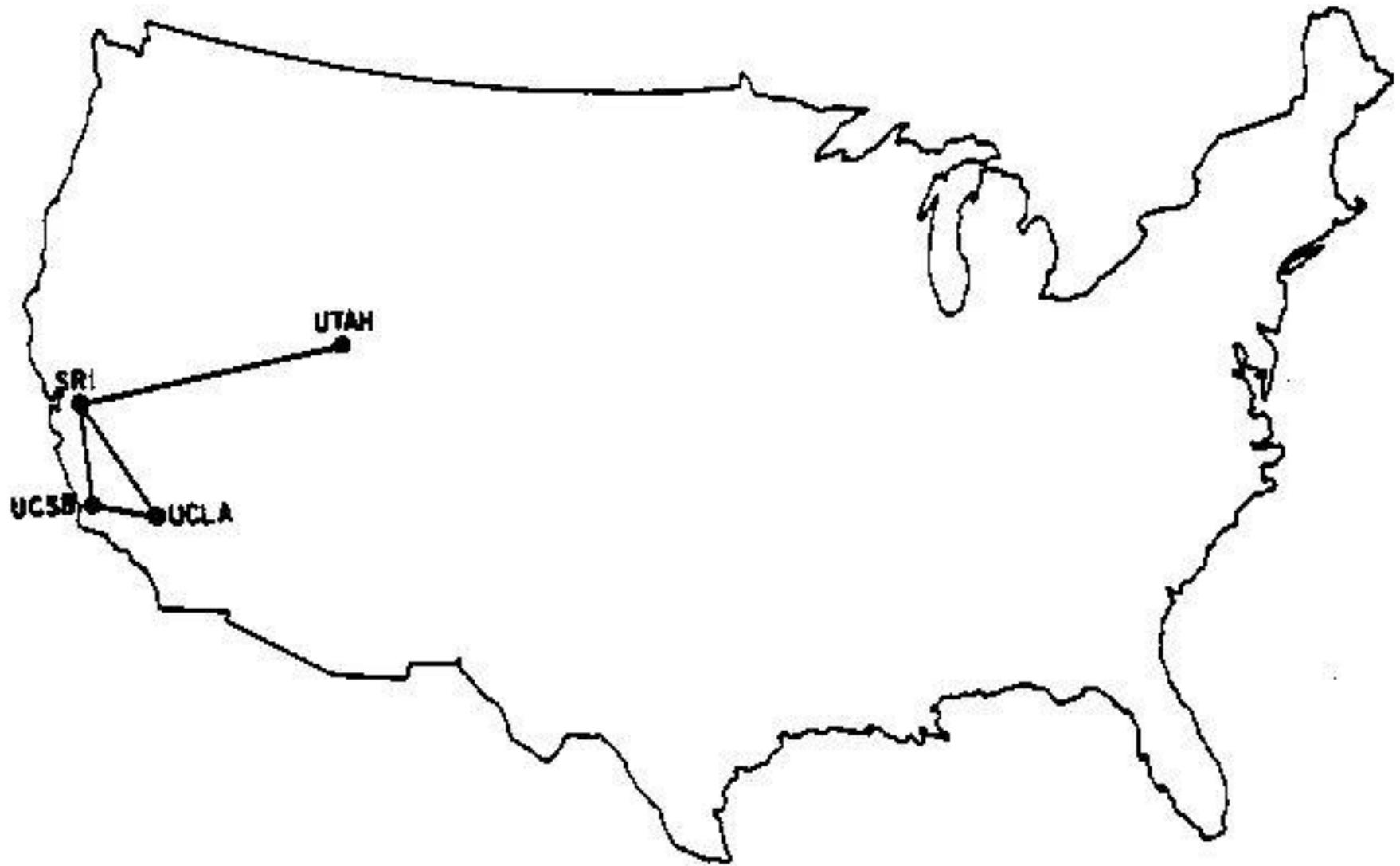
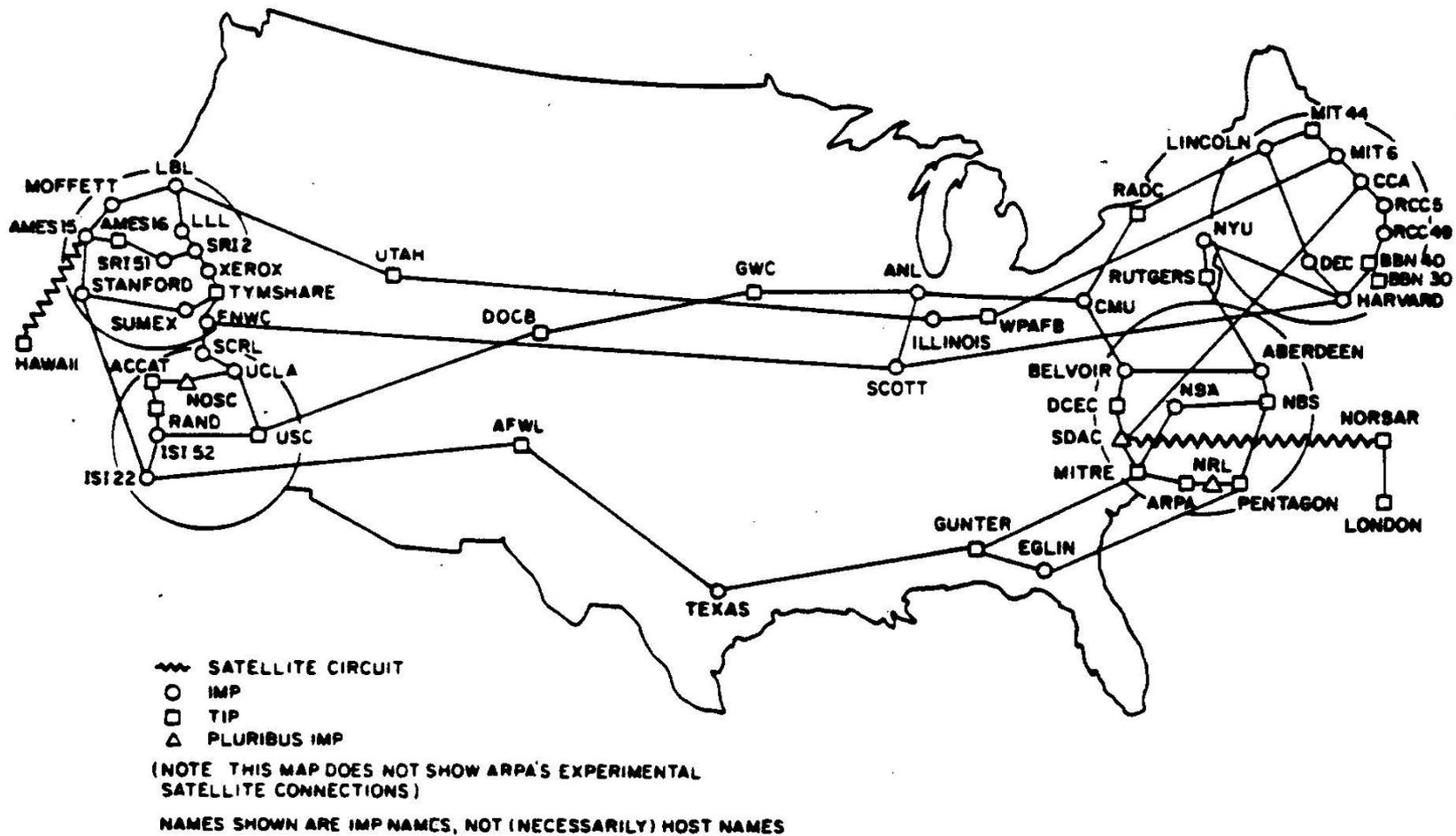


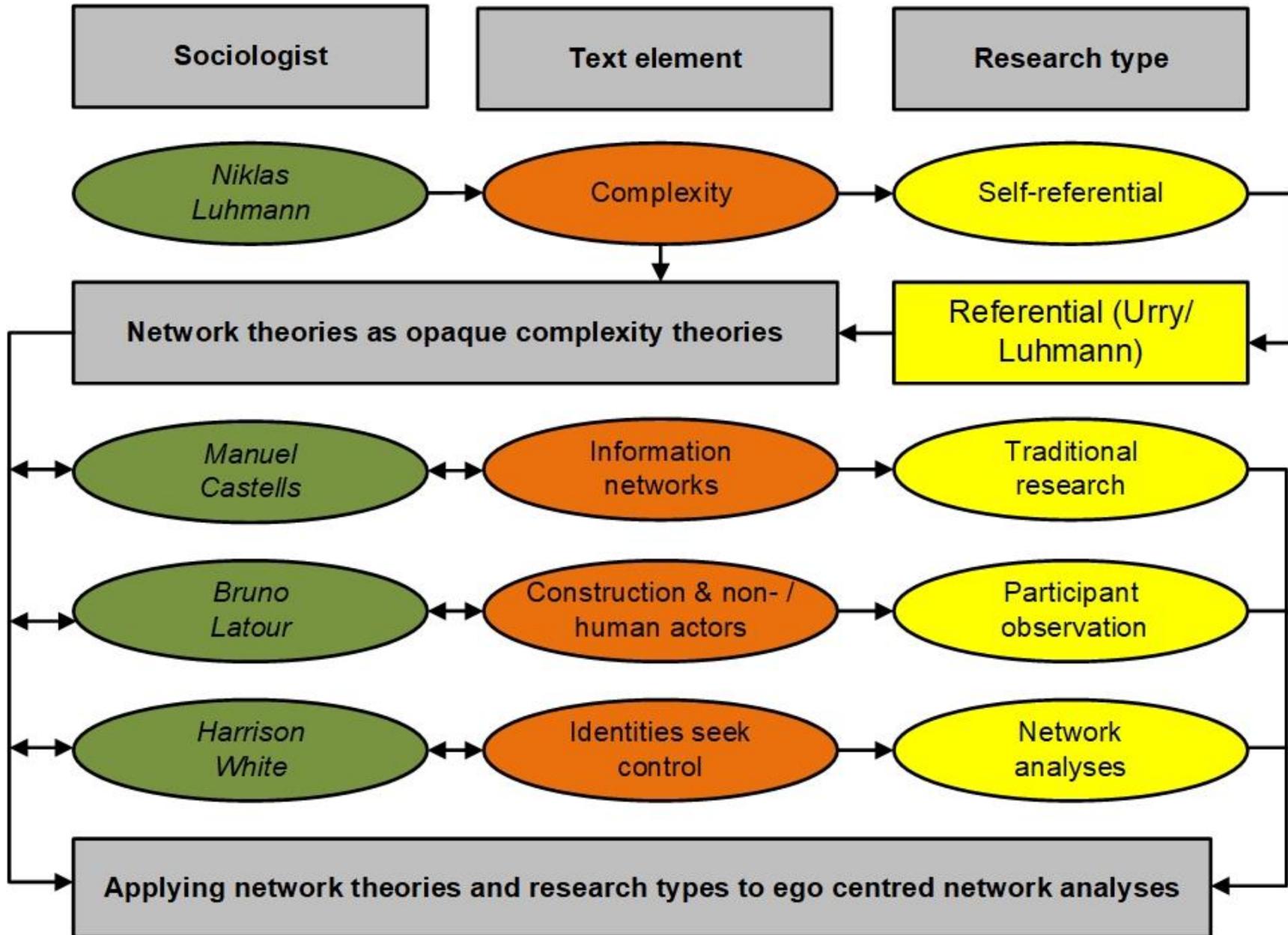
The organisation of complexity



An introduction to contemporary classics of system and network theory



Network of content



Niklas Luhmann



And the ultimate problem of complexity

1. Niklas Luhmann wanted to solve an ultimate problem: the incomprehensible complexity of the social world.
2. His solution was a theory, that claims universality.

-
1. In 1970: “**Sociology is ultimately constituted** [...] by the way, how it works against the incomprehensible **complexity** of a social contingent world, (Soziologie konstituiert sich [...] letztlich durch die Art, wie sie der unfaßlichen Komplexität einer sozial kontingenten Welt entgegenarbeitet)“ (Luhmann 1970, p. 69).
 2. “However, one can maintain the **claim to universal theory** [...], if one finds the point at which system theory failed so far in its claim, (Man kann den Anspruch auf universelle Theorie jedoch [...] festhalten, wenn man den Punkt findet, an dem die Systemtheorie bisher in ihrem Anspruch scheitert)“ (Luhmann 1970, p. 113).

Two and a half options

1. He mentioned two and half possible theories.

1.1 A theory of **system differentiation**.

1.2 A stub of a theory of system complexity.

1.3 And a vague notion of a theory of **pure/opaque complexity** (Luhmann 1995, p. xlvii).

1.1 - 1.2 “There are **two different possibilities** for viewing the decomposition of a system. One aims to form **subsystems** [...] within the system. The other decomposes systems into **elements and relations**. [...] The first kind of decomposition is carried out as a **theory of system differentiation**. The other ends up in a theory of **system complexity**” (Luhmann 1995, p. 21).

1.3 “As a result, the rapidly **increasing complexity** of the theory discussion **confuses the observer**. [...] **The unity of sociology** then appears, not as theory, and certainly not as the concept of its object, but as **pure complexity**” (Luhmann 1995, p. xlvi).

Luhmanns theory of system differentiation

1. Luhmanns system theory is based on three principles.
 - 1.1 A difference theory, working in the background.
 - 1.2 A claim to universality.
 - 1.3 A self-referential theory construction.
2. A system is basically “the difference between system and environment” (Luhmann 1995, p. 7 and 178f).

-
1. “Theories that **claim universality** are easily recognized by the fact that **they appear as their own object**. (If they wanted to exclude themselves, they would have to surrender the claim to universality.) [...] Therefore, theories that make a **claim to universality** are **self-referential**. [...] Thus a **universal theory**, [...] precisely as a **theory of differentiation**, can understand itself as the **result of differentiation**” (Luhmann 1995, p. xlvii - xlviii).
 2. “System differentiation is nothing more than the **repetition** within **systems** of the **difference between system and environment**” (Luhmann 1995, p. 7).

Luhmanns concept of complexity

1. Besides an elaborated theory of system differentiation, he sketched a theory stub and a definition of complexity.
2. He defined complexity by “using the concepts **element** and **relation**” (Luhmann 1995, p. 24).
3. Complexity is at first a **quantitative concept** of observation, too which **quality** can be **added**.

2. “**Elements** can be **counted** and the number of *possible* mathematical **relations** among them can be determined* on the basis of their number. The enumeration reduces the relations among the elements to a **quantitative expression [...]**. Elements **acquire quality** only insofar as they are **viewed relationally**” (1995, p.21).

2. “**Complexity** [...] is an understanding of observation and description”, (Komplexität [...] ist ein Begriff der Beobachtung und Beschreibung) (Luhmann 2012, p. 78).

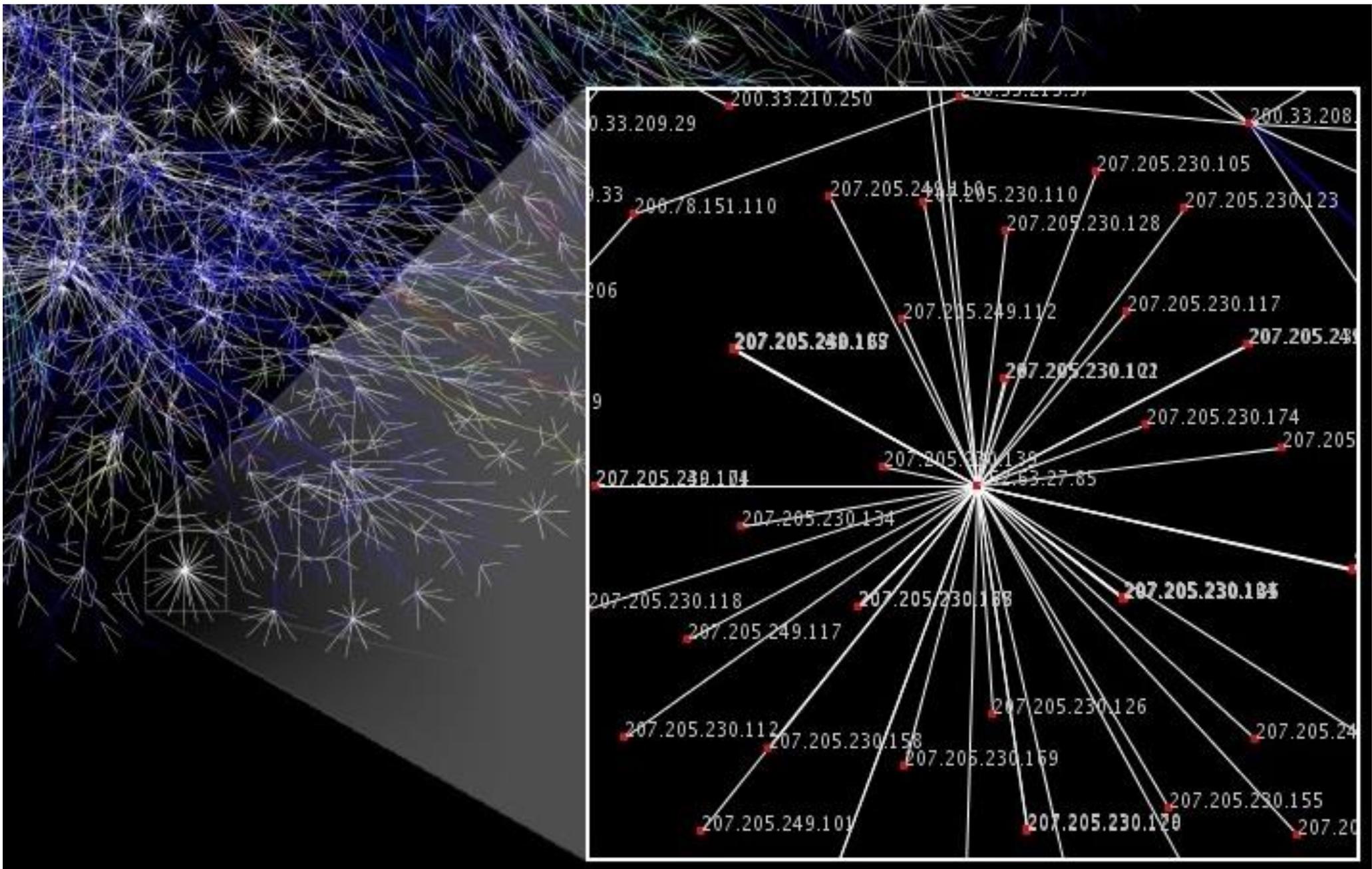
* E. g. Adapted **Gauss sum**: $c = (n*(n-1))/2$ (Holzer 2006. p. 38).

Features of Luhmanns concept

1. Highest grade of universality within Luhmanns theory.
2. But universality means only universal applicability.
3. At last complexity is only a second difference.

-
1. “This enjoys the advantages of making the concept [complexity] **applicable to what is not a system** (environment, world)” (Luhmann 1995, p. 24).
 2. “Theory establishes its relation to its object as **a relation of opaque to transparent complexity**. It claims neither to reflect the complete reality of its object, nor to exhaust all the possibilities of knowing its object. [...] But it does claim **universality** for its grasp of its object in the sense that it **deals with everything social** and not just sections” (Luhmann 1995, p. xlvi).
 3. “The difference between system and environment must be distinguished from a second, equally constitutive difference: namely, **the difference** between **element** and **relation**” (Luhmann 1995, p.20).

Visualisation of the elements and relations of the internet



John Urry and the complexity of complexity theories

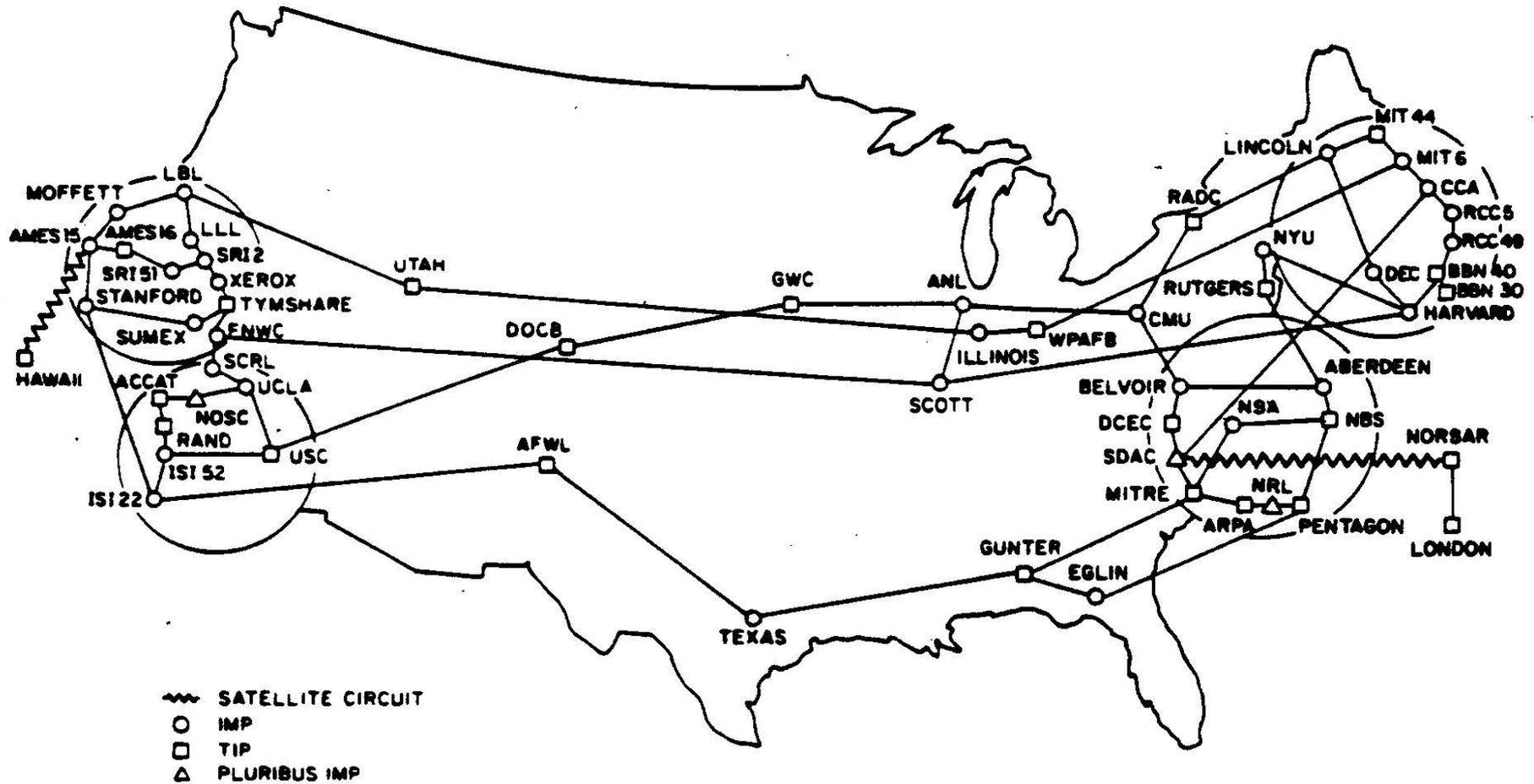
1. According to the British sociologist John Urry **opaque complexity theories** are the most common ones.
2. In his article 'Complexities of the Global' (2004) he introduced over dozens of authors as complexity scientists using various concepts such as 'multitude' (p. 2), 'system' (p. 7) or 'network' (p. 8).

-
1. "Various social analysts of modernity and globalisation implicitly draw upon '**complexity**' concepts and ideas even where these **are not explicitly articulated**" (Urry 2004, p. 2).
 2. There are very many relevant contributions [**to complexity science**] derived from the physical and social sciences (see Capra this volume, Maturana 1981; Prigogine and Stengers 1984; Casti 1994; Hayles 1991, 1999; **White 1992**; Kauffman 1993; Zohar and Marshall 1994; Kelly 1995; Mingers 1995; Krugman 1996; Prigogine 1997; Jervis 1997;...)" (Urry 2004, p. 3).

Network theories as opaque complexity theories

Author/ concept	Complexity as a problem	Definition	Status
Niklas Luhmann (complex.)	“Sociology is constituted [...] by [...] how it works against [...] complexity” (v. s.).	“ Element and relation ” (v. s.).	“A concept of observation and description” (2012, p. 78).
Bruno Latour (network)	“Sociologists [...] had to multiply [...] agencies to account for the complexity [...] of action ” (2005, p. 44f).	“A point-to-point connection ” (2005, p. 132).	“A concept [...]. A tool [...] to describe s.th.” (2005, p. 131).
Harrison White (network)	Researchers should put on different eyeglasses that unfold the complexities of the everyday ” (2008, p. 1).	“A set of nodes with connecting lines ” (2008, p. 41).	“Phenomenological realities [and] measurement constructs ” (2008, p. 36).
Manuel Castells (network)	“The IT revolution [...] will be my entry point in analyzing the complexity of the new economy, society...”(2010, p. 5).	“A set of inter-connected nodes ”(2000, p.15).	“Very old forms of social organization ” (2000, p. 15).

Elements and connections



(NOTE THIS MAP DOES NOT SHOW ARPA'S EXPERIMENTAL
SATELLITE CONNECTIONS)

NAMES SHOWN ARE IMP NAMES, NOT (NECESSARILY) HOST NAMES

Manuel Castells



And his theory of the network society

1. The current society is build on networks.
2. Networks are an old form of organisation, but regularly outperformed by centralised hierarchies.
3. Enhanced by the internet, networks have changed into information networks.

-
1. “The [...] new **social structure** in the making [...] is made of **networks** in all the key dimensions of social organization and social practice” (2010, p. xviii).
 2. “For most of human history [...] networks were outperformed by organizations able to master resources around centrally defined goals, achieved through the implementation of tasks in rationalized, vertical chains of **command and control**” (2000, p. 15).
 3. “While **networks** are an **old** form of **organization** [...] **digital networking technologies** [...] **powered** social and organizational networks in ways that allowed their endless expansion and reconfiguration, overcoming the traditional limitations of networking forms of organization to **manage complexity** beyond a certain size of the network” (Castells, p. xviii).

Manuel Castells' empirical research

1. Manuel Castells prefers traditional research such as secondary data analyses, participant observation and interviews.
2. Network theory therefore does not enforce the use of network methods.

-
1. "I have tried to present the movements in their own words and by their own actions, using some **direct observation** and a considerable amount of information: some from **individual interviews** and some from **secondary sources**" (Castells 2012, p. 18).

Excursus: The complexity of Wikipedia

WIKIPEDIA

Die freie Enzyklopädie

Deutsch

2 343 000+ Artikel

English

5 930 000+ articles

Español

1 545 000+ artículos

Русский

1 568 000+ статей

Italiano

1 552 000+ voci

Português

1 013 000+ artigos

Polski

1 359 000+ hasel

日本語

1 168 000+ 記事

Français

2 139 000+ articles

中文

1 073 000+ 條目



DE ▾

🌐 Wikipedia in deiner Sprache lesen ▾

The complexity of its content

1. The [English Wikipedia](#) is one of the most expanded and [visited](#) information networks of our time.
2. It contains nearly [6 million articles](#), an equal to [2949 printed volumes](#) of the “[Encyclopædia Britannica](#)”.
3. The last printed version of the [Britannica](#) (2013) had 40 000 articles in 40 volumes.
4. The [Cebuano](#) Wikipedia is with 5.3 million articles the second largest Wikipedia.
5. It is mainly created by a computer program named [Lsjbot](#).

A comparison of its organisational complexity

	<u>Wikimedia Foundation</u>	<u>RUB</u>	<u>Yahoo</u>	<u>Google Alphabet</u>
Alexa Rank (27/10/19)	<u>9</u>	<u>7624</u>	<u>10</u>	<u>1</u>
Budget in million US \$ (rounded)	100	600	5.170	136.820
Employees (rounded)	300	5500	8600	100 000
<u>Community</u> (27/10/19)	37 466 443	?	?	?
Active community	134 352	?	?	?

Bruno Latour



And a common notion of constructivism



W. McPhail

“Listen to me. Gender is a construct, society is a construct, money is a construct. But bedtime is very, very real.”

And Latour's notion of constructivism



W. M. Thail

“Listen to me. Houses are constructs, bedrooms are constructs, beds are constructs. So, bedtime is very, very real.”

Bruno Latour's notion of constructivism

1. Is opposed to the notion that sth constructed is not real.
2. Sth is real, because it is constructed like a house is constructed by human actors (construction workers...) out of non human actors (stones, nails...).

-
1. "For other colleagues [...] either something was real and not constructed, or it was constructed and artificial, contrived and invented, made up and false" (2005, p. 90)
 2. "The great advantage of visiting construction sites is that they offer an ideal vantage point to witness the connections between humans and non-humans" (p. 88).
 3. "There is hardly any doubt that [...] hammers 'hit' nails on the head" (p. 71). For any construction to take place, non-human entities have to play the major role" (p. 92).

Bruno Latour's early vs. later constructivism

1. There is significant difference between Bruno Latour's early (1999) and later (2005) notion of constructivism.
 - 1.1 1999: symmetry between humans and non-humans.
 - 1.2 2005: non-human actors play the major role.
-

- 1.1 "The modern collective is the one in which the relations of humans and nonhumans are so intimate, the transactions so many [...] that there is no plausible sense in which artifact, corporate body, and subject can be distinguished. In order to take account of this **symmetry** between humans and nonhumans.." (Latour 1999, p. 197)
- 1.2 "There is hardly any doubt that [...] hammers 'hit' nails on the head" (2005, p. 71).
- 1.2 "For any construction to take place, non-human entities have to play the major role" (Latour 2005, p. 92).

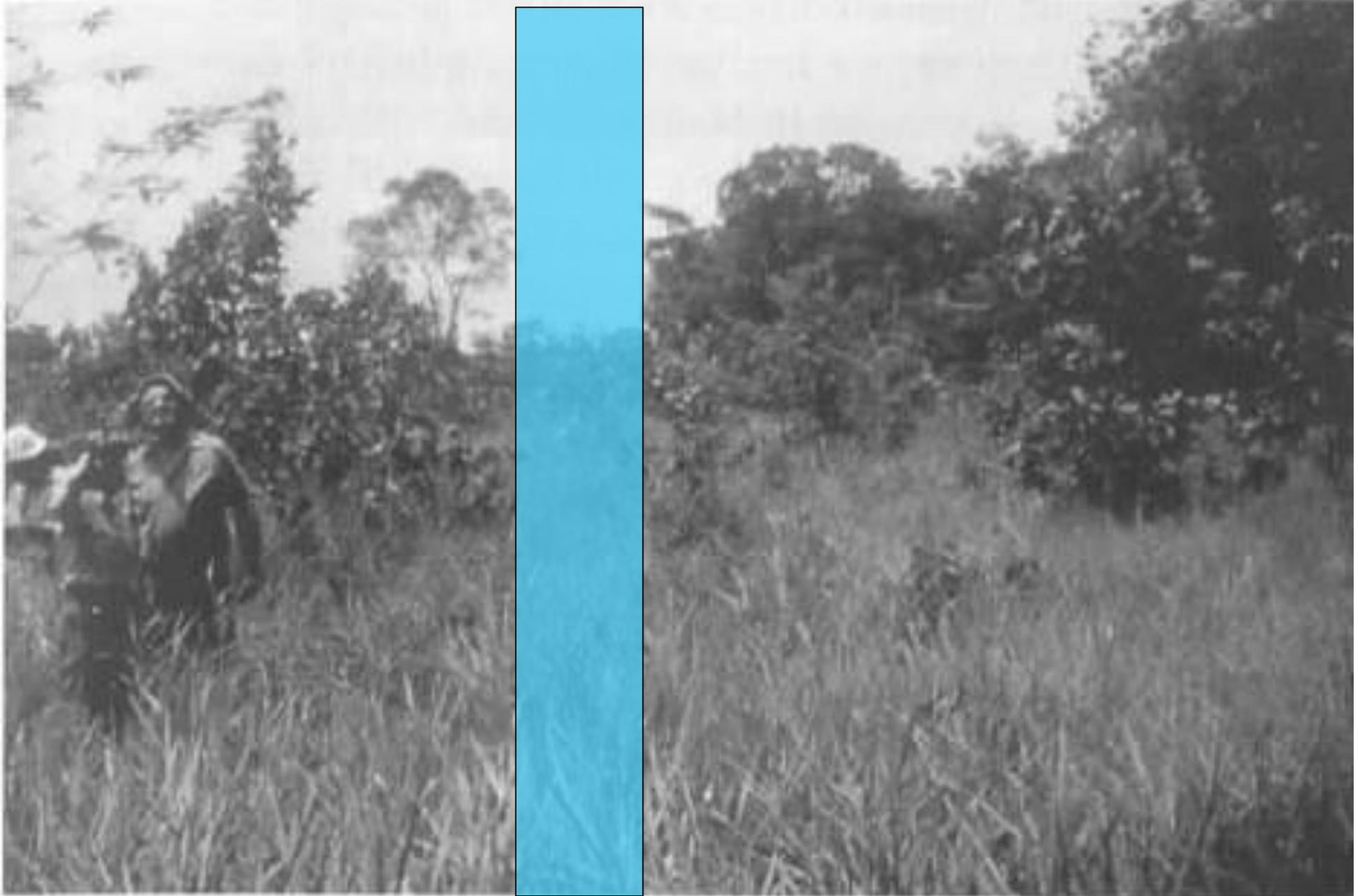
Bruno Latour's empirical research

1. Bruno Latour's empirical research is guided by the slogan "follow the actors".
2. In order to do so, he often used participant observations.

-
1. "Using a slogan from ANT, you have '**to follow the actors themselves**', that is try to catch up with their often wild innovations in order to learn from them what the collective existence has become in their hands, which methods they have elaborated to make it fit together, which accounts could best define the new associations that they have been forced to establish" (Latour 2005, p. 12).

Circulating Reference - Sampling the Soil in the Amazon Forest

All pictures: Latour 1999: [Pandoras Hope](#). 25 – 57.



Two pedologists, a geographer and a botanist are looking at two maps.



The pedologists collect soil samples.



And sort them into a pedocomparator



The botanist cuts of plant samples



Which are transported to a cabinet in a botanical institute in Manaus



Circulating Reference



The diagram shows the boarder between savanna and forest

lowed: I mean the gap that divides our prose from the annex of diagrams it will refer to. We will write about the forest-savanna transition, which we will show within the text through the medium of a graph. The scientific text is different from all other forms of narrative. It speaks of a referent, *present* in the text, in a form other than prose: a chart, diagram, equation, map, or sketch. Mobilizing its own *internal* referent*, the scientific text carries within itself its own verification.

In Figure 2.15 is the diagram that combines all the data obtained during the expedition. It appears as "figure 3" in the written report of which I am one of the proud authors and of which the title page reads:

Relations between Vegetation Dynamics and the Differentiation of Soils in the Forest-Savanna Transition Zone in the Region of Boa Vista, Roraima, Amazonia (Brazil)
Report on Expedition in Roraima Province, October 2-14, 1991

E. L. Setta Silva (1), R. Boulet (2), H. Filizola (3),
S. do N. Morais (4), A. Chauvel (5) and B. Latour (6)
(1) MIRR, Boa Vista RR, (2,3) USP, São Paulo, (3-5)
INPA,
Manaus, (6) CSI, ENSMP, (2,5) ORSTOM Brazil

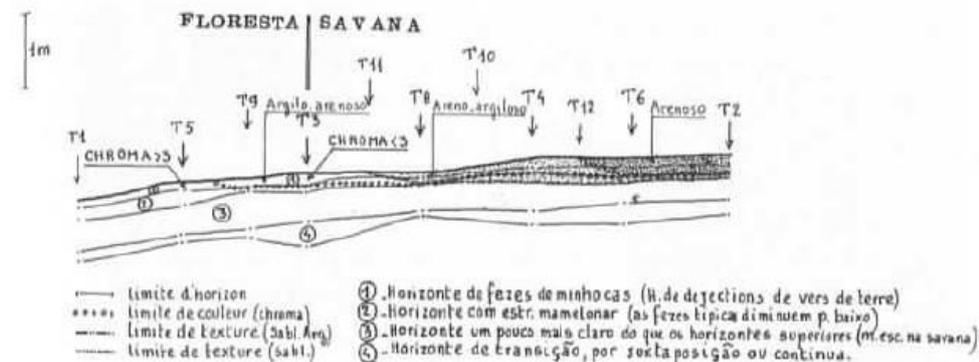
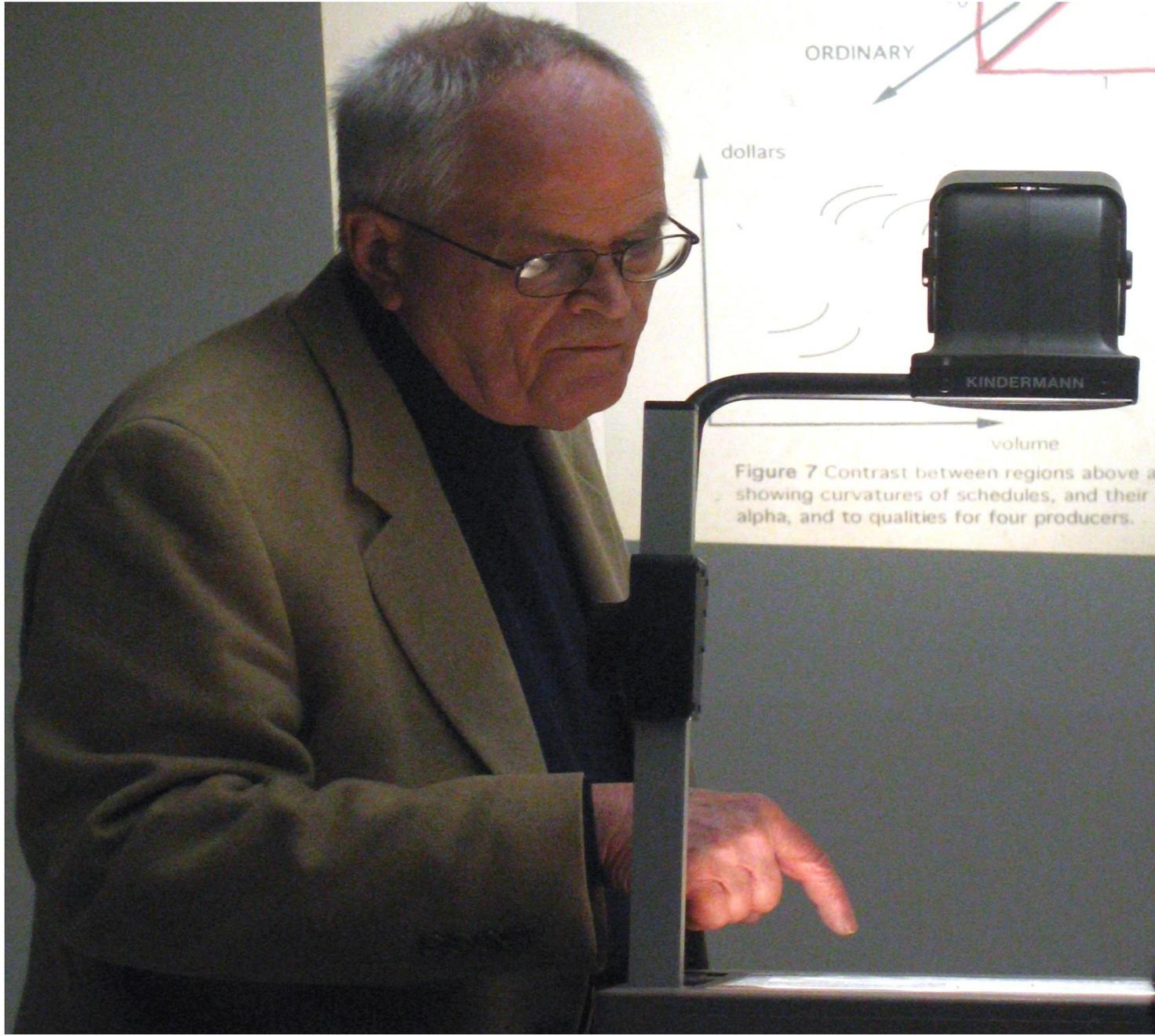


Figure 3. Coupe du transect 1

Figure 2.15

in a group of researchers. On each occasion a new phenomenon is deduced from this hybrid of form, matter, skilled bodies, and groups. Let us remember René, in Figure 2.12, placing the brown earth into the white cardboard cube that was then immediately marked with a number. He did not divide the soil according to intellectual categories, as in the Kantian mythology; rather, he conveyed the meaning of each phenomenon by making matter cross the gap that separated it from form.

Harrison C. White



And his theory of identity & control

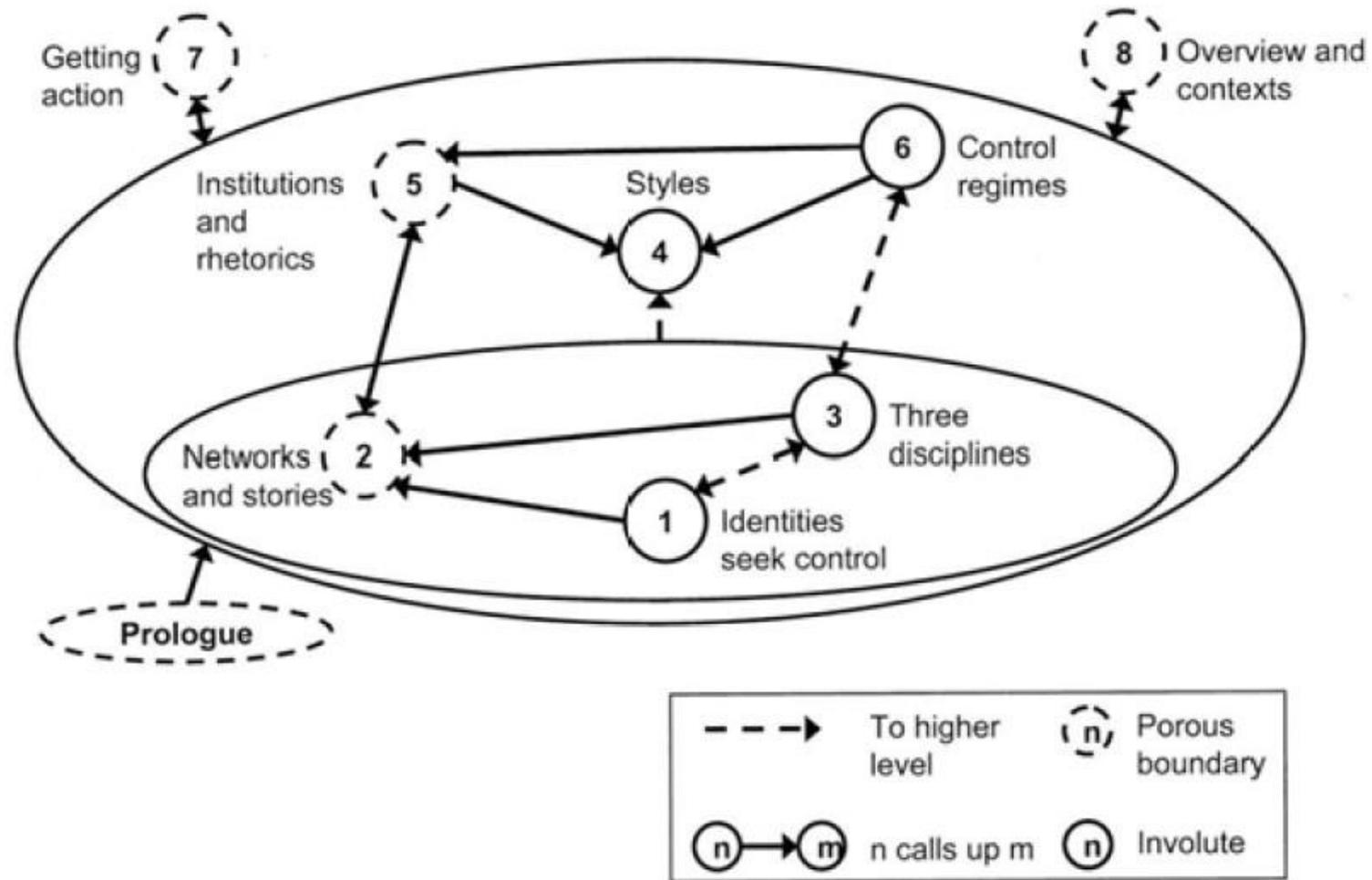


Figure 8.1: *Identity and Control*—Graph of chapters and conceptual guide

Compatibility with Luhmann

1. Harrison White considers his theory as compatible with Luhmanns theory of social systems.
2. Indeed, White uses practically the same notion as Niklas Luhmann did in an early version of his theory in 1972 (Luhmann 2016, p. 7).

-
1. “Niklas Luhmann’s system theory (1995), which I see as **compatible with mine**, does’ treat consciousness **but keeps it segregated** (his chapter 7). I discuss this further in chapters 4 and 6, and then start chapter 8 on this issue” (White 2008, p. 17).

The theory in a nutshell

White 2008

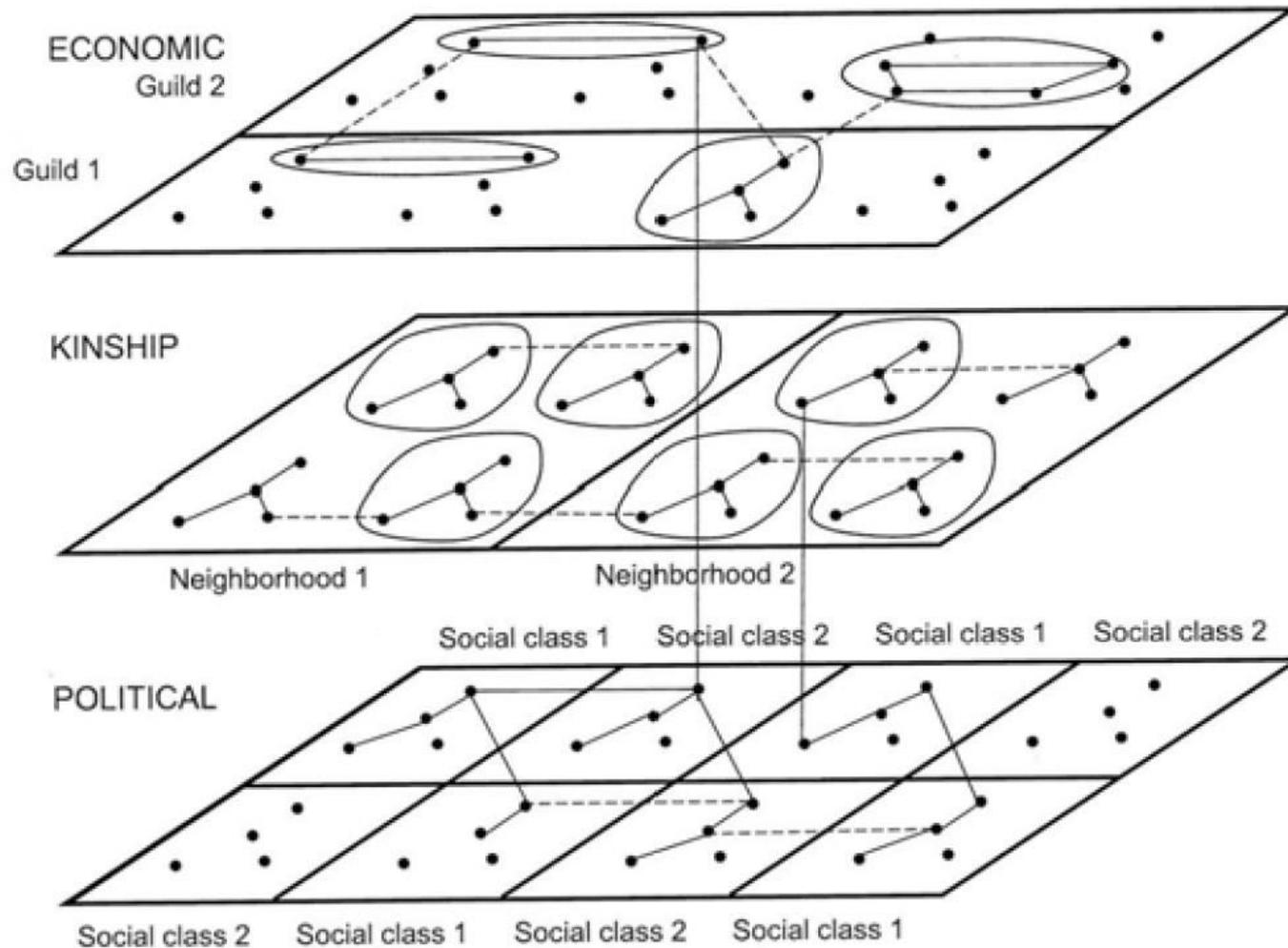
Identities trigger out of **events**— [...] out of switches in surroundings—**seeking control** over **uncertainty** and thus over fellow identities. Identities build and articulate ties to other identities in network-domains, **netdoms** for short. However, **netdoms** themselves remain subject to interruption from further switching with attendant **netdoms**. Thus, the world comes from identities attempting control within their relations to other identities.

In their **search for control**, identities **switch** from **netdom** to **netdom**, and each switching is at once a **decoupling** from somewhere and an **embedding** into somewhere. Identities trigger out of **events** [...] **seeking control** over **uncertainty** and thus over fellow identities” (White 2008, p. 2).

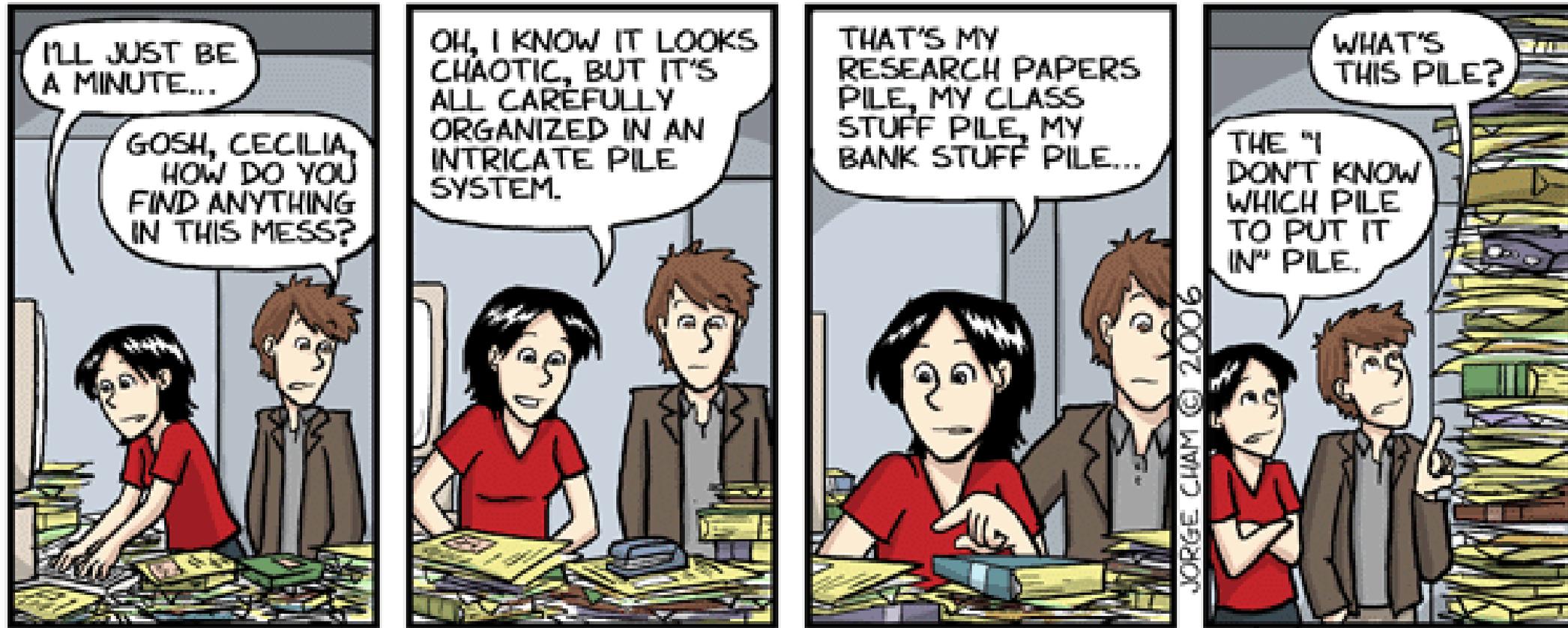
Luhmann 1972

“The appropriate structures for processing of **experience (identities)** develop within this **existential situation (events)** and make allowance for the joint problem of **complexity** and **contingency (uncertainty)** for future experiences thus bringing it **under control**” (Luhmann 2016, p. 26).

Identities and networks in Renaissance Florence



How to use network theories and methods as a student



Jorge Cham 2006: Piles

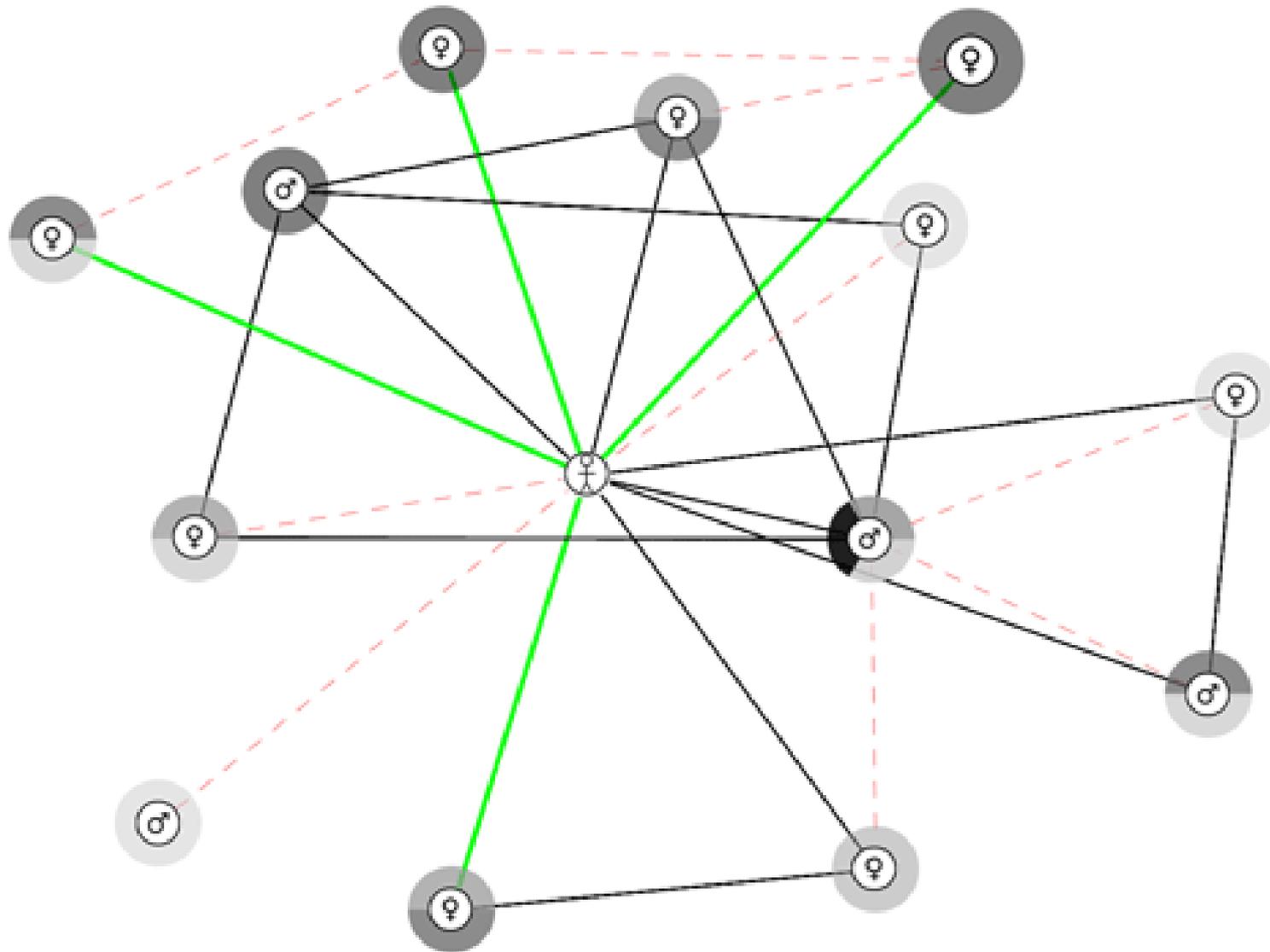
Namensgenerator

4 Hin und wieder besprechen die meisten Leute wichtige Angelegenheiten mit anderen. Wenn Sie an die letzten sechs Monate zurückdenken: Mit wem haben Sie über Dinge gesprochen, die Ihnen wichtig waren? (Namen oder Kürzel)

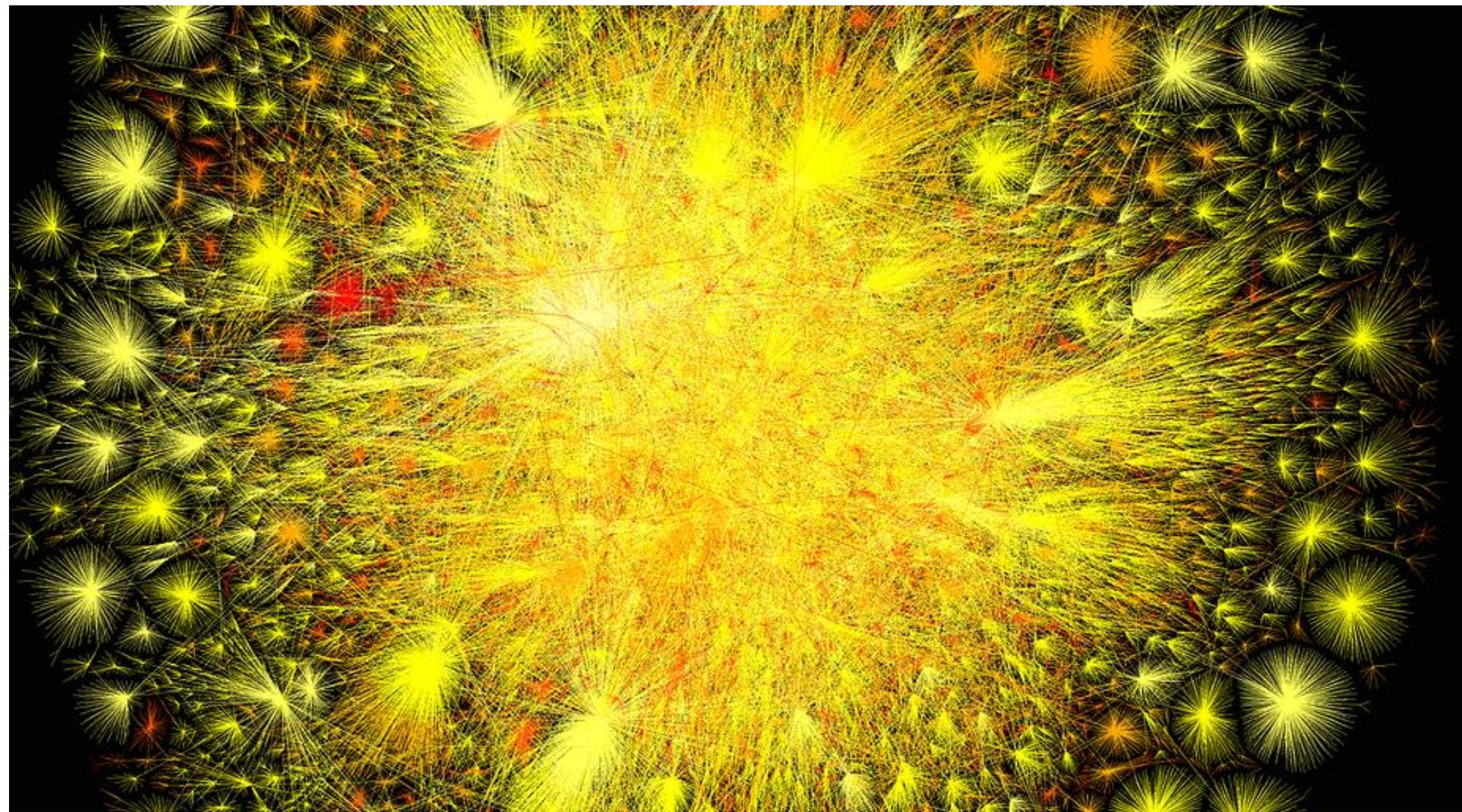
a
b
c
d
e
f
g
h

Mit welchen Familienmitgliedern hatten Sie in den letzten sechs Monaten Kontakt?

Ego centered network



Global network



Thick description



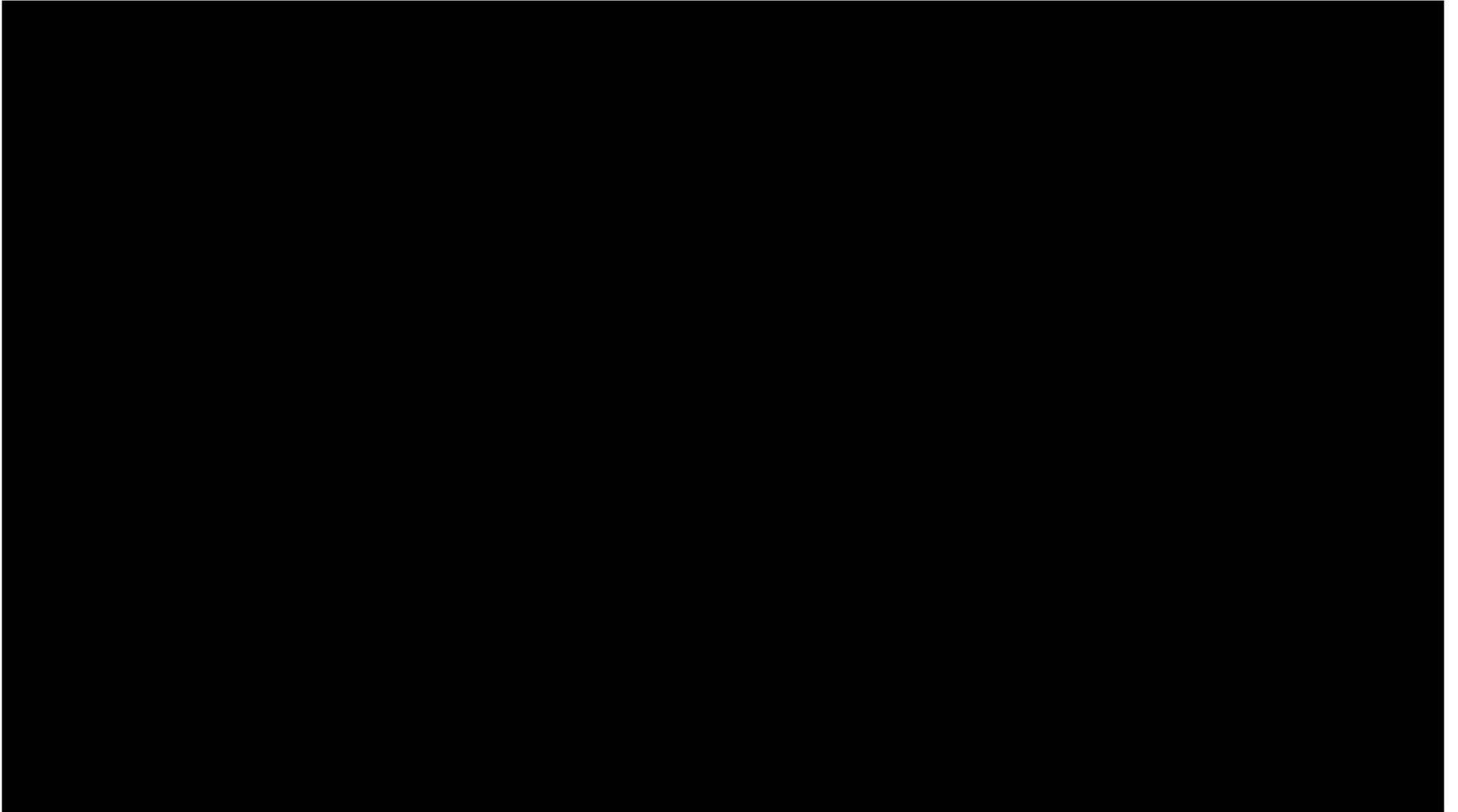
Vielen Dank für Ihre Aufmerksamkeit

Eine PDF-Version des Vortrags können Sie auf thedigitalisedworld.org herunterladen.

Folgen Sie dafür den Link:

<https://thedigitalisedworld.org/download-presentation-theory/>

The network society



Quelle: Warner Brothers 2014

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