

A grayscale aerial photograph of a dense urban skyline, likely New York City, at dusk or night. The city lights are visible through the windows of the skyscrapers. Overlaid on the image is a network graph consisting of numerous black and gray circular nodes of varying sizes and a web of thin black lines connecting them, symbolizing connectivity and data flow.

Network Analysis: The Introduction

Dr. Stanislav Sobolevsky

- ✓ Network Science and Complexity
- ✓ Network Concept and Model
- ✓ Node importance: Degree, Centrality
- ✓ Routing algorithms
- ✓ Community detection
- ✓ Network Modeling

Complex urban system

COMPLEX

[adj., v. kuh m-pleks, kom-pleks; n. kom-pleks]

—adjective

1. composed of many interconnected parts; compound; composite: a complex highway system.

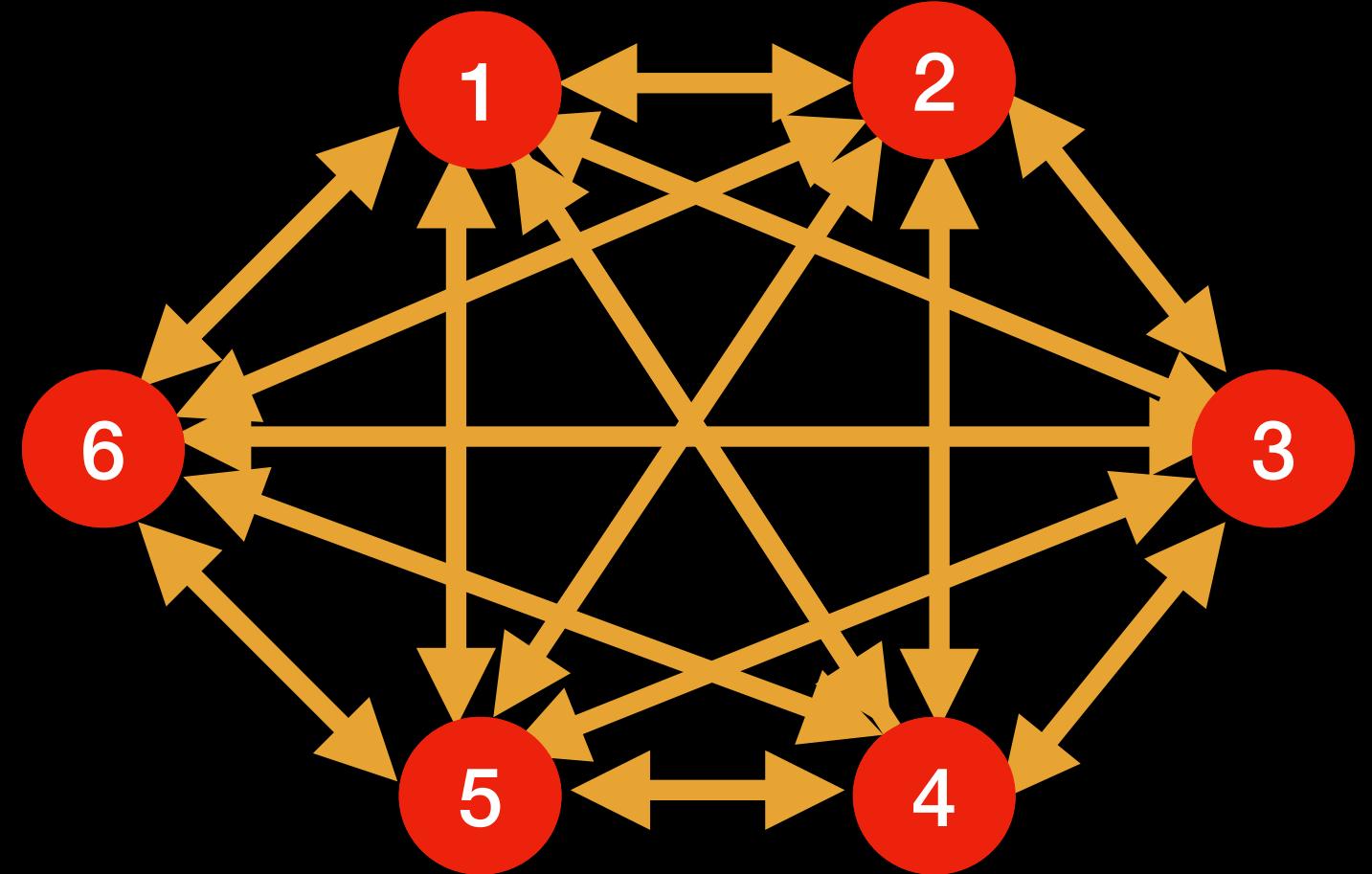
2. characterized by a very complicated or involved arrangement of parts, units, etc.: complex machinery.

3. so complicated or intricate as to be hard to understand or deal with: a complex problem.

Source: [dictionary.com](https://www.dictionary.com)

Complexity, a scientific theory which asserts that some systems display behavioral phenomena that are completely inexplicable by any conventional analysis of the systems' constituent parts. These phenomena, commonly referred to as emergent behaviour, seem to occur in many complex systems involving living organisms, such as a stock market or the human brain.

Source: John L. Casti, Encyclopædia Britannica



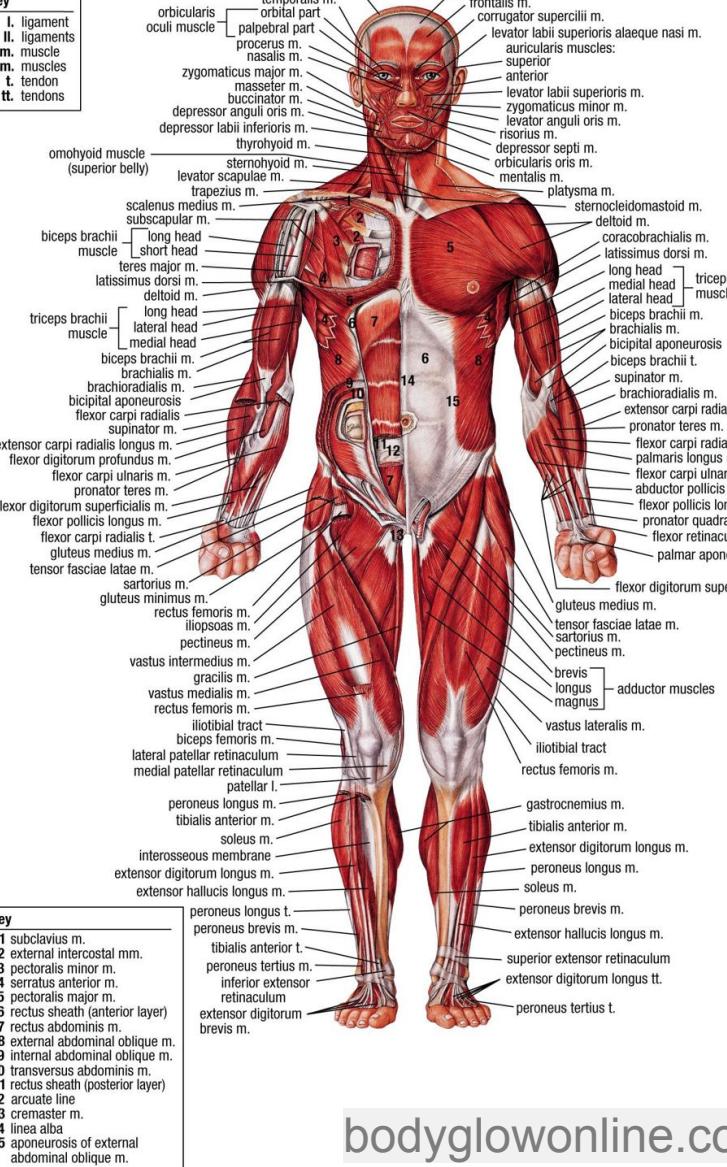
Behind each complex system there is a **network**

A.-L. Barabasi **Network Science : Introduction 2012**



MUSCULAR SYSTEM (ANTERIOR VIEW)

Key
L ligament
m muscle
mm muscles
T tendon
tt tendons



Human brain

...Society can only be understood through a study of the messages and the communication facilities which belong to it...

Norbert Weiner

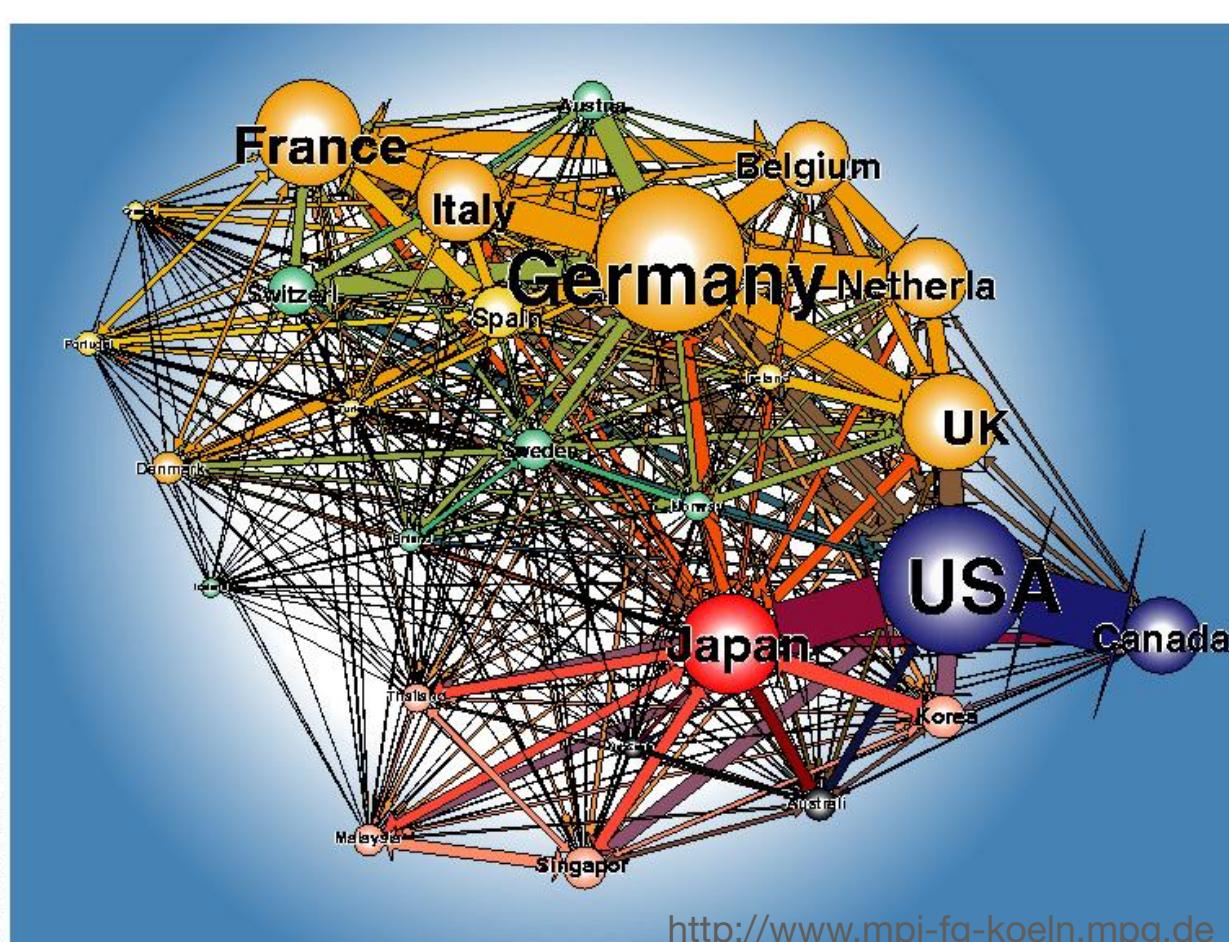


The "Day of 7 Billion" has been targeted by the United States Census Bureau to be in July 2012.
http://en.wikipedia.org/wiki/World_population

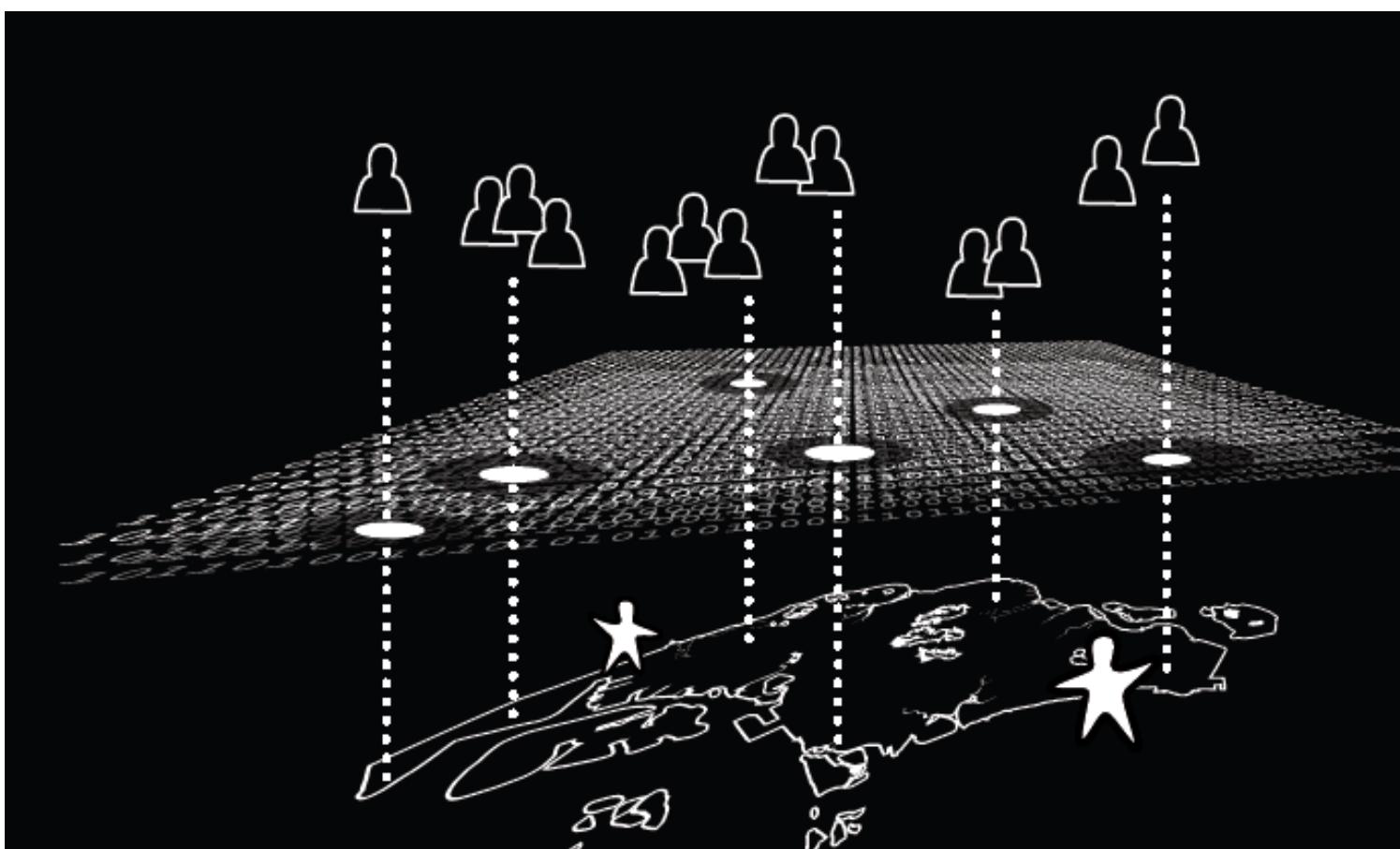
Human society

Complexity

Human economy



<http://senseable.mit.edu/livesingapore/>



Human cities



NETWORKS

- Human dynamics
- Traffic and road infrastructure
- Human interactions and social networks
- Professional interactions, collaboration
- Utility infrastructure: energy grid, water supply etc
- Waste removal
- Trade; goods supply and logistics
- Individual purchases
- Disease spread
- Knowledge propagation and innovation