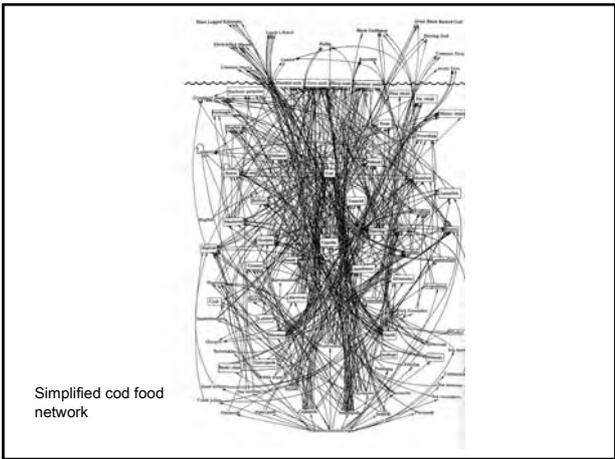


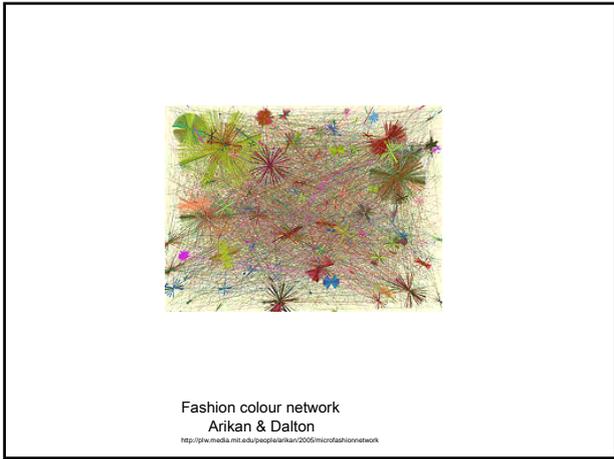
1. Simple systems – “a small number of individuals with relatively weak interactions”. Tool – reductionist analysis
2. Statistical systems – “composed of such a vast number of objects that we can employ statistical averaging techniques to study their behaviour”
3. Complex systems – the number of elements is between simple and statistical, the agents are adaptive, and get information from a number of other agents, but not all of them

Cash World by words 1997

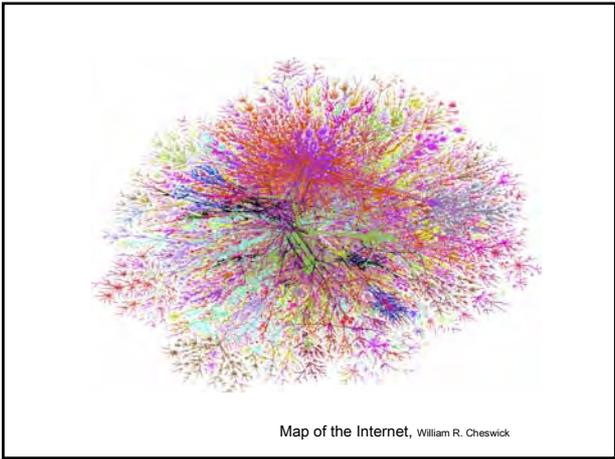
Small changes in complex systems can lead to large and unexpected results
 “the flap of a butterfly’s wings in Brazil set off a tornado in Texas” (Lorenz)



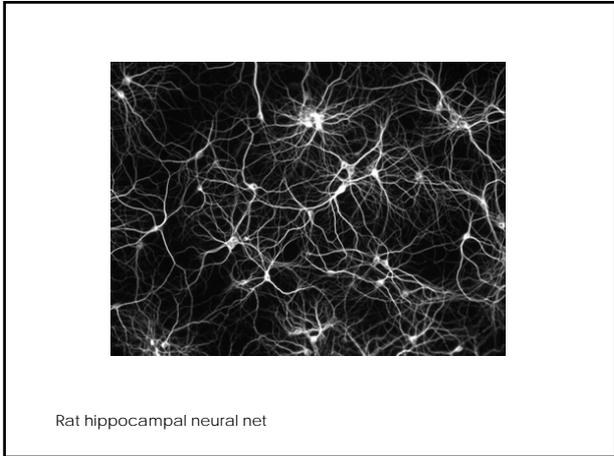
Simplified cod food network



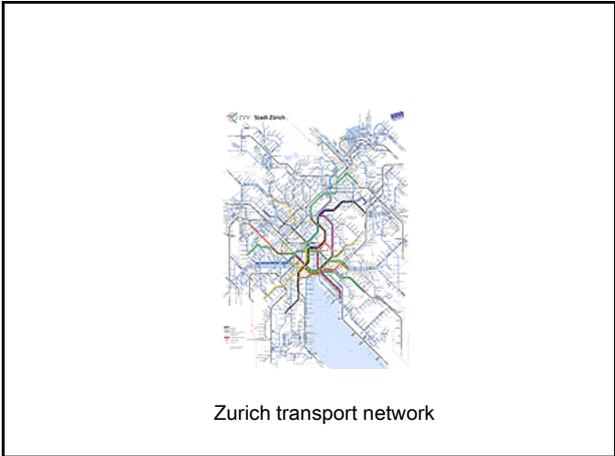
Fashion colour network
 Arikani & Dalton
<http://www.media.mit.edu/people/arikan/2009/microfashionnetwork>



Map of the Internet, William R. Cheswick

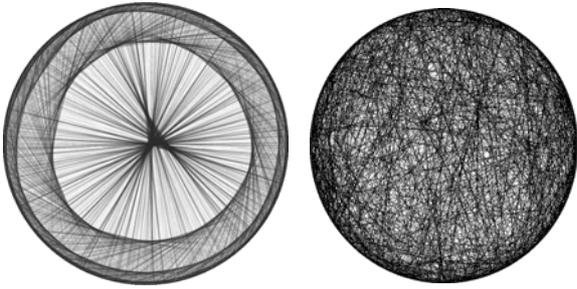


Rat hippocampal neural net



Zurich transport network

Ordered & Random networks



http://planet.urv.es/pkanetsim/images/symphony_1000_random.gif

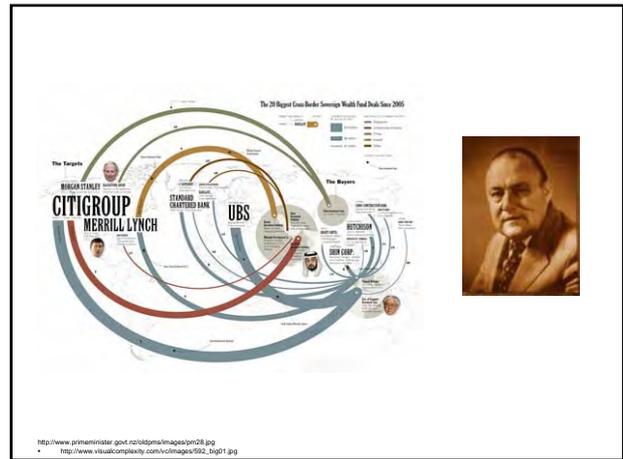
The agents and their interactions "...then generates a pattern at a higher level than the agents themselves. Such a pattern is often termed an *emergent* phenomena since it emerges out of the aggregate interactions among the individual agents in the system."
Casti 1997



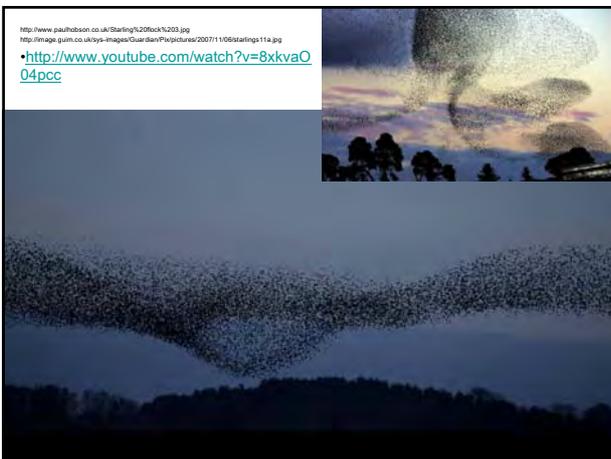
http://www.bbc.co.uk/tradeout/content/images/2007/09/2007_09_2007_47b0303.jpg



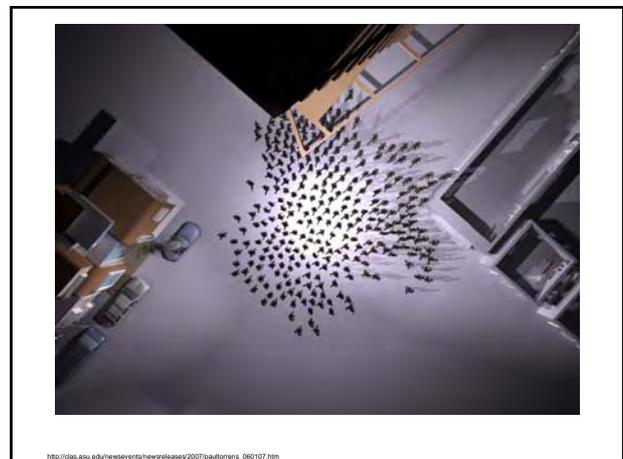
<http://www.texelated.net/notes/ACCI/images/andDollars.jpg>



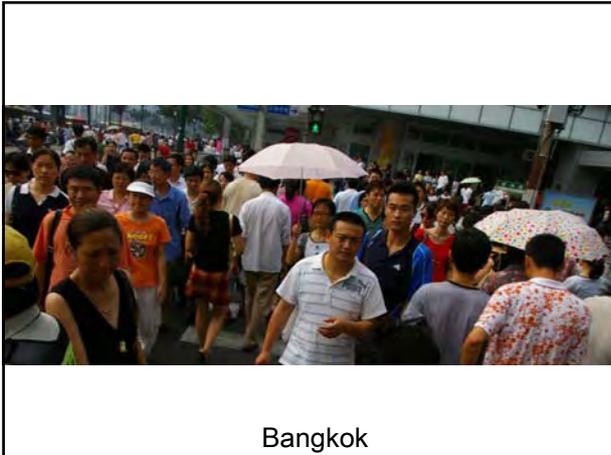
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http://www.visualcomplexity.com/vc/images/552_bsp1.jpg



<http://www.duchhobson.co.uk/Glarfing%20back%2033.jpg>
<http://image.gum.co.uk/kyx-images/Cuar/dan/Pic/pictures/2007/11/06/starlings11a.jpg>
• <http://www.youtube.com/watch?v=8xkvaO04pcc>



http://dsk.ssu.edu/news/events/newsreleases/2007/paulomems_060107.htm



Self organising in a complex system

'Order for free'

- Density of agents
- Density of interactions between them
- Variety of types of agents
- Tinkering with the feedbacks

Breaking down self organisation in a system

- Reduce the number of agents in a system
- Reducing variety of agents
- Reduce interactions between them

modularising

Grouping agents into components effectively reduces interactions, variety and number of agents within the smaller subsystems

The system will become brittle and liable to sudden catastrophic failure

Skytner 2005

The system will become brittle and liable to sudden catastrophic failure

Skytner 2005

http://upload.wikimedia.org/wikipedia/commons/6/6d/Beijing_traffic_jam.JPG

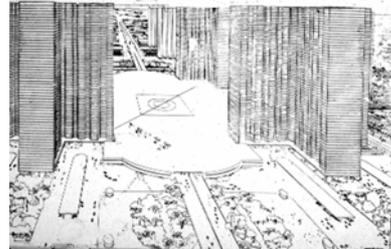
Lambton Quay 1900



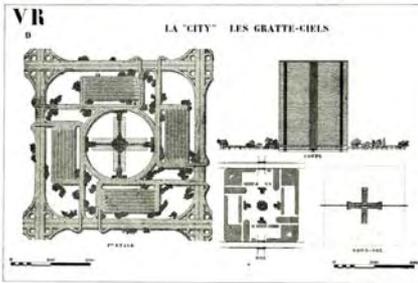
BNZ corner, Wellington

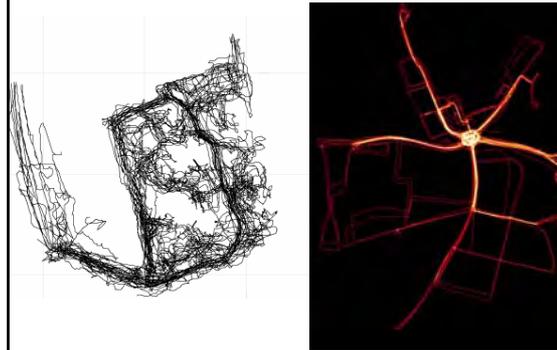
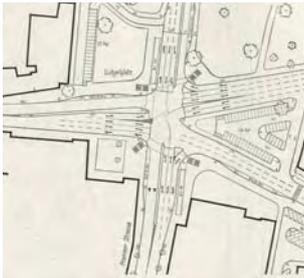
Le Corbusier:

“The street is a traffic machine; it is in reality a sort of factory for producing speed” *The city of tomorrow* 1929:131



“The Plan must rule
Disappearance of the street
Differentiation between simple and multiple speeds..”
The Radiant city Le Corbusier 1933:7





http://www.gsdrawing.com/gallery/fan/magic_roundabout/roundabout.gif

" When the two [pedestrians] are about twenty feet apart, they will look at each other. This is a critical moment. By their glance they must not only convey the signal but see if the signal has been acknowledged. A few feet nearer they drop their gaze and make a slight shift in course...the stop and slide. The course shift in itself is not enough for a full clearance but it will be enough if the other pedestrian makes a comparable move, as with few exceptions they do."

Whyte, City: rediscovering the center.1998.57

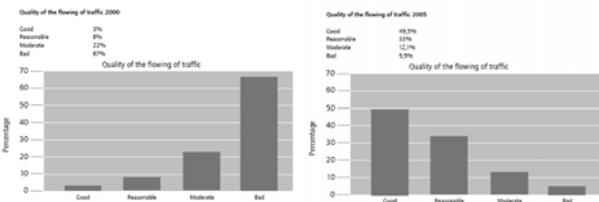




http://www.charbonfm.com/Picture_2482.JPG



Design by Hans Monderman



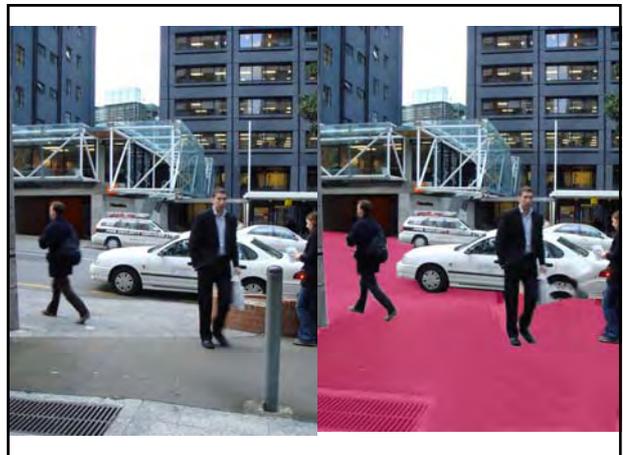
Buses now take 20 seconds to move through the intersection instead of 56 seconds

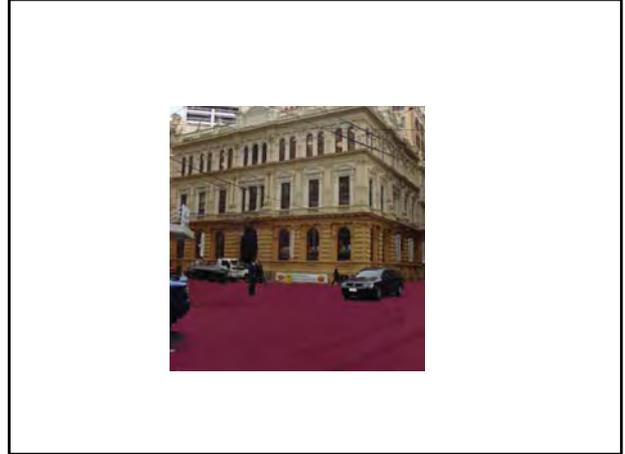
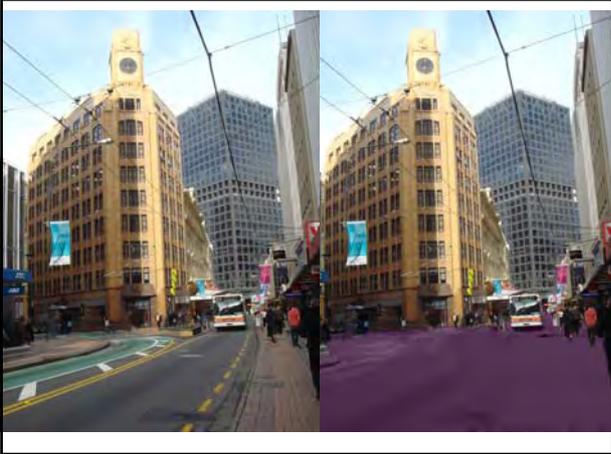
Leeuwarden 2007

Other studies find serious accidents reduced by 50%

Ben-Joseph 1995

The reason the shared street is able to work so well is that it enables the power of self-organization to work amongst *both* walkers and drivers. The shared street removes the modularization of space and movement modes and enables interactions between ALL the agents on the street. Without specific rules for movement the drivers and walkers must both make the slight, subtle negotiations that will allow flocking or swarming to give us 'order for free'.





- **Removes the hierarchy between walkers and drivers**
- **Reduces brittleness in the road system**
- **The carriageway is returned to public space**
- **Allows aesthetic design**
- **Flexibility to adapt to changing futures**