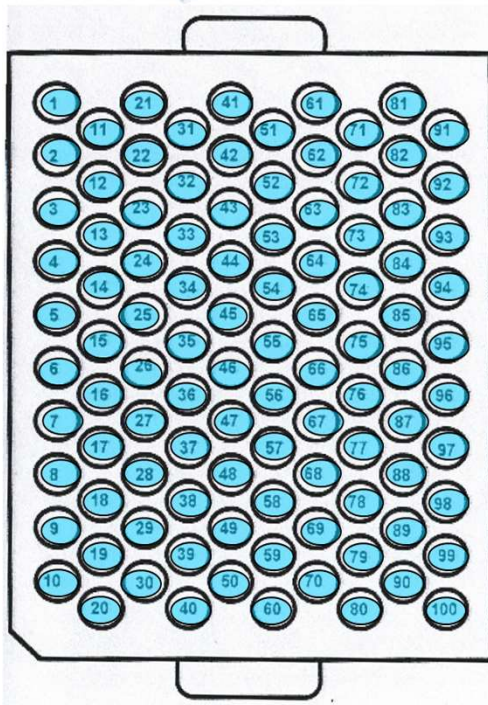
Asymmetric cost for
prediction error

The cost is different for under- and over-estimations.

Can bimodality be predicted BEFORE the inoculation or it is formed DURING the adaptation period?



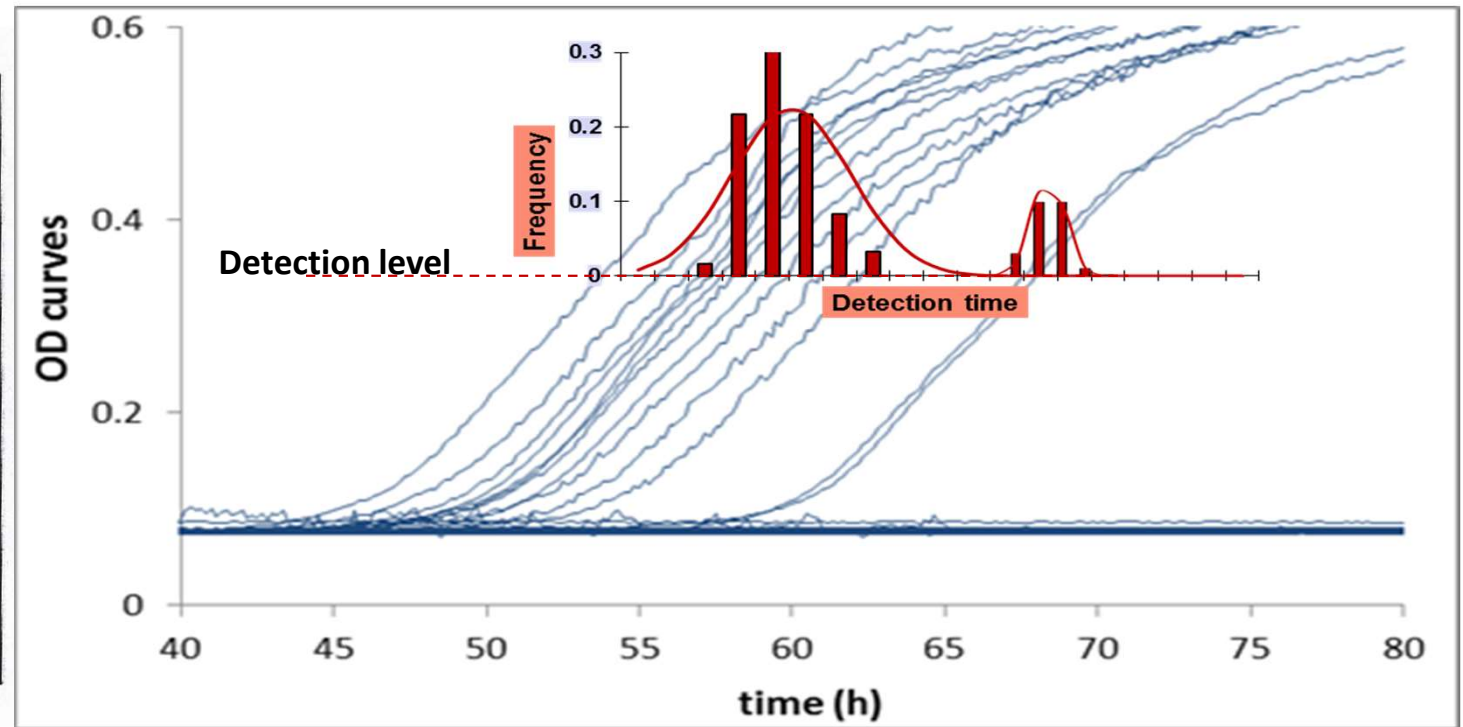
(Kinetic) bistability formed under stress, during the lag



Response to osmotic stress

C.a. one cell/well (average) inoculum.

The lag times of a few cells were much longer than the vast majority.



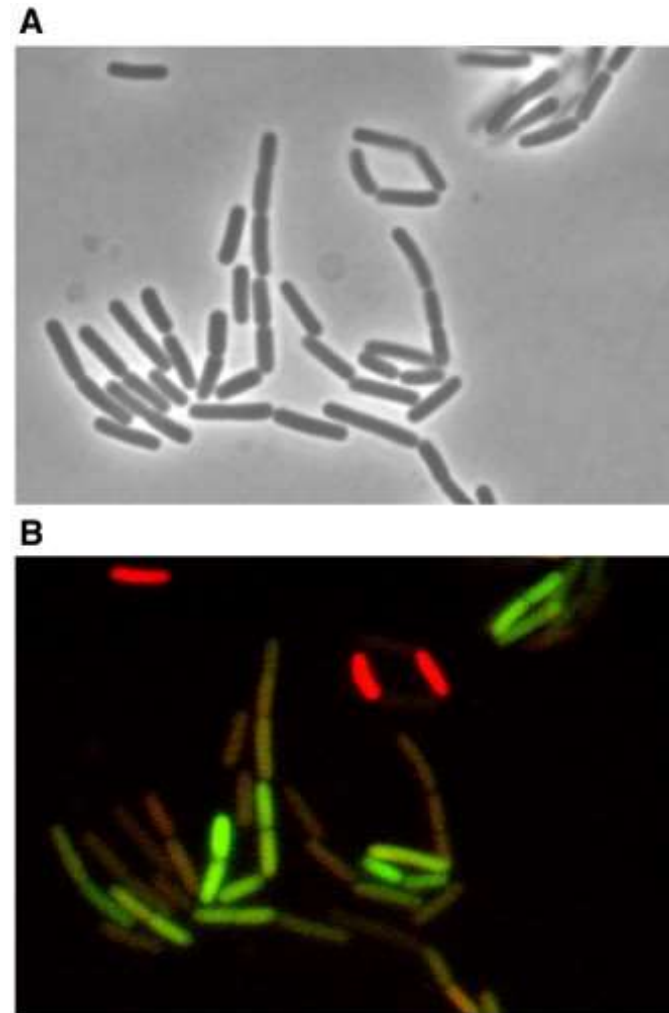
Salmonella in LB+6.5% NaCl

Bistable gene expression in isogenic populations is a ubiquitous phenomenon

Heterogeneous response by *B. subtilis*

Stress: glucose depletion

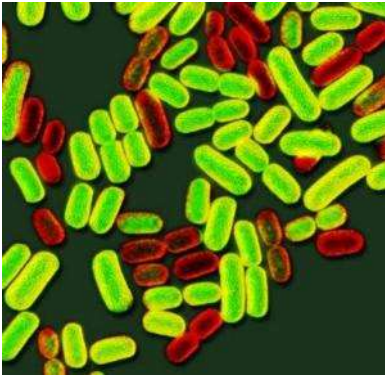
Measurement by fluorescent reporters.



Hornstra, Ter Beek, Smelt, Kallemeijn, Brul. (2009).
International Journal of Food Microbiology, 134, 9.

Morphological bistability

Various manifestations of morphological bistability has been observed as responses to different stresses



Isogenic salmonella population after antibiotics:
Green tagged genes produce flagellin; red ones do not.
(Stewart, 2011; PNAS)

Salmonella response to osmotic stress:
Colonies with pronounced and “slimy”
boundary (Credit: Susie George, IFR)



Identical genome, proved by sequencing.
Bimodal gene expression in response to stress.

Cognitive influence: Bigger choice delays decisions

Shop 1:
6 options



Shop 2:
24 options, refinements of the other 6 items



Customers spent more time here but spent less

Fear of not
having made
the “best”
decision
increases the
perception of
cost



Barry Schwartz:
Paradox of choice

Köszönöm hogy meghallgattak !