

Networks and stability

Part 3B. – Examples for networks

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www.weaklink.sote.hu

1. network topology (II.20-27.)
2. network dynamics (III.6.-13.)
(III.20.-27. no lectures)
3. **examples for networks (IV.3.-10.)**
(IV.17. Easter)
4. synthesis (IV.24., V.1. holiday, V.8.)
(V.13. consultation)

Examples for networks

- molecules
- networks in the cells
- networks from cells
- **social networks (psycho-nets)**
- cultural networks
- ecosystems

Memory-net:

Effect of context to the accuracy of memory

- if you learn detoxicated, you should drink before the exam
- alcoholics remember to hidden liquor or money only when detoxicated again
(Science, 163, 1358 –1969 –)
- divers, medical students etc.

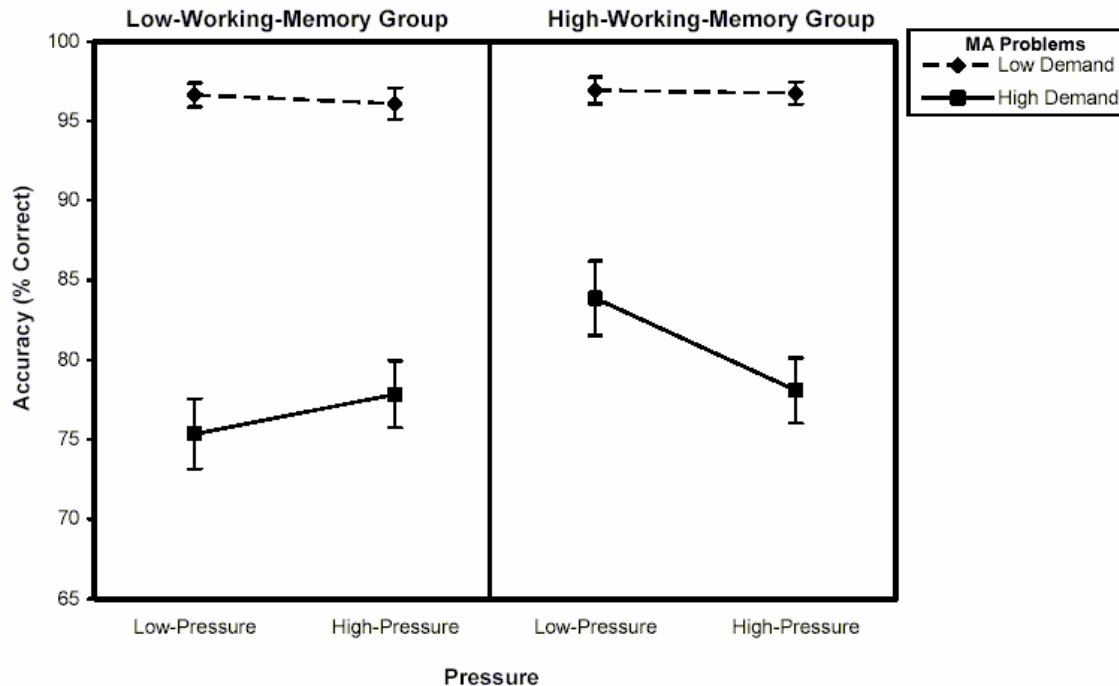
Greater self-complexity buffers stress

More social dimensions +
high stress result in

- less flu, backaches, headaches,
menstrual cramps
- less depression, mood-swings

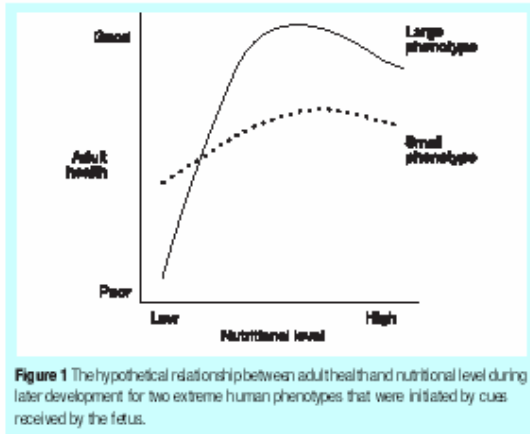
Linville, J. Pers. Soc. Psych. 52, 663

Top performers choke under pressure



Beilock and Carr, Psychol. Sci. 16, 101

Small and large phenotypes



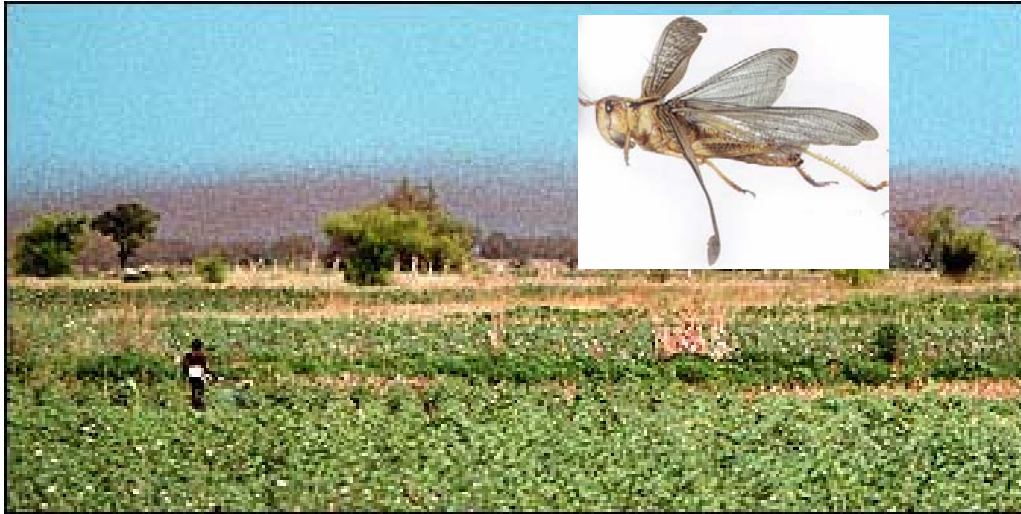
- thrifty and susceptible phenotypes
- slow and rapid metabolism
- changes only in three generations
- health problems: small overeating, bigs in gulags

Nature 430, 419

Neel (1962) Am. J. Human. Genet. 14, 353:diabetes is a thrifty genotype

Hales et al (1982) Diabetologia 35, 595: thrifty phenotype (metabolic syndrome)




Desert locust swarms



low density: cryptic, shy, nocturnal, sedentary

high density: conspicuous, gregarious, diurnal, migrates

for several generations

	Stronglinker behavior	Weaklinker behavior
friendship network 	Relying more to family links, and usually has a few very good friends only	Has friends from a rather broad circle including those with different backgrounds and lifestyles
Cognitive and emotional hierarchy	Centered to a few ideas, and emotions; change of cognitive sets is difficult; highly hierarchical; self-disciplined	Many competing ideas and emotions; low, conflicted and ambiguous hierarchy; playfulness
Internal images of the outside world	Rigid, usually match-seeking with pre-set ideas occurs	Flexible, highly adaptive to new information and environment
Cognitive dimension	Low: can imagine only a few attitudes, maximal capacity to understand interacting persons may be easily saturated	High: can imagine numerous attitudes, can assess a large number of interacting persons
Exploration	Short range; very rare jumps; the exponent of the Levy-flight is big	Enjoys longer jumps, unexpected explorations; the exponent of the Levy-flight is small, may shift towards random walk
Relaxation 	Disturbed to keep the rare energy packages in the system	Undisturbed to release surplus energy as fast as possible
Ambiguity tolerance	Low	High
Efficiency in well-defined tasks	High	Low
Creative behavior	High in structured, hierarchical schemes like engineering, mathematics, religion	High in diffuse structures like social sciences, humanities, interdisciplinary research or art
Attitude towards resources 	Spending-conscious; thrifty; minimizes excess expenditure	Achievement-conscious; generous; maximizes income
Major problems	Loneliness, depression, too rigid, too logical lifestyle, instability due to the absence of weak links	Unfocused life, variable motivations, lack of endurance, instability due to over-connectedness
Network structure	The scale-free network is getting closer to a star network	The scale-free network is getting closer to a random

stronglinkers – weaklinkers



- proteins
- cells
- persons
- firms
- countries

Consequences I.

stronglinker	weaklinker
introverted	extroverted*
better in school wit	sociable, suggestible has more sexual partners aggressive jokes
highly aroused, overstimulation possible, avoids stimulus	resourceful, low threshold for boredom seeks stimulus positive affect
low inhibition: remembers	high inhibition: forgets

change needs
3 generations:
democracy can
not be exported



*Eysenck (1967) The biological basis of personality

Consequences II.

Secure: I find it relatively easy to get close to other people. I am comfortable depending on other people and having them depend on me. I don't usually worry about being abandoned or having someone too close to me.

Avoidant: I find it difficult to trust people completely. I am somewhat uncomfortable being close to others. I feel nervous when people start to get too close. Often, I feel like people want me to be more intimate than I feel comfortable being I find it difficult to allow myself to depend on other people.

Anxious/ambivalent: I find that other people are reluctant to get as close as I would like. I often worry that someone I am close to doesn't really love me or won't want to stay with me. I want to merge completely with another person, and this sometimes scares people away.

Consequences III.

small	big
stronglinker	weaklinker
introverted	extroverted*
avoidant (25%, no romantic love)	secure (56% love-maker)**
better in school wit	sociable, suggestible has more sexual partners aggressive jokes
highly aroused, overstimulation possible, avoids stimulus	resourceful, low threshold for boredom seeks stimulus positive affect
low inhibition: remembers	high inhibition: forgets



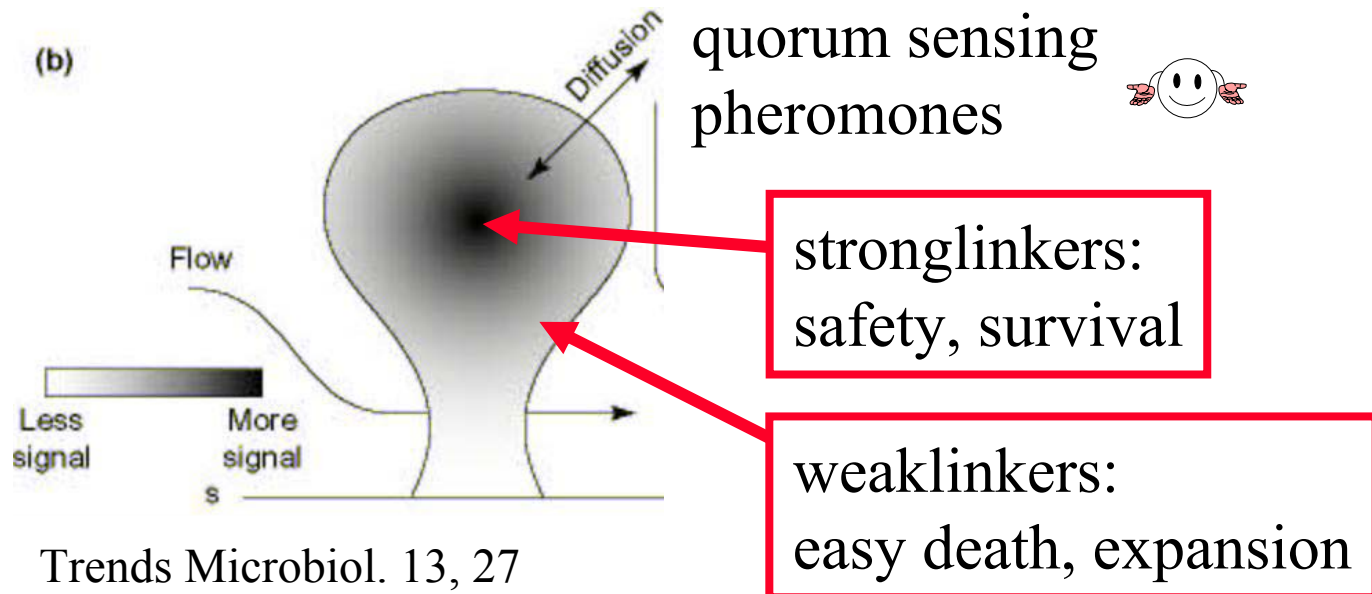
romanticism
is a result
of feeding...



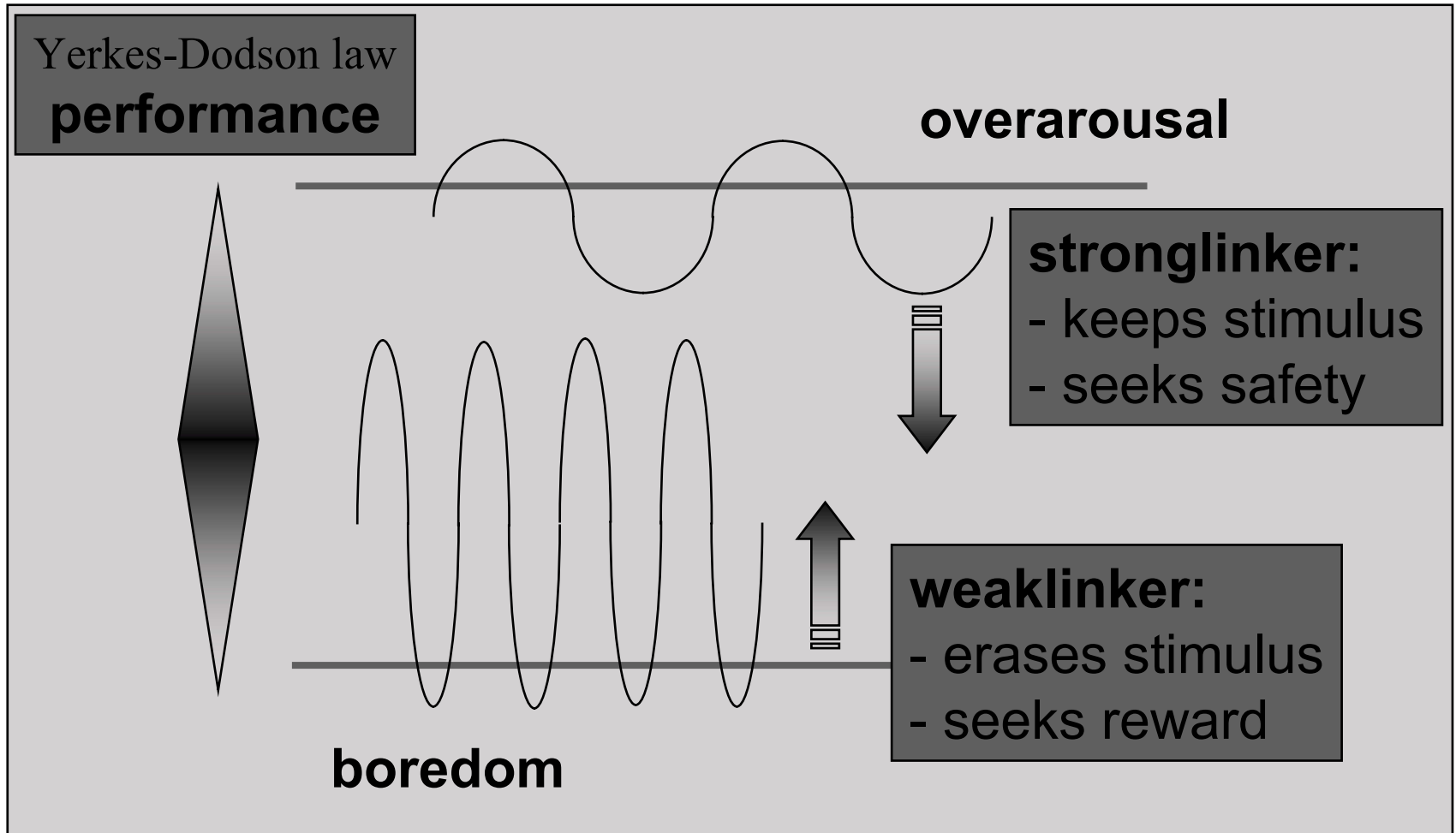
*Eysenck (1967) The biological basis of personality

** (19% anxious/ambivalent) Ainsworth et al. (1978) Patterns of attachment: Hazan & Shaver (1987) J Pers Soc Psych 52 511

Possible molecular reasons



Summary



Stronglinkers may help weaklinkers



Proc. Natl. Acad. Sci. USA
Vol. 92, pp. 452–456, January 1995
Biochemistry

A relationship between protein stability and protein function

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Contributed by Brian W. Matthews, October 4, 1994

ABSTRACT Enzymes are thought to use their ordered structures to facilitate catalysis. A corollary of this theory suggests that enzyme residues involved in function are not optimized for stability. We tested this hypothesis by mutating functionally important residues in the active site of T4 lysozyme. Six mutations at two catalytic residues, Glu-11 and Asp-20, abolished or reduced enzymatic activity but increased thermal stability by 0.7–1.7 kcal·mol⁻¹. Nine mutations at two

Table 1. Stability and activity of T4 lysozymes with subst in the substrate-binding site

Protein	ΔT_m , [†] °C	$\Delta\Delta G_{\text{stability}}$, [†] kcal·mol ⁻¹	$\Delta H (T_m)$, kcal·mol ⁻¹
WT	0	0	140
WT*	0	0	131
E11F	4.3	1.7	138
E11M	4.1	1.6	134

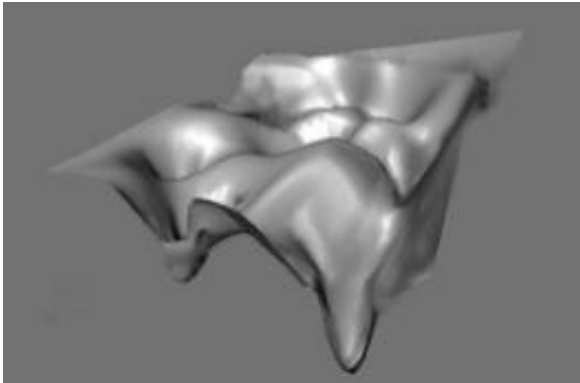
**jam may occur at low flux (no data!):
low flux points need extra stability
stronglinkers absorb damage and
allow weaklinkers to work**

(stronglinker-weaklinker)

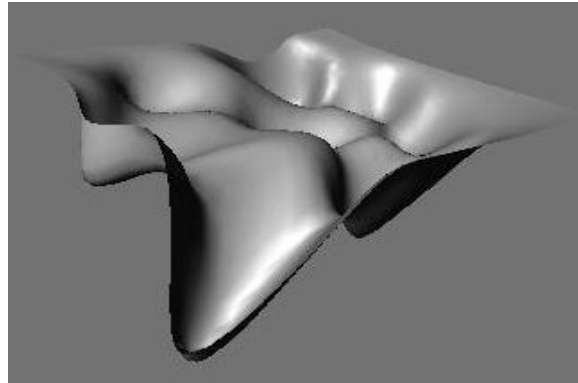
Duality is rather general

- S/C strategy for survival: cactus versus tree
 - polynesian tribes: isolated or killing
mixed strategy is a disaster
 - planning or reacting
 - binding, affection
- why do these phenotypes segregate?

Rough landscapes develop stronglinkers, which help to preserve them



rough landscape:
for stronglinkers



smooth landscape:
for weaklinkers

rough landscape does not allow the propagation
of weaklinkers: resource poor environment prefers
low relaxation, energy-keeping networks,
which develop rough surfaces