The Recognition Factor

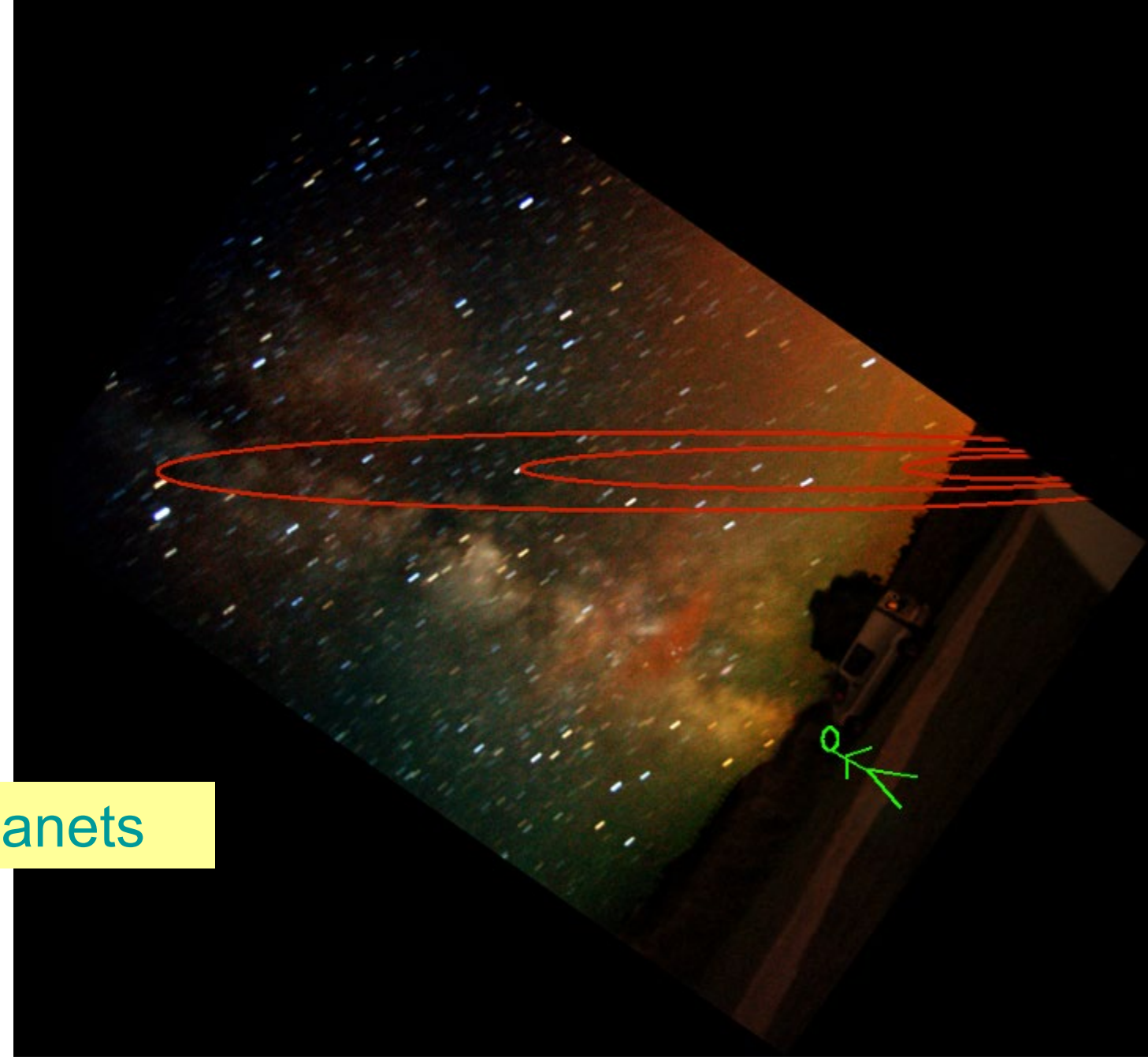
1. Practical Applications
2. Distributed Knowledge
3. Patterns and Clustering
4. Pattern Recognition
5. Reliable Networks

You already know a lot of this stuff

What I am trying to do is to get you to see it differently, more clearly

Then you will see things in everyday knowledge differently than you did before

Spot the Planets



Spot the Planets

The Theory

To teach is

to model and to demonstrate

To learn is

to practice and to reflect

Pretty simple, eh?

No cheats, no shortcuts

To model what?

To practice what?

That is the topic of this talk…

For example…

Evaluate [6 - (5 - 7(7 - 3) + 5)] + 4

1. -33
2. 28
3. 21
4. 13

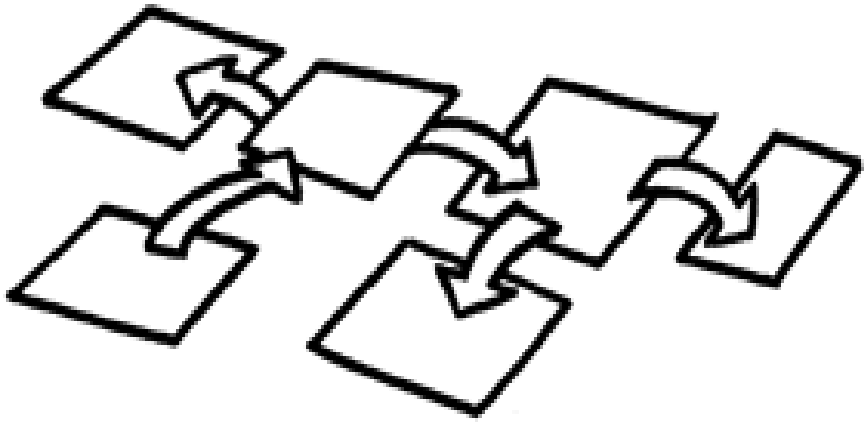
To teach the concept of brackets, would you use this same example over and over? Of course not.

Why not?

Because you are trying to teach a *concept*, not a fact…

And the concept is something *deeper* than what you see in any given example

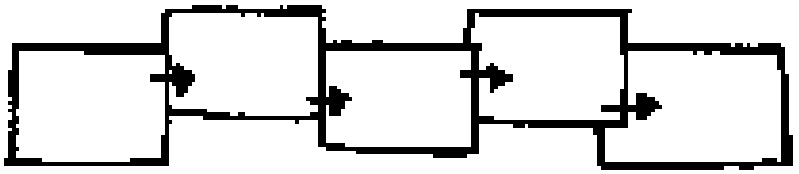
Fair enough…

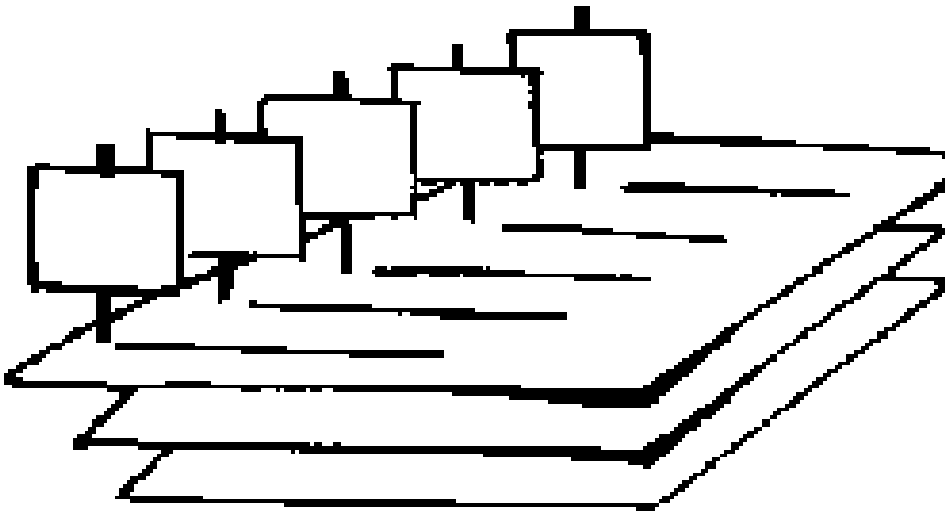


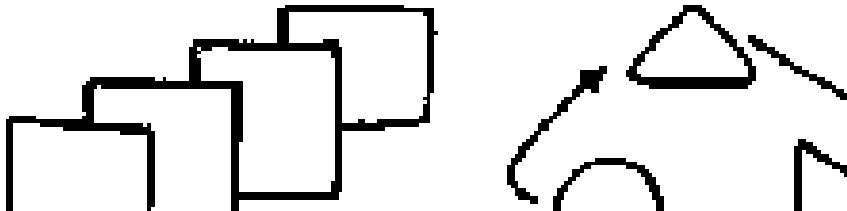
http://classes.aces.uiuc.edu/ACES100/Mind/c-m2.html

But is the concept best thought of as:

- A rule?
- A pattern?







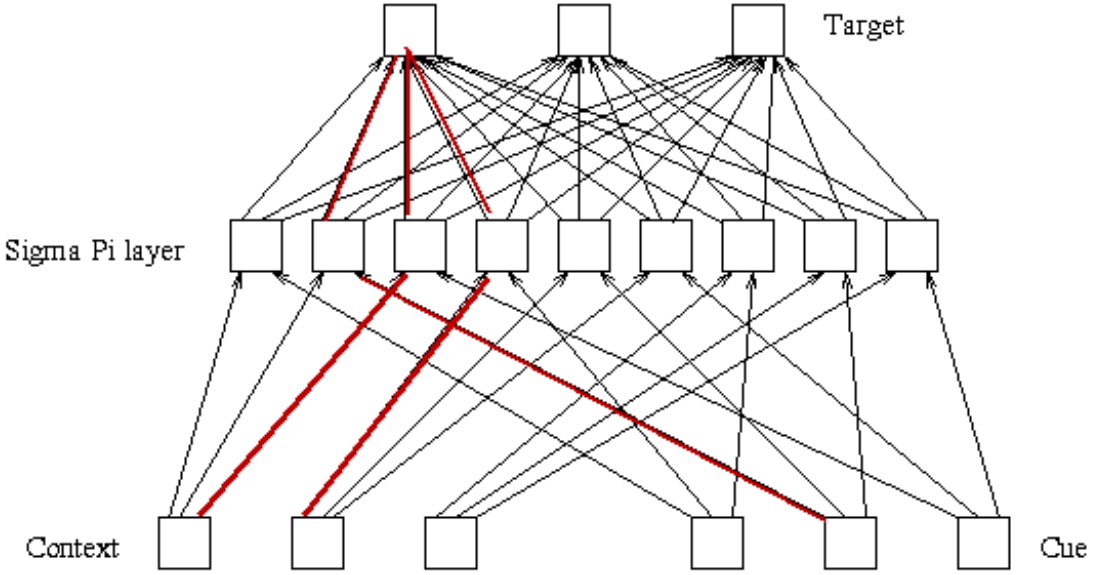
2

Representation

tree

stands for

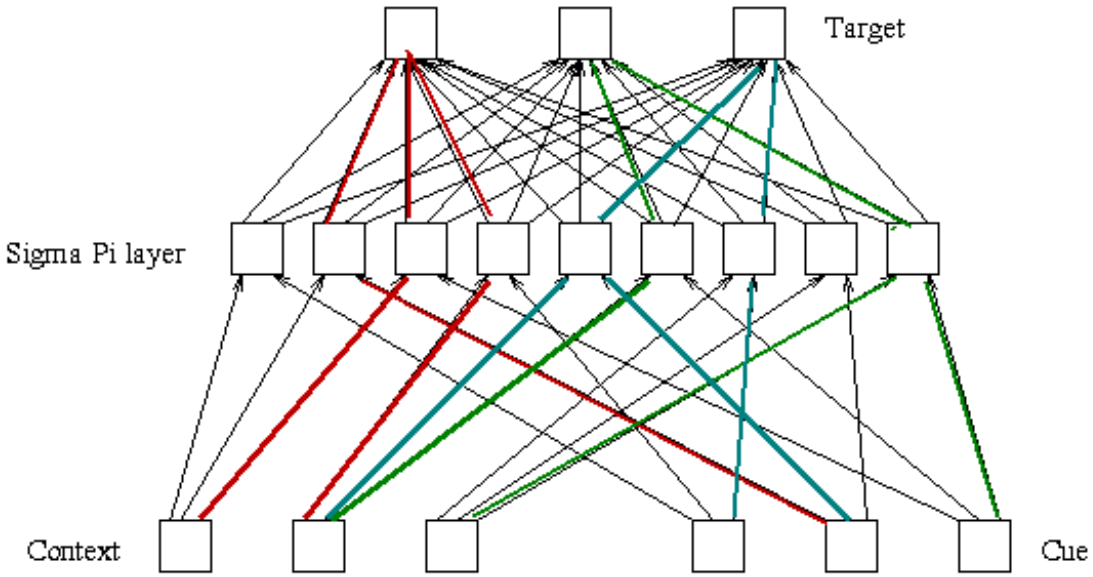
stands for?



Or is caused by?

Distributed Representation

= a pattern of connectivity


Target
Sigma Pi layer
Context
Cue


BRING BACK THE COUCH

The theory…

Concepts are ***not words***…

They are ***patterns*** in a network

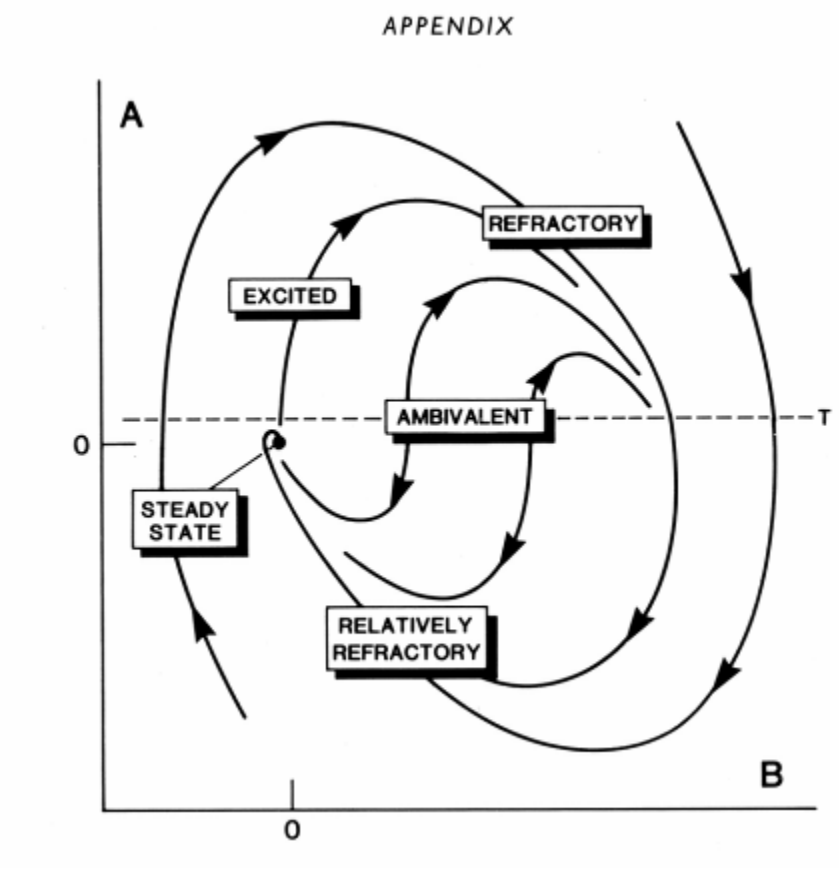
(like the mind, like society)

There is no *specific* place the concept is located – it is distributed as a ***set of connections*** across the network

Other concepts are embedded in the same network

they form parts of each other,

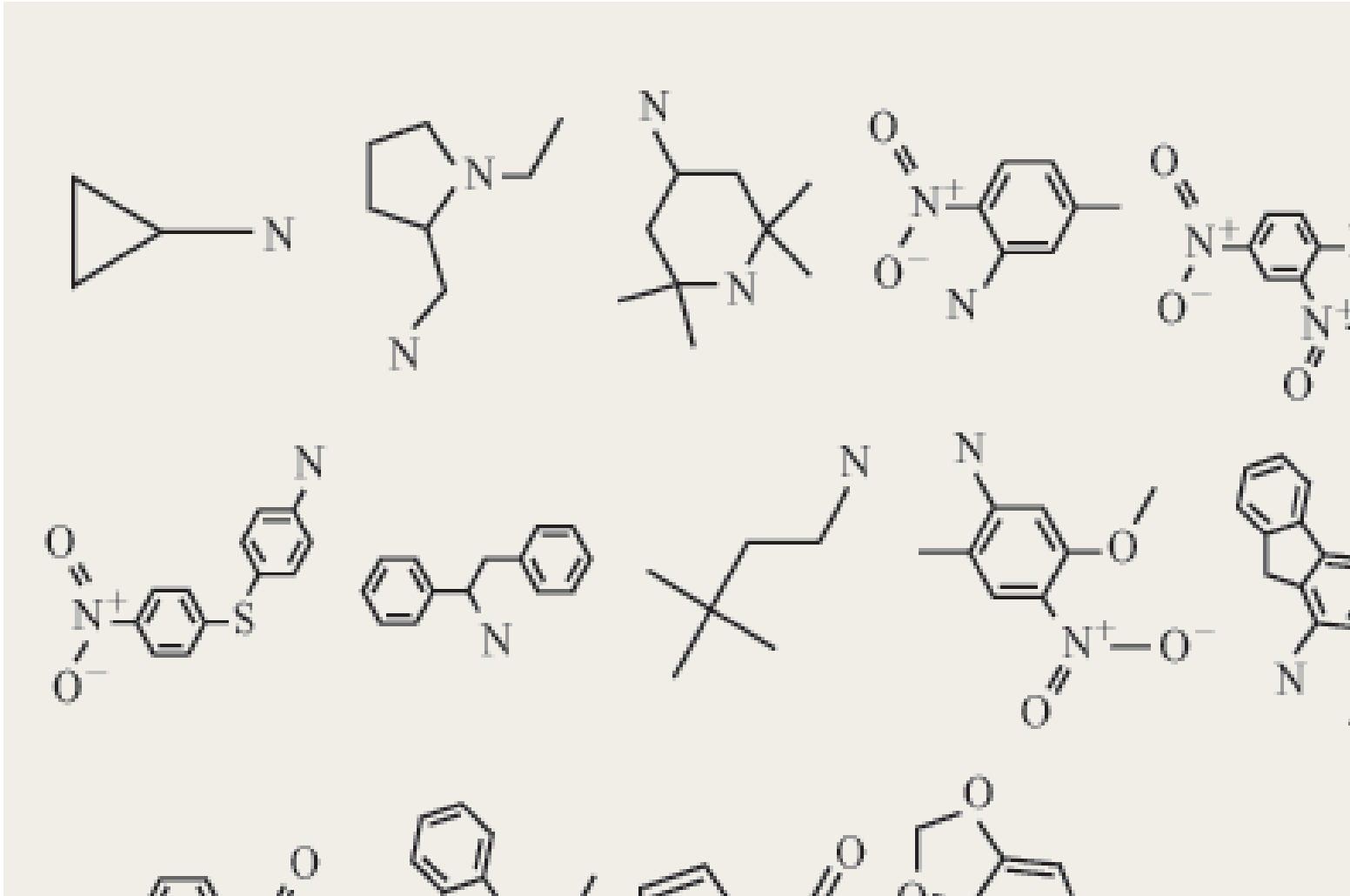
they effect each other

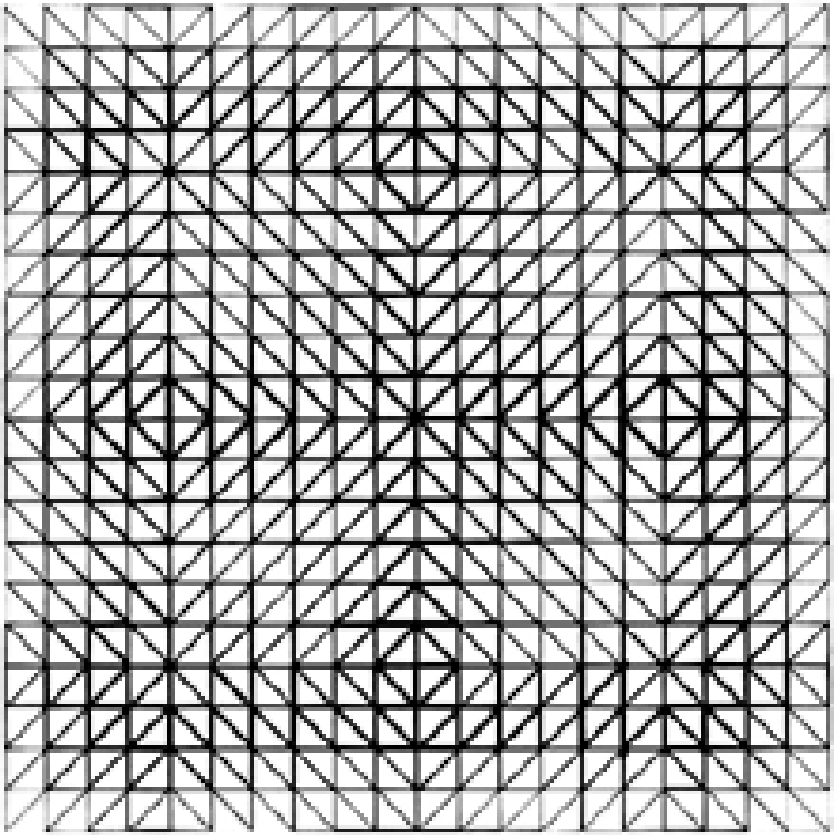


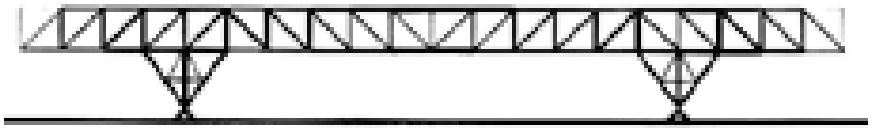
3

Self-organizing systems acquire new structure without specific interference from the outside. They exhibit qualitative macroscopic changes such as bifurcations or phase transitions.
http://www.christianhubert.com/hypertext/self_organization.html

The way things connect is reflective of the properties of those things





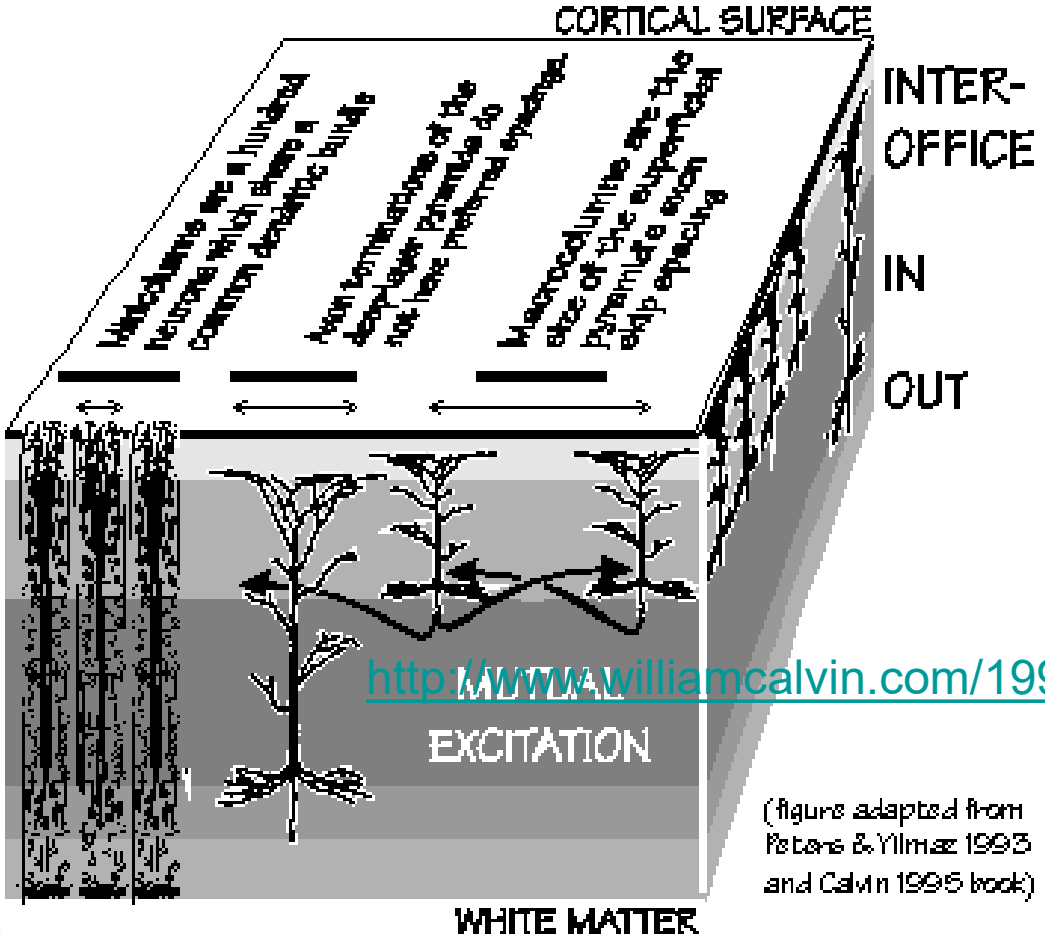


They obey the laws of physics

(Force patterns in construction…

http://paginas.ufm.edu/arquitemas/ffconclusions03.html)

They are influenced by *external stimuli…*

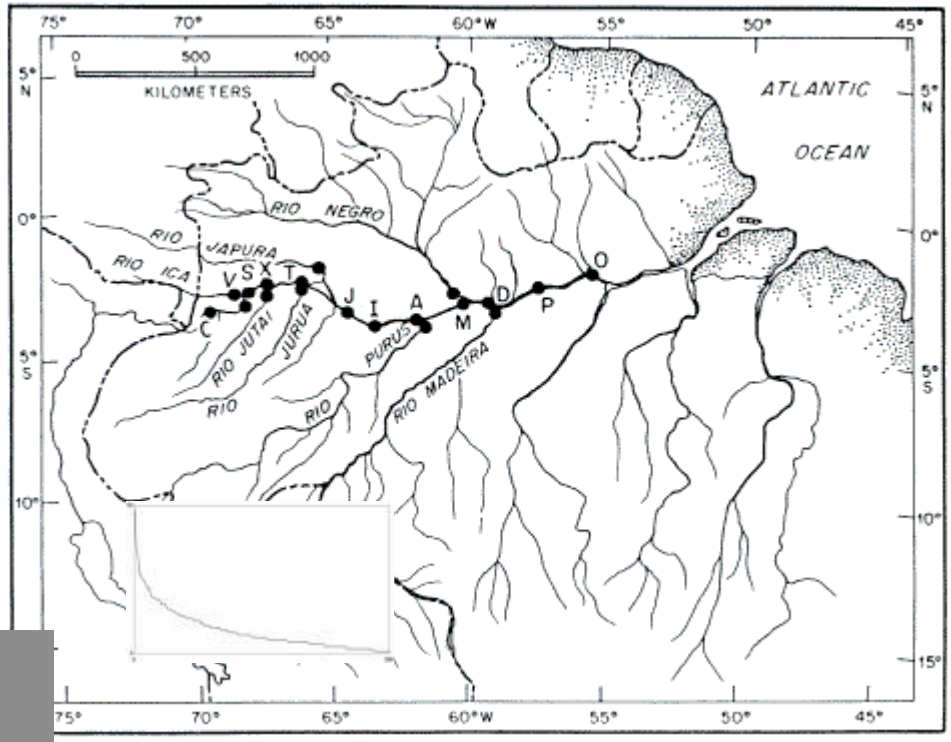


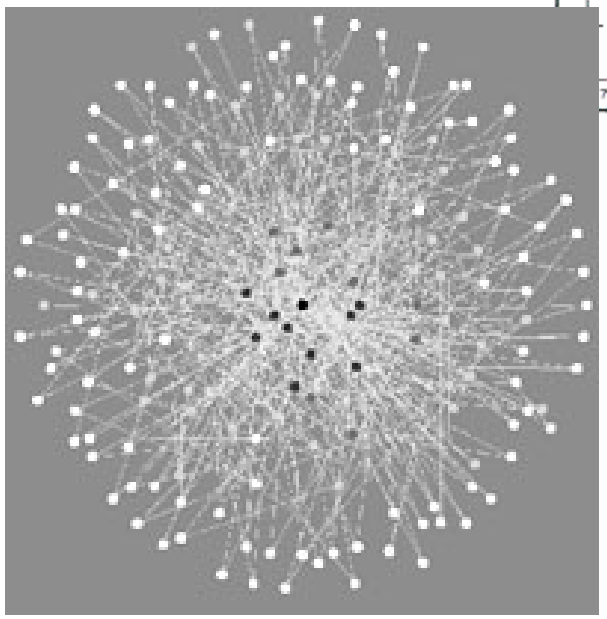
http://www.williamcalvin.com/1990s/1995Handbook.htm

Scale-free networks and power laws

are

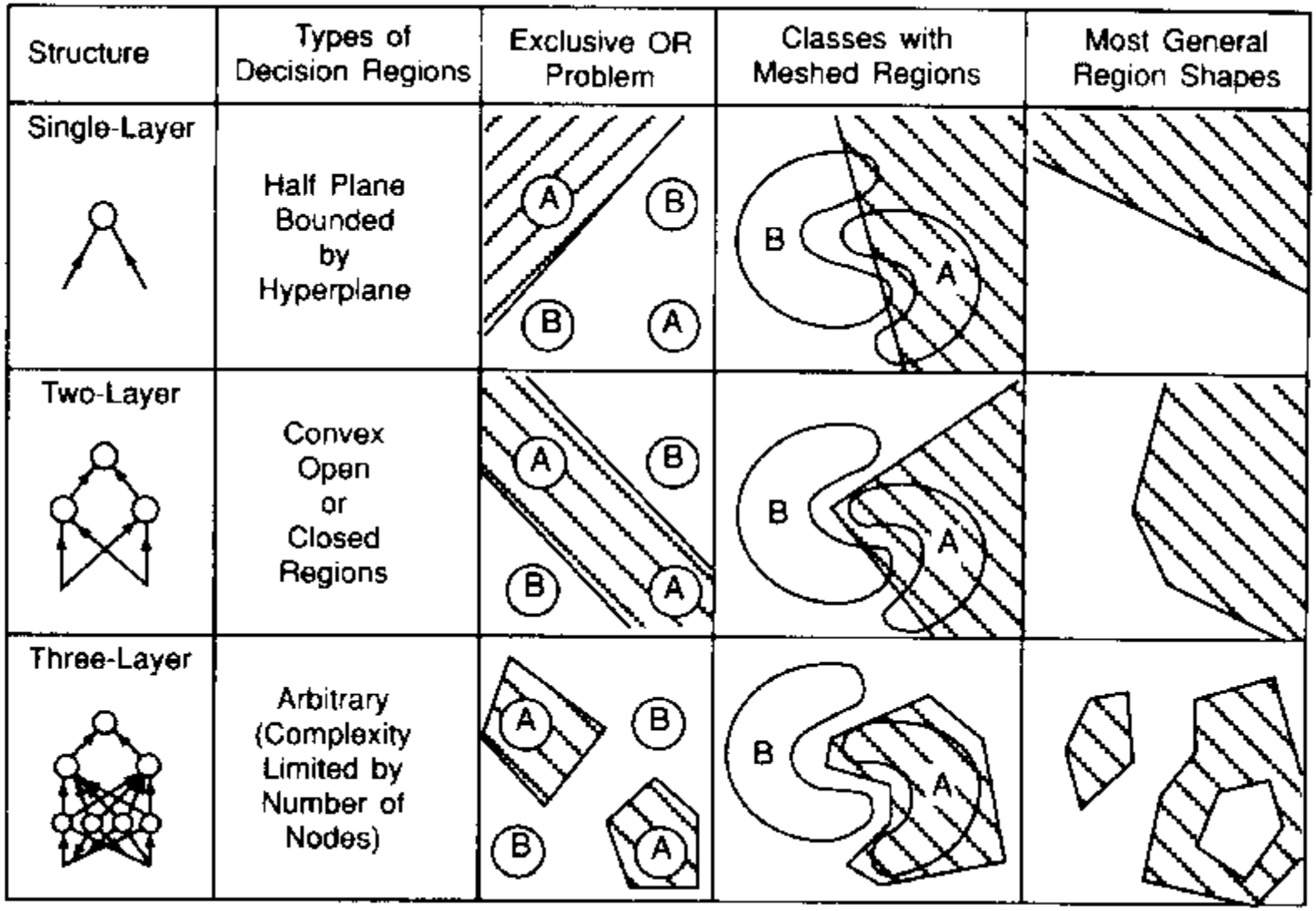
just *one* type of network





where *early* links are *attractors…*

http://neural.cs.nthu.edu.tw/jang/courses/cs5652/lippman.gif

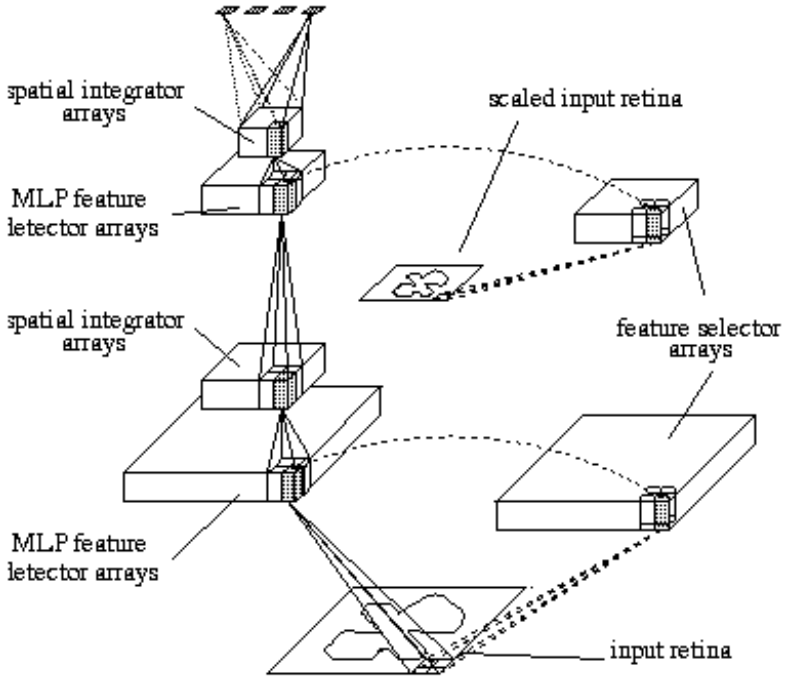


Different kinds of networks detect different kinds of patterns

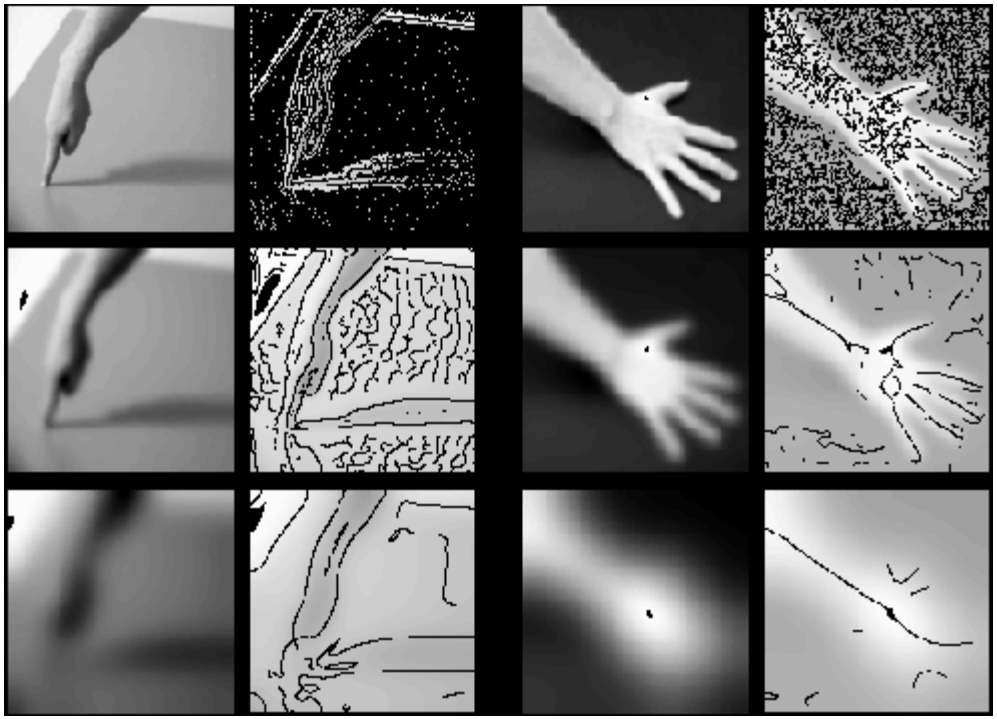
We are natural pattern recognizers…

that's what our brains *do*

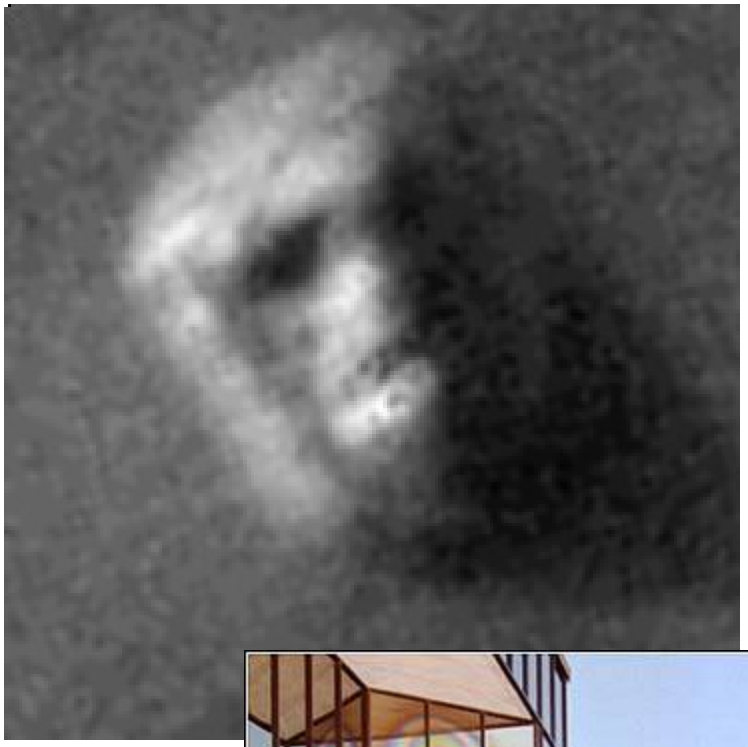
4



hierarchical neural network for visual pattern recognition



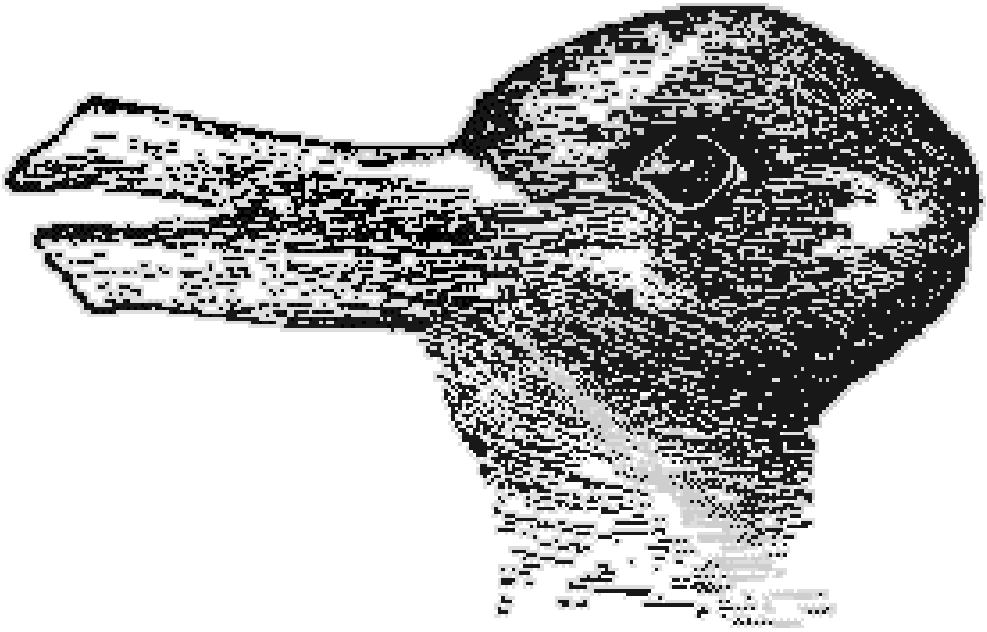
Some things (like edge detection) we do because of the way we're wired…



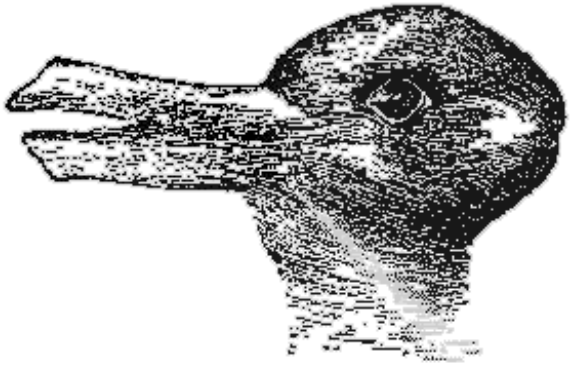
(AP Photo)

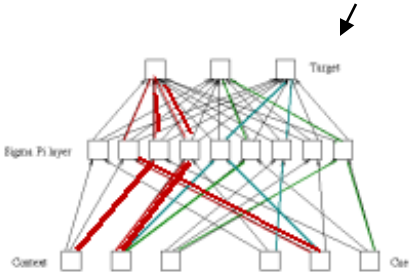
For most things, though, there is more at work…

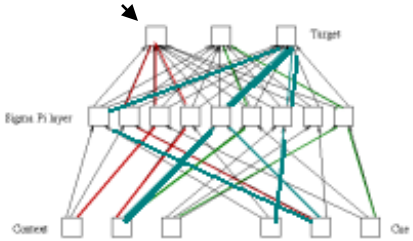
http://www.mcs.drexel.edu/~gcmastra/strange2.html



What is it?





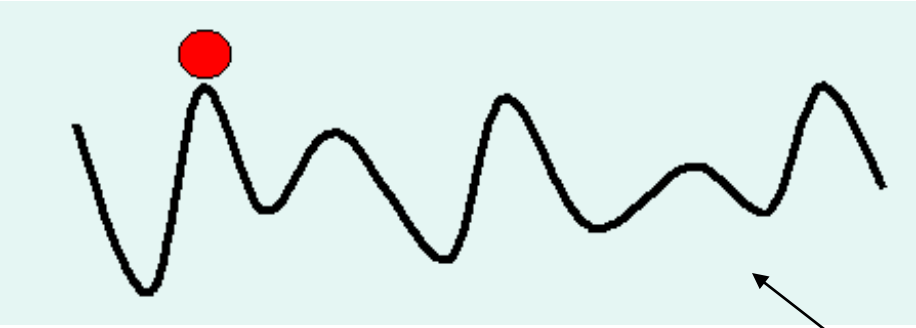


Duck

Rabbit

http://7ka.mipt.ru/~yevin/vismath/

Attractors = the tendency of the network to interpret a phenomenon one way as opposed to another



(energy states of various neural net configurations)

Associative memory =

pattrerns of connectivity =

the creation of attractors =

recognition

Knowledge is like *recognition*

Learning is like *perception*

the acquisition of new patterns of connectivity

through experience

Like I said, you already know this phenomenon, you've already seen it

Emergent Learning

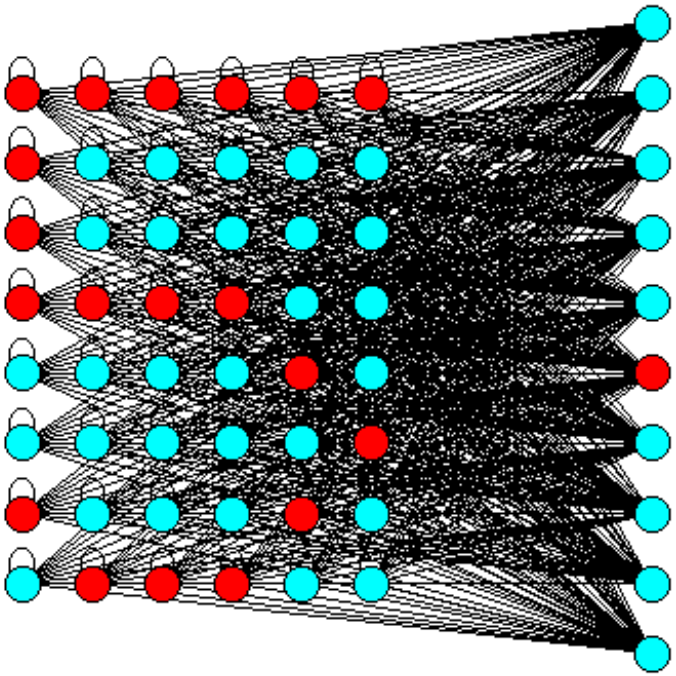
http://growchangelearn.blogspot.com/2007/02/emergent-learning.html
Tom Haskins

"Now I get it"
A-ha!
"Out of the blue"
"My mind leaped"
"Did an about-face"
"Shut up and did it"
Sudden breakthrough

Knowledge is *recognition*

It’s a belief you *can’t not have*

Like after you’ve *found Waldo*



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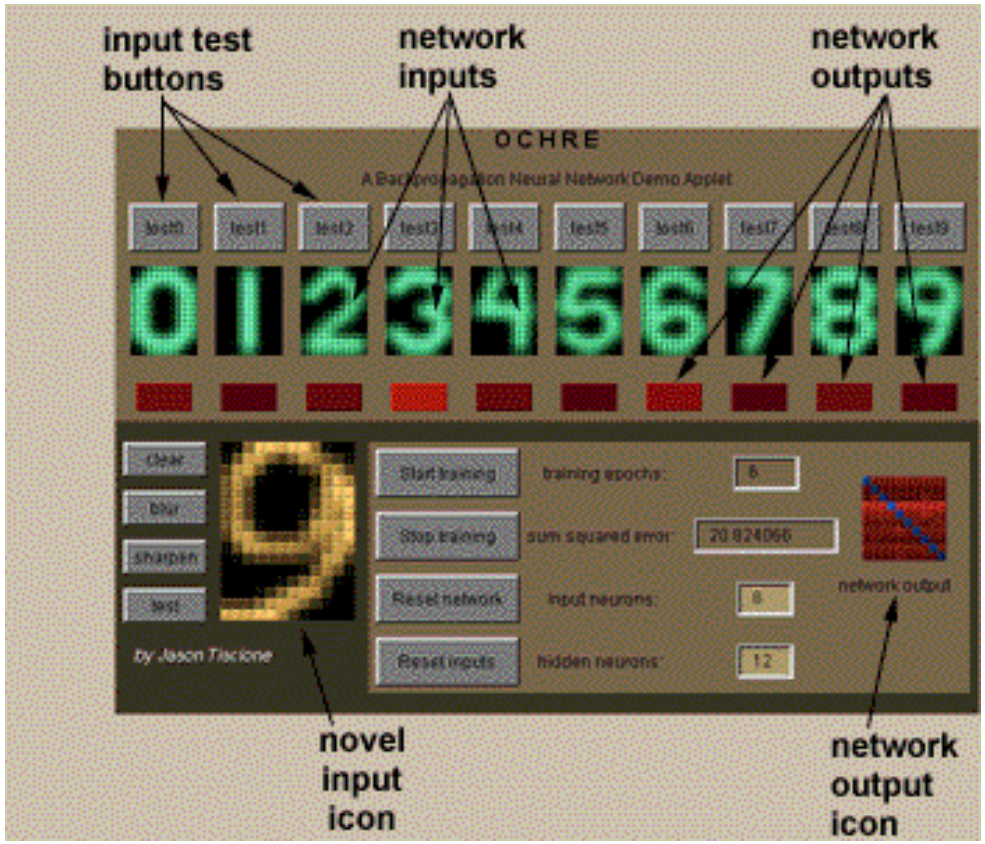
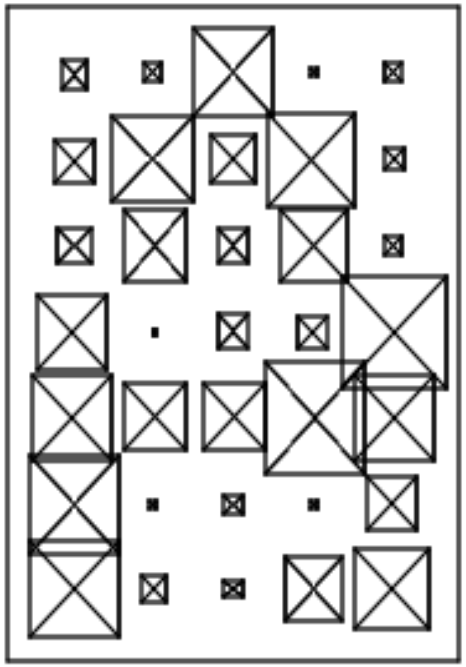
Pattern Recognition…



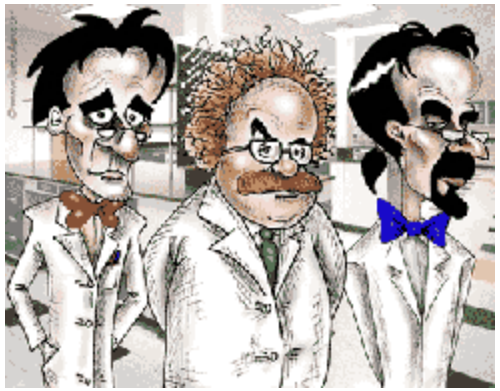


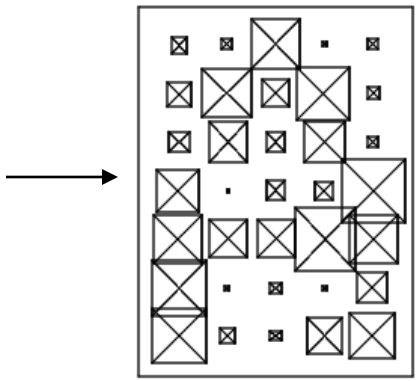
http://www.sund.de/netze/applets/BPN/bpn2/ochre.html

Pattern recognition is based on *similarity* between the current phenomenon and previously recognized phenomena

What we *want* is for students to recognize patterns in existing networks – in communities of experts, communities of practice

That's why we model and demonstrate



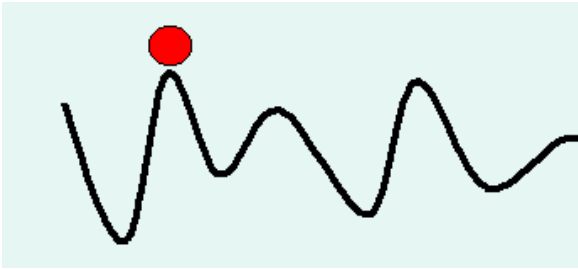


But what *kind* of network do we want to model for our students?

For that matter, what kind of network do we want for *ourselves?*

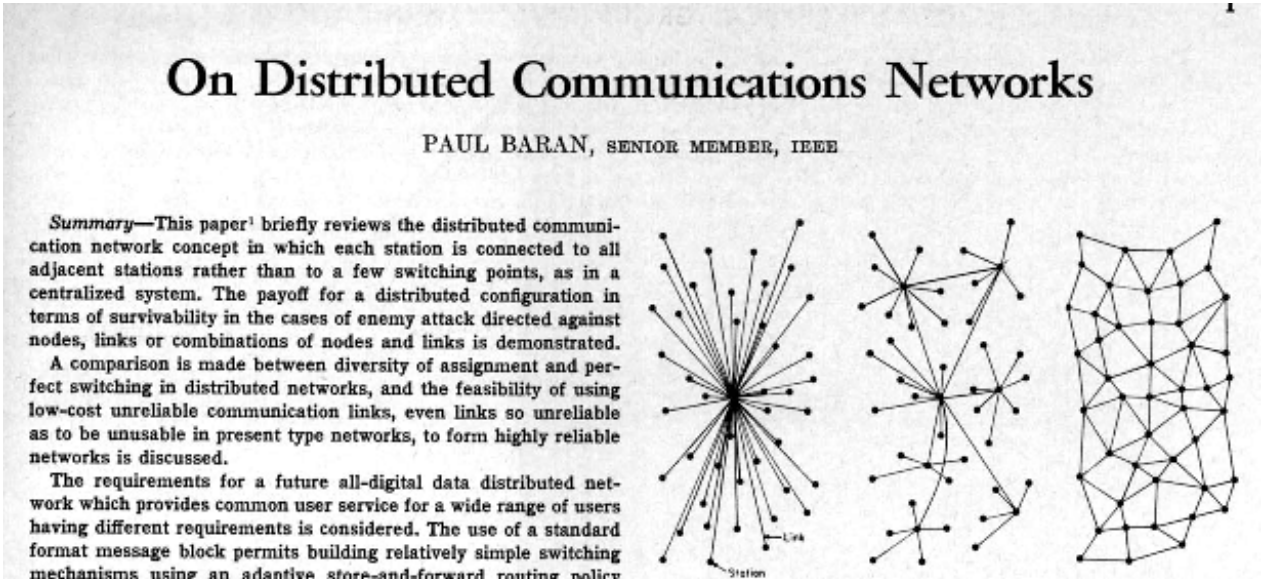
To maximize knowledge?

To little connection and in formation never propagates



Too much connection and information propagates too quickly

The internet itself illustrates a sound set of principles, grounded by two major characteristics: simple services with realistic scope. "*Simple service or simple devices with realistic scope are usually able to offer a superior user experience compared to a complex, multi-purpose service or device*".



On Distributed Communications Networks

PAUL BARAN, SENIOR MEMBER, IEEE

Summary—This paper[1] briefly reviews the distributed communication network concept in which each station is connected to all adjacent stations rather than to a few switching points, as in a centralized system. The payoff for a distributed configuration in terms of survivability in the cases of enemy attack directed against nodes, links or combinations of nodes and links is demonstrated.

A comparison is made between diversity of assignment and perfect switching in distributed networks, and the feasibility of using low-cost unreliable communication links, even links so unreliable as to be unusable in present type networks, to form highly reliable networks is discussed.

The requirements for a future all-digital data distributed network which provides common user service for a wide range of users having different requirements is considered. The use of a standard format message block permits building relatively simple switching mechanisms using an adaptive store-and-forward routing policy

Effective networks are…

Decentralized

Disaggregated

widgetbox
widgetizing the web

digg™

Distributed

Disintermediated

Dis-Integrated

XML XML
XML XML

Dynamic

Desegregated

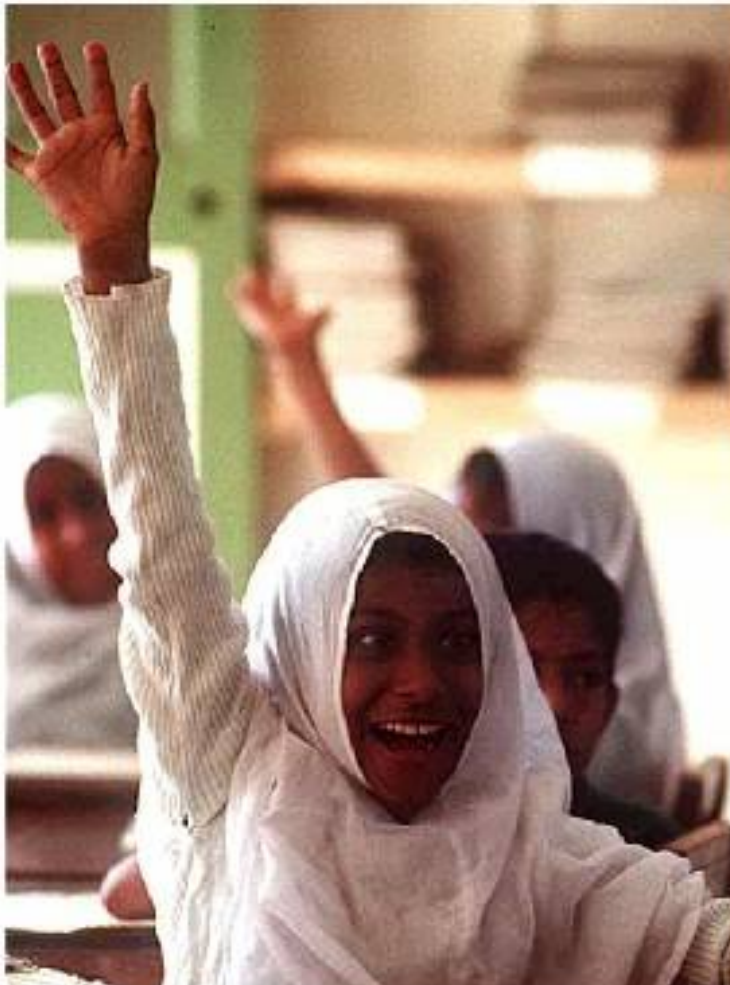
Democratic

Democratic =

The Semantic Condition

Reliable networks support…

- *Autonomy*
- *Diversity*
- *Openness*
- *Connectivity*



How is this practical?

Ask yourself…

To teach the concept of brackets, would you use this same example over and over? Of course not.

Why not?

Because of the need for *diversity*.

Diverse experiences create better networks than monotonous experiences

Thank you

http://www.downes.ca