



Dr. Andrea NANETTI, PhD MA BA
Assoc. Prof. at NTU Singapore
School of Art, Design and Media

in collaboration with
Microsoft Research

Reloading the Treasure of Human Experiences for Artificial Intelligence

Provenance and Validation as Key Issues

SoftNet 2016 conferences
(Rome, Italy, August 21-25, 2016)
Keynote, August 22, 2016



Principal Investigator
Andrea Nanetti
Nanyang Technological
University, SINGAPORE

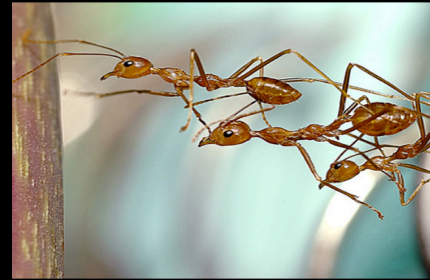
RESEARCH TEAM



Complex Systems
Siew Ann Cheong
Nanyang Technological
University, SINGAPORE



Renaissance World Maps
Angelo Cattaneo
New University of Lisbon,
PORTUGAL

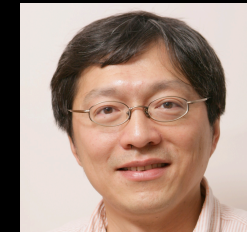


Spatial Science
Yiao-Yi Chiang
University of Southern
California, LA, USA



Numismatics
Alan Stahl
Princeton University,
USA

HUMANITIES and DATA SCIENCE



Knowledge Mining
Chin-Yew Lin
Microsoft Research,
Beijing, CHINA



Chinese Chronicles
Geoffrey Wade
Australian National
University, AUSTRALIA



Computer Science
Gao Cong
Nanyang Technological
University, SINGAPORE



Indian (non Arab sources)
Rila Mukherjee
University of Hyderabad,
INDIA



GIS
Alessandro Seravalli
University of Bologna,
ITALY

Heritage. A working definition

TREASURE OF HUMAN EXPERIENCES

HERITAGE

interpreted as
Treasure of Human Experiences

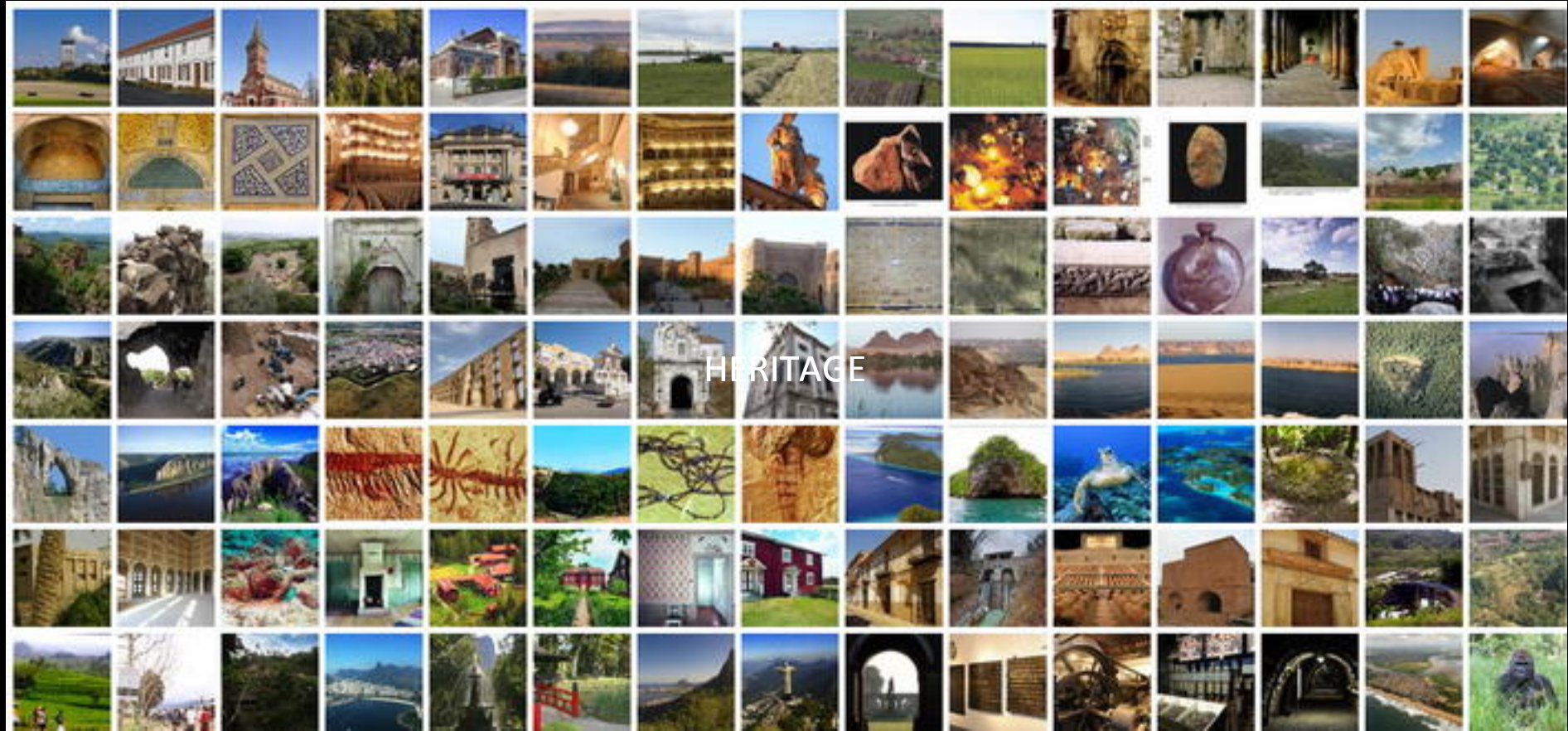
in theory

- THE Treasure OF
- Human
- Experience

and practice

- HOW TO Treasure
- Human
- Experience

heritage taxonomy





22/08/16

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6

values

(non est vivere, sed valere vita)

value | 'valyoo |

noun

1 the regard that something is held to deserve; the importance, worth, or usefulness of something: *your support is of great value.*

- the material or monetary worth of something: *prints seldom rise in value | equipment is included up to a total value of \$500.*

- the worth of something compared to the price paid or asked for it: *at \$12.50 the book is a **good value.***

2 (values) a person's principles or standards of behavior; one's judgment of what is important in life: *they internalize their parents' rules and values.*

verb (**values, valuing, valued**) [with obj.]

1 estimate the monetary worth of (something): *his estate was **valued at** \$45,000.*

2 consider (someone or something) to be important or beneficial; have a high opinion of: *she had come to value her privacy and independence.*

ORIGIN Middle English: from Old French, feminine past participle of *valoir* 'be worth,' from Latin *valere* .

values change across time and space
even if they have the same name



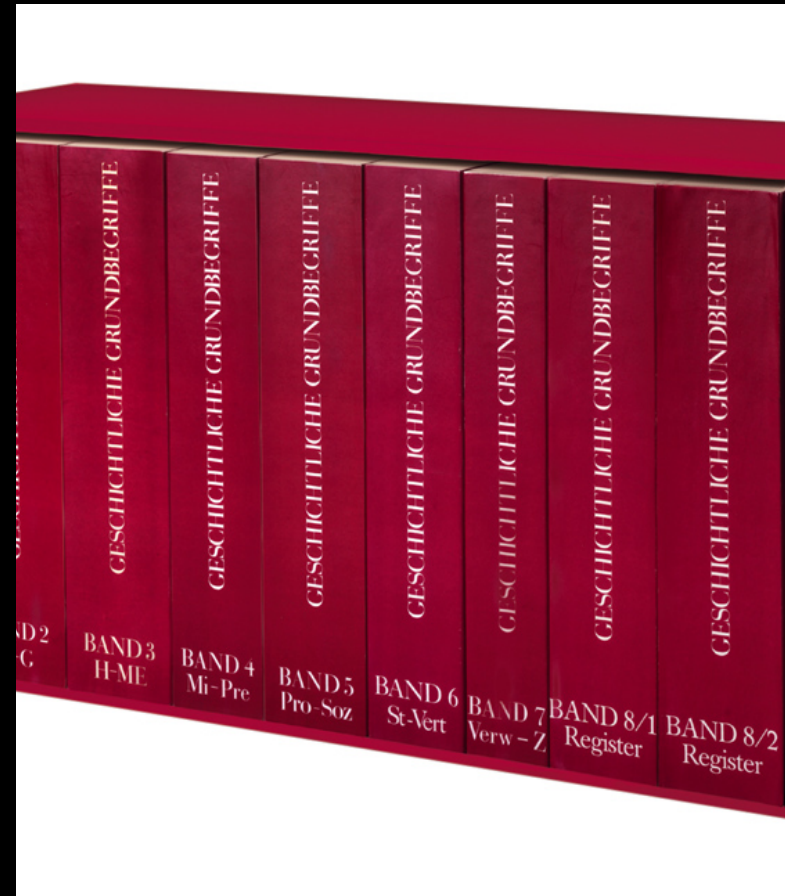
Reinhard Koselleck (1923-2006)

Reinhard Koselleck (23 April 1923 – 3 February 2006) was a German historian, considered as one of the most important historians of the twentieth century. He held an original position in the historical discipline and was not part of any historical 'school', working in such varied fields as CONCEPTUAL HISTORY (Begriffsgeschichte), the epistemology of history, linguistics, the foundations of an anthropology of history and social history, the history of law and the history of government. (WIKIPEDIA, 2015-01-19).



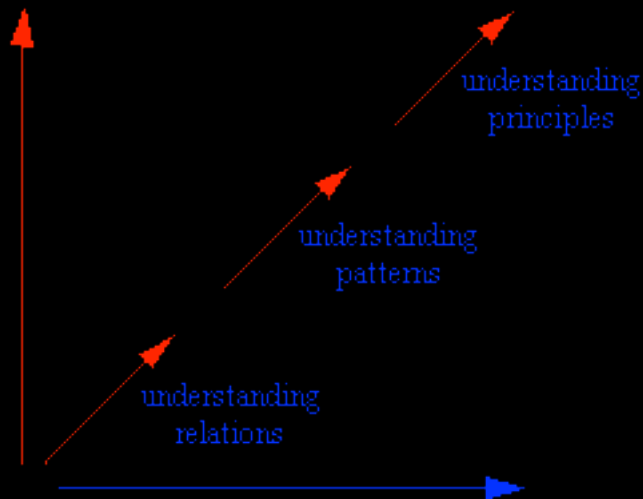
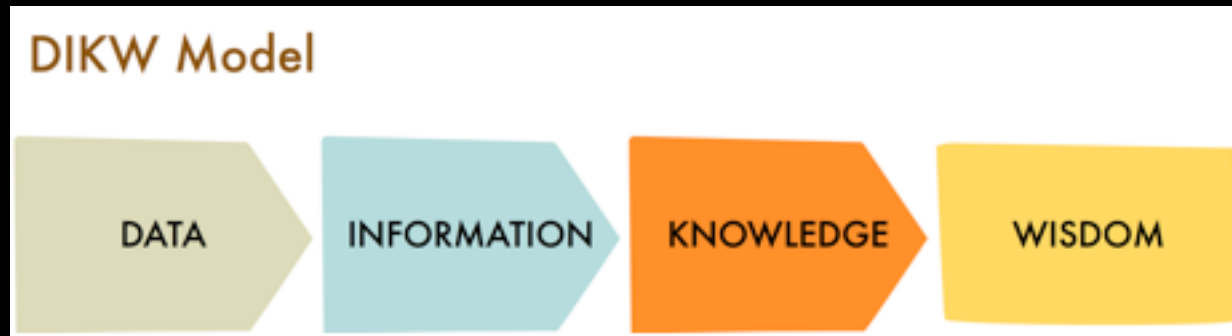
Begriffsgeschichte/History of Concepts

Reinhart **Koselleck's** *Geschichtliche Grundbegriffe* (GG, Basic Concepts in History: A Historical Dictionary of Political and Social Language in Germany) charts how in German-speaking Europe the accelerated changes occurring between the Enlightenment, the French Revolution and the Industrial Revolution were perceived, conceptualized and incorporated into political and social language, registering the transition from a hierarchy of orders to modern societies. The 'Introduction' presents the problematic and method formulated in 1972 by **Koselleck** for writing the history of concepts (Begriffsgeschichte). During the twenty-five years needed to complete the GG, he continued to revise and develop this method. In prefaces written for subsequent volumes, he replied to criticisms of its choice of basic concepts and findings. In these prefaces **Koselleck** both summarized the great contribution to our historical knowledge of political and social terms that this work and its index volumes had made, and suggested further research projects to build upon its achievements.



the knowledge hierarchy

Ackoff 1989, Berlinger et al. 2004, Rowley 2007



- data = isolated symbols we associate with features in outside world
- information = relationship between data
- knowledge = prescriptive and proceduralised information to act on and solve problems
- wisdom = knowing under which situations to act

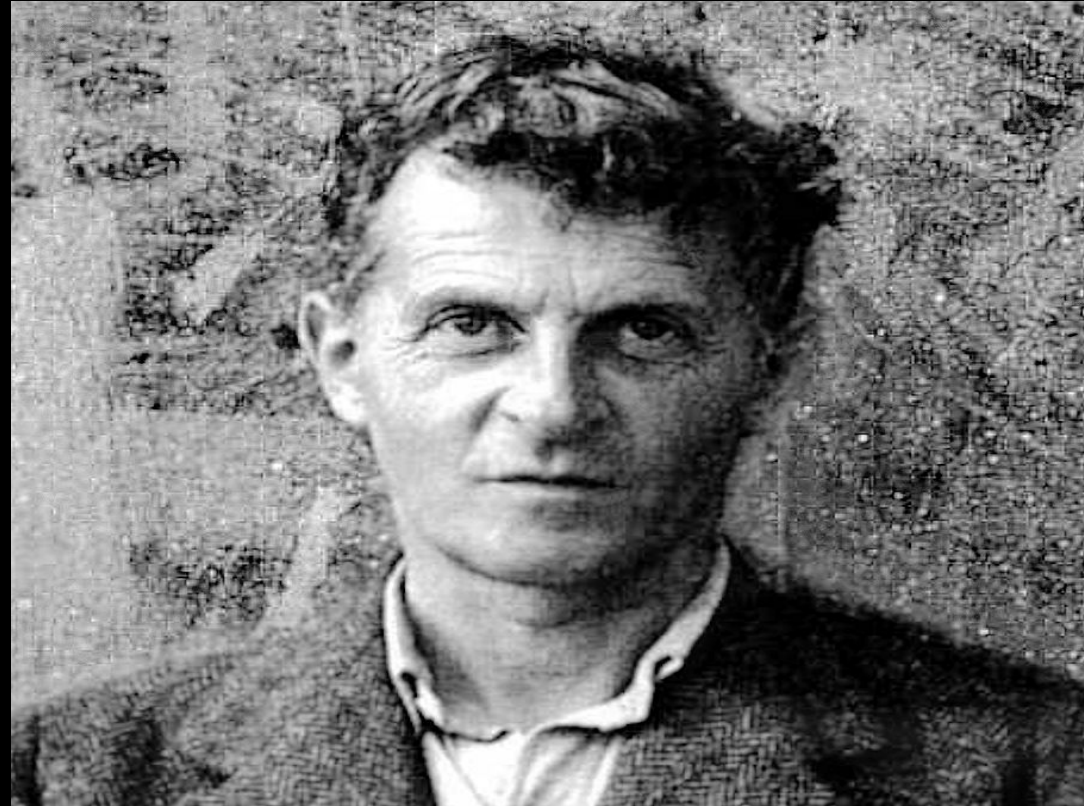
不闻不若闻之，闻之不若见之，见之不若知之，知之不若行之；学至于行之而止矣

As you can read, this thought is not completely new, and seems to have been already familiar to the Chinese author Xun Kuang (c. 310 – c. 235 BC, in *Xunzi* by Liu Xiang 818AD, Chapter 8 *Ruxiao*)

Not hearing is not as good as hearing, hearing is not as good as seeing, seeing is not as good as knowing, knowing is not as good as acting; true learning continues up to the point that action comes forth (or, only when a thing produces action we can say that it has been truly learned)

Ludwig Wittgenstein
(1889-1951)

Familienähnlichkeit



Familienähnlichkeit?

culture

sustainability

technology

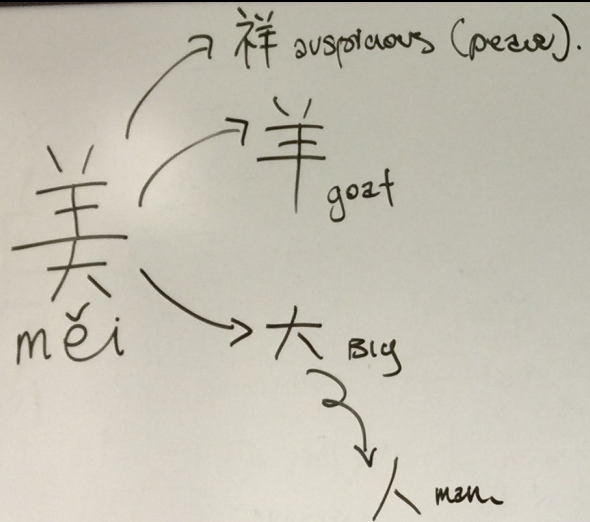
ART

industry

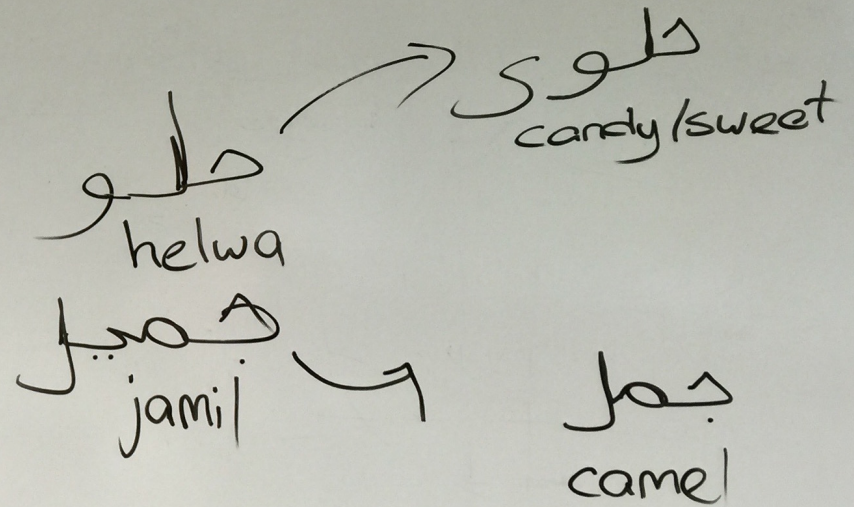
heritage

SCIENCE

Exercise



cantik



Engineering Historical Memory

THE BIG PICTURE: WHY A NEW SCIENCE OF HERITAGE?

Heritage Science

At the Interface of

(Digital) HUMANITIES and (Data) SCIENCE

Where data are THE data

(i.e. Treasure of Human Experiences data)

**TREASURE OF HUMAN
EXPERIENCES (DIKW)
(Maximal Encyclopedia of
Data, Information,
Knowledge, and Wisdom
of Humankind))**

**KNOWLEDGE
GROWS WITH HUMANITY
how to make things, how
to solve problems, how to
act**

**WISDOM CHANGES
ACROSS TIME AND SPACE
(Cultural/Political
selection > chooses under
which situation to act)**

[231] Ἔλεγε δὲ (Socrate) καὶ ἓν μόνον ἀγαθὸν εἶναι τὴν ἐπιστήμην, καὶ ἓν μόνον κακόν, τὴν ἀμαθίαν, dice il LAERZIO, in *Socrate*, l. 2, segm. 31. Oggidì possiamo dire tutto l'opposto, e questa considerazione può servire a definire la differenza che passa tra l'antica e la moderna sapienza.

Omero e Dante per l'età loro seppero moltissime cose e più di quelle che sapiano la massima parte degli uomini colti d'oggi, non solo in proporzione dei tempi, ma anche assolutamente. Bisogna distinguere la cognizione materiale dalla filosofica, la cognizione fisica dalla matematica, la cognizione degli effetti dalla cognizione delle cause. Quella è necessaria alla fecondità e varietà dell'immaginativa, alla proprietà verità evidenza ed efficacia dell'imitazione. Questa non può fare che non pregiudichi al poeta. Allora giova sommanente al poeta l'erudizione, quando l'ignoranza delle cause, concede al poeta, non solamente rispetto agli altri ma anche a se stesso, l'attribuire gli effetti che vede o conosce, alle cagioni che si figura la sua fantasia. (5 Settembre 1820).

G. Leopardi, Zibaldone di Pensieri, 231

Umberto Eco (IT2007 and EN2014)

Maximal Encyclopedia and Internet

the sum total of everything that was ever said, or at least of everything that could in theory be discovered, to the extent to which it has been expressed through a series of materially identifiable interpretants... .. a sort of World Wide Web far richer than the one to which we have access through the Internet

Vertigo of the Labyrinth

If cultures survive, one reason is because they have succeeded in reducing the weight of their encyclopaedic baggage by placing so many notions in abeyance, thus guaranteeing their members a sort of vaccination against the Vertigo of the Labyrinth (2007, p. 96 – 2014, p. 93)

Does Internet Make a Difference?

"Internet e' come una sterminata biblioteca senza filtraggio. La virtu' delle biblioteche, come delle enciclopedie, non e' soltanto quella di conservare la memoria, ma di buttare via quello che a una cultura non serve. Se non buttassimo via nulla saremmo come *Funes el memorioso*, di un racconto di Jorge Luis Borges. Questo personaggio ricordava tutto: era un uomo dalla memoria totale, incapace di ragionare, perche' incapace di filtrare. Internet e' come Funes: contiene tutto, il vero e il falso, il che e' un grave rischio soprattutto per i giovani" (2012 Umberto Eco, Intervista, Famiglia Cristiana)

Advancement of Learning

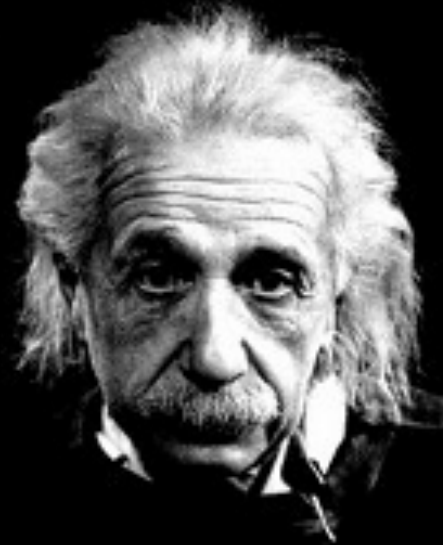
[However, it] is not the fact that cultures *pare down* their encyclopaedias (which is, in any case, a physiological phenomenon), but rather that what has been placed in abeyance can always be recovered. For this reason the regulatory idea of a Maximal Encyclopaedia is a powerful aid to the Advancement of Learning—and having to confront ever and anon the Vertigo of the Labyrinth is often the price we must pay for calling into question the laziest of our ontologies (2007, p. 96 – 2014, p. 93)

to do that we need

a new science, a highly relevant science,
a very unconventional approach at the interface of
art and science

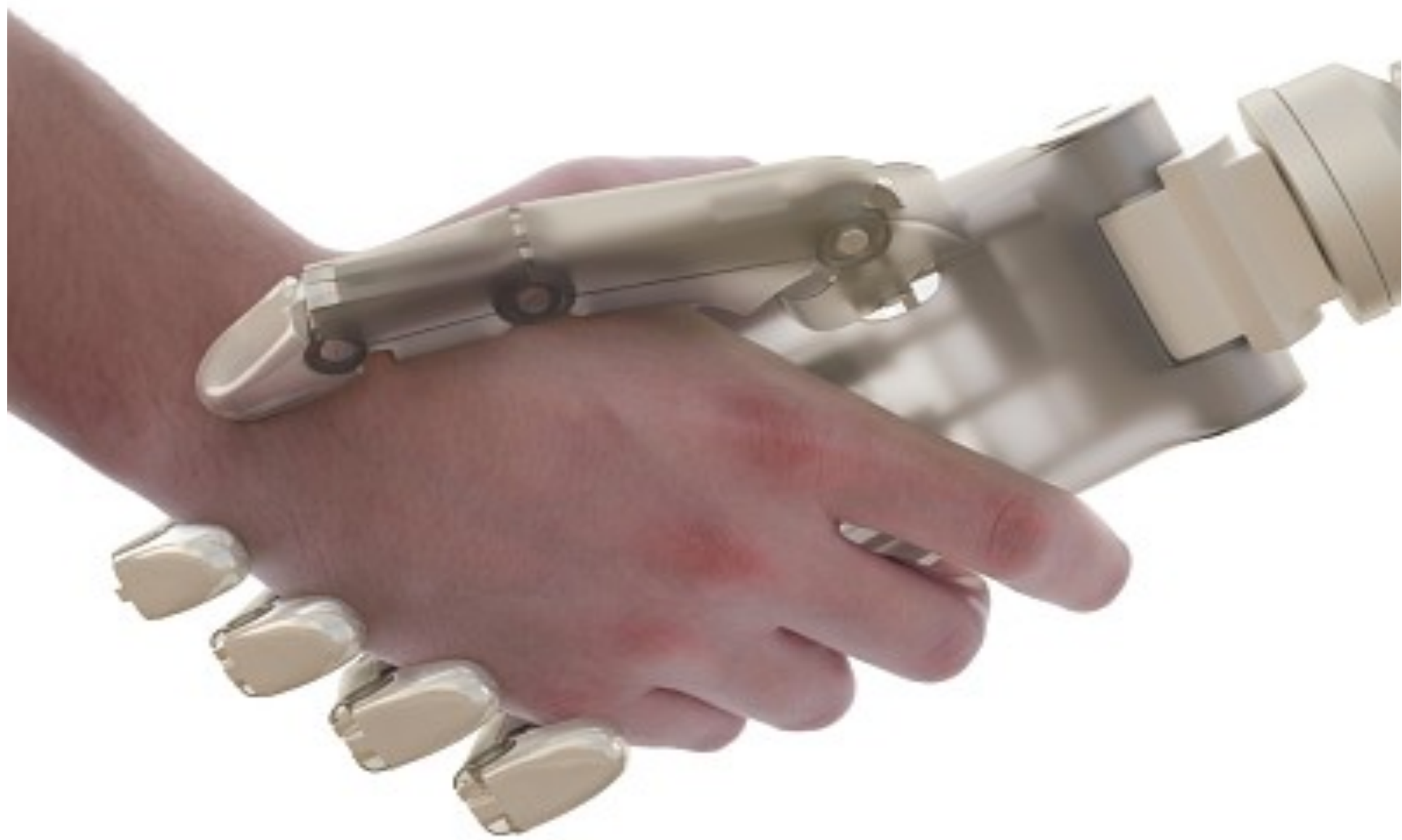
BECAUSE

“WE CANNOT
SOLVE OUR
PROBLEMS
WITH THE SAME
THINKING WE
USED WHEN WE
CREATED THEM”



art and science





At the interface of art and science

HERITAGE SCIENCE

Singapore Heritage Science Conference series





Nanyang Technological University, Singapore
Complexity Institute and School of Art, Design and Media
cordially invites you to the

1st Singapore Heritage Science Conference on Heritage Science as a Complex System

In the conference we propose to answer the questions: · What does Heritage mean for the future of Singapore? · How can complexity science help Singapore to make the best possible decisions with regard to its heritage and the way it may help Singapore to face the challenges of the 21st century?

Opening Reception: Monday 6 January 9 am
ADM Auditorium,
School of Art, Design & Media (Level 2)



ADM Auditorium, Level 2,
School of Art, Design and Media,
Nanyang Technological University,
81 Nanyang Drive
Singapore 637458

CONFERENCE CHAIRS
Siew Ann Cheong
School of Physical & Mathematical Sciences,
Nanyang Technological University Singapore

Andrea Nanetti
School of Art, Design, and Media,
Nanyang Technological University Singapore

*CONFERENCE IS FREE AND REGISTRATION IS
NEEDED FOR THIS EVENT

INVITED SPEAKERS

Lisa Ackerman, World Monuments Fund, USA
Stefano Bertocci, University of Florence, Italy
Yongkang Cao, Shanghai Jiaotong University, China
Julia Chee, Oral History Centre, National Library Board, Singapore
Min Fui Chee, National Institute for Education, Singapore
Ai Lin Chua, National University of Singapore, Singapore
Roland Fletcher, University of Sydney, Australia
John Stephen Lansing, Nanyang Technological University, Singapore
Kai Khiun Liew, Nanyang Technological University, Singapore
Ivy Maria Lim, National Institute of Education, Singapore
Bee Chin Ng, Nanyang Technological University, Singapore
Helga Nowotny, European Research Council, Vienna, Austria
Alessio Re, UNESCO-ITRECH and SITI, Italy
Hui Lin Lena Teo, Independent Scholar, Former at Ministry of Education, Singapore
Wee Pin Wan, National Library Board, Singapore
Julia Watson, Columbia University, USA
Jean Wee, Preservation of Sites & Monuments, National Heritage Board, Singapore
Kang Shua Yeo, Singapore University of Technology and Design, Singapore



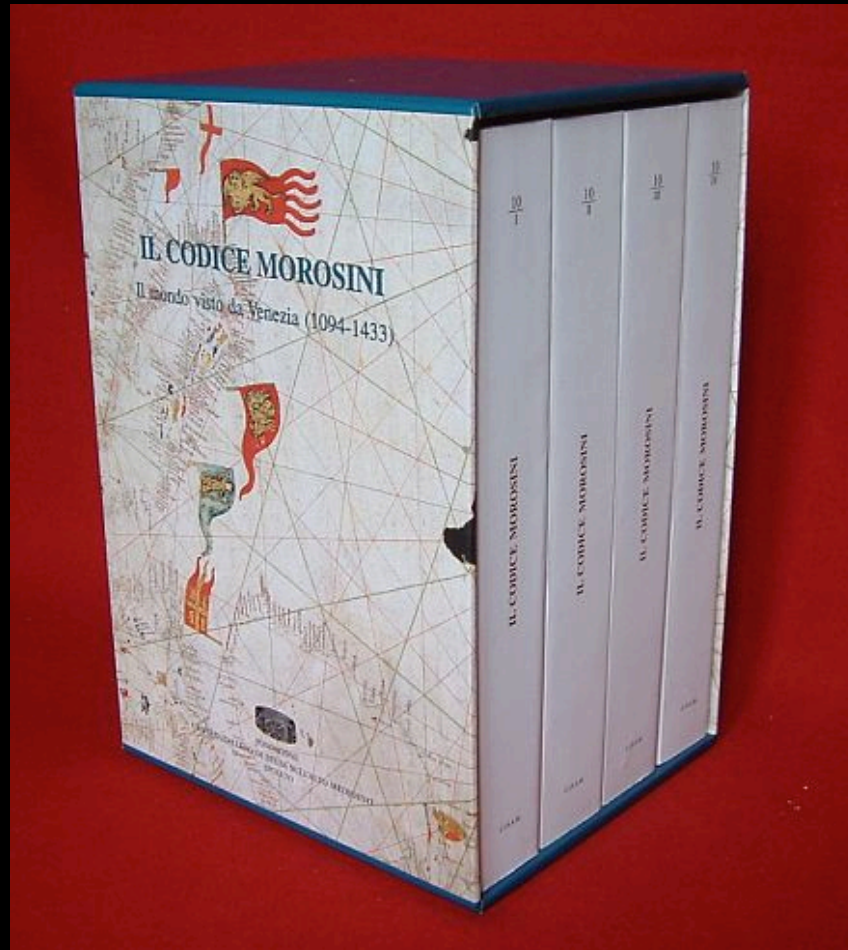
Heritage Science Conference Series

- 1st (Jan. 2014) Heritage as a Complex System
- 2nd (Jan. 2015) Heritage and the Creative Industry
- Special edition (Nov. 2015) Exploring Maritime Heritage Dynamics
- 3rd (Jan. 2016) H. The Treasure of Human Experiences
- 4th (Jan. 2017) Heritage and Resilience in Societal Change

Engineering the Historical Memory of Interactive Global Histories

A SCALABLE CASE STUDY FOR HERITAGE SCIENCE

The World as seen from Venice

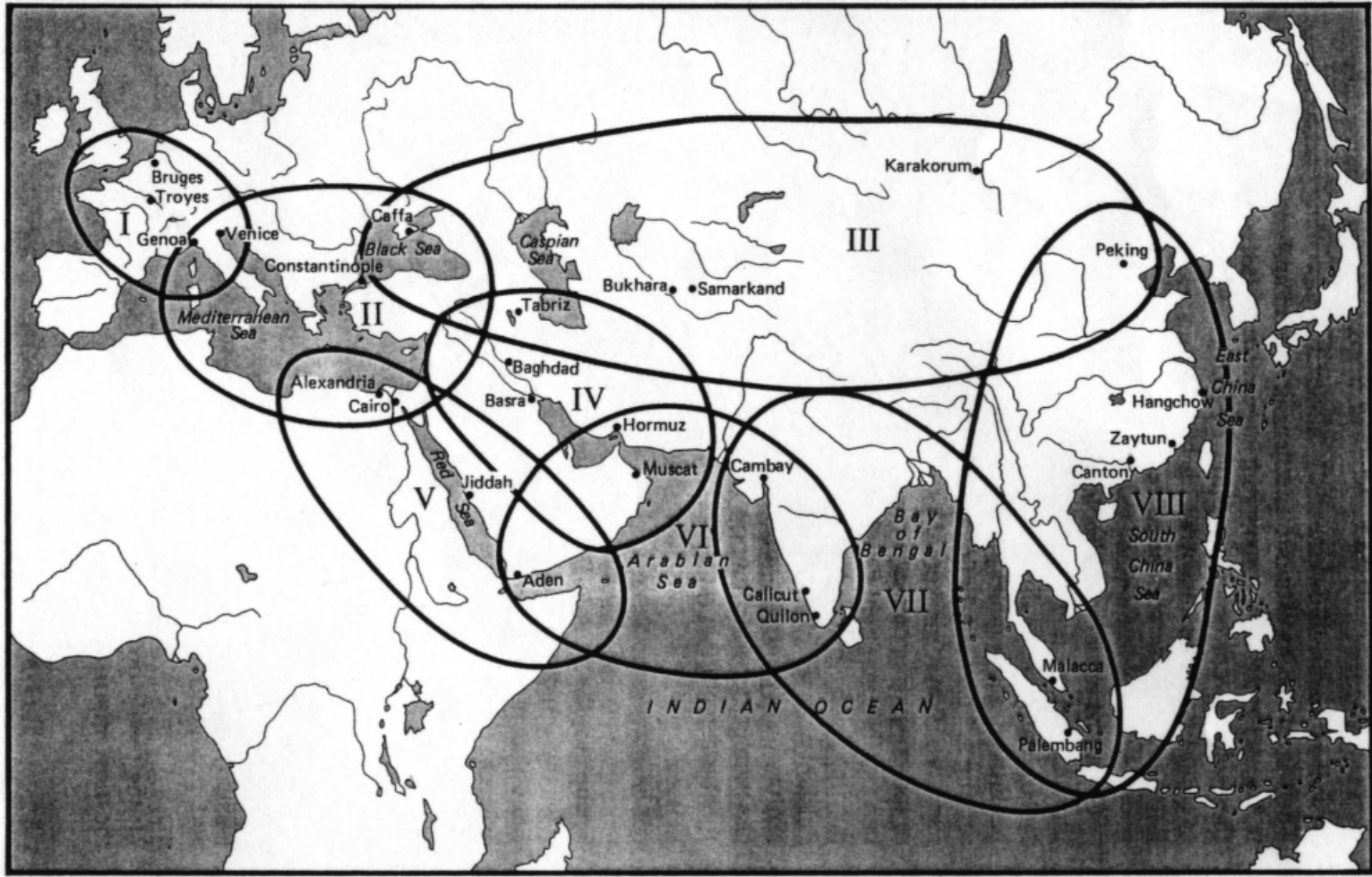


- Morosini (1205-1433)
- Dolfin (1433-58/78)
- Malipiero/Longo (1457-1500)
- Magno (697-1498)
- Marin Sanudo *Vite dei Dogi* (origins-1494)
- Priuli (1494-1512)
- Marin Sanudo, *Diarii* (1496-1533)

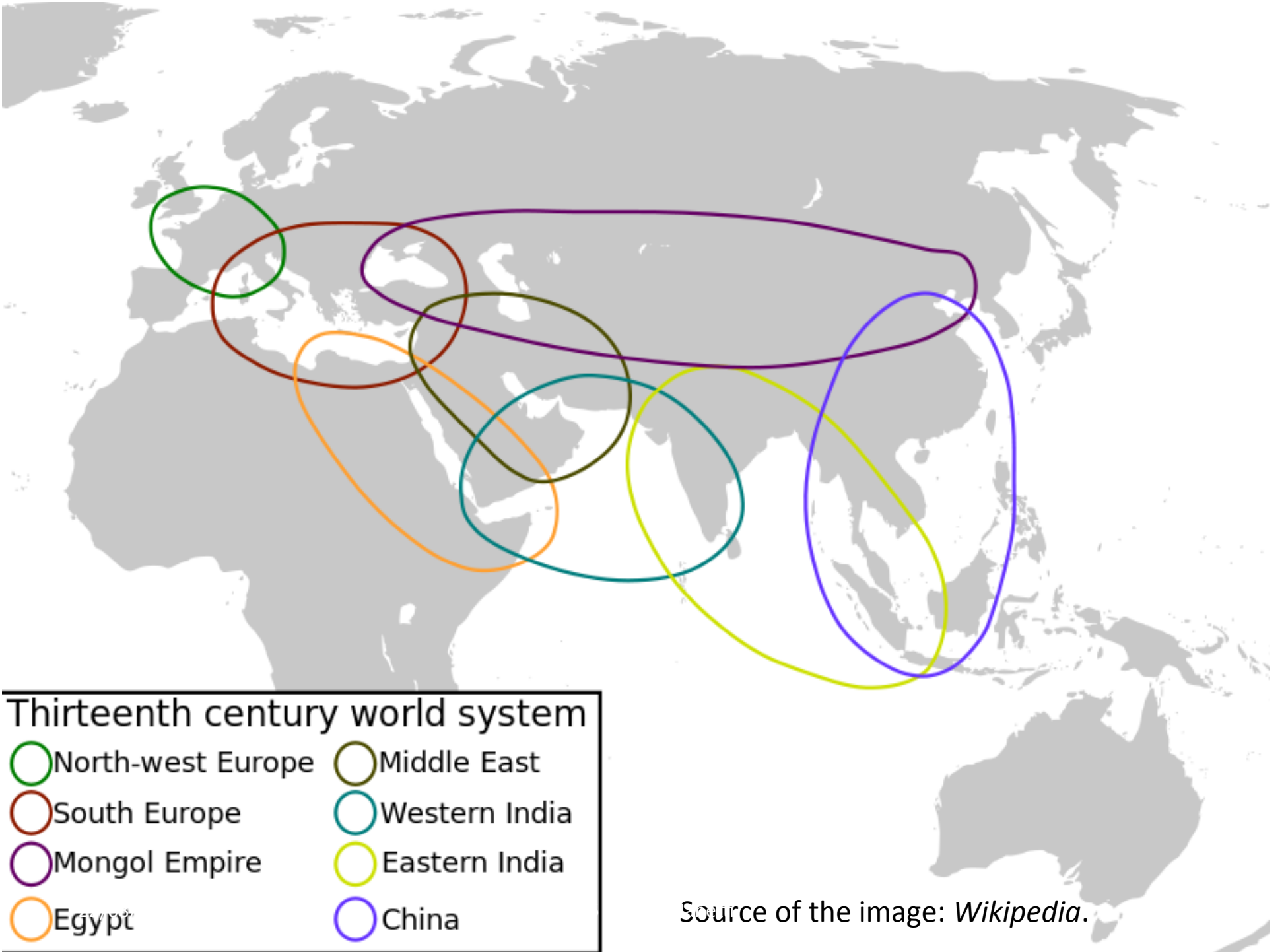
The Maritime Space

“Still, the idea that studying maritime spaces will enable one to break free from the national histories, extolling the achievements of particular peoples and dynasties, that for long dominated writing about the past, has obvious attraction in an age of globalisation. Out of this have grown new ways of studying maritime history, which has long been anchored elsewhere”

(David Abulafia, Singapore, NTU, Nov. 20, 2015)



Abu-Lughod 1989 (p. 34); eight circuits of the thirteenth-century world system
Source of the image: <https://lxsmuchxs.files.wordpress.com/2012/02/il1.gif>



Thirteenth century world system

- | | |
|---|---|
|  North-west Europe |  Middle East |
|  South Europe |  Western India |
|  Mongol Empire |  Eastern India |
|  Egypt |  China |

Source of the image: *Wikipedia*.



Firenze,
Biblioteca
Nazionale
Centrale,
Portolano 1
(cm. 39.5 x 79.5)
World Map, dated 1457

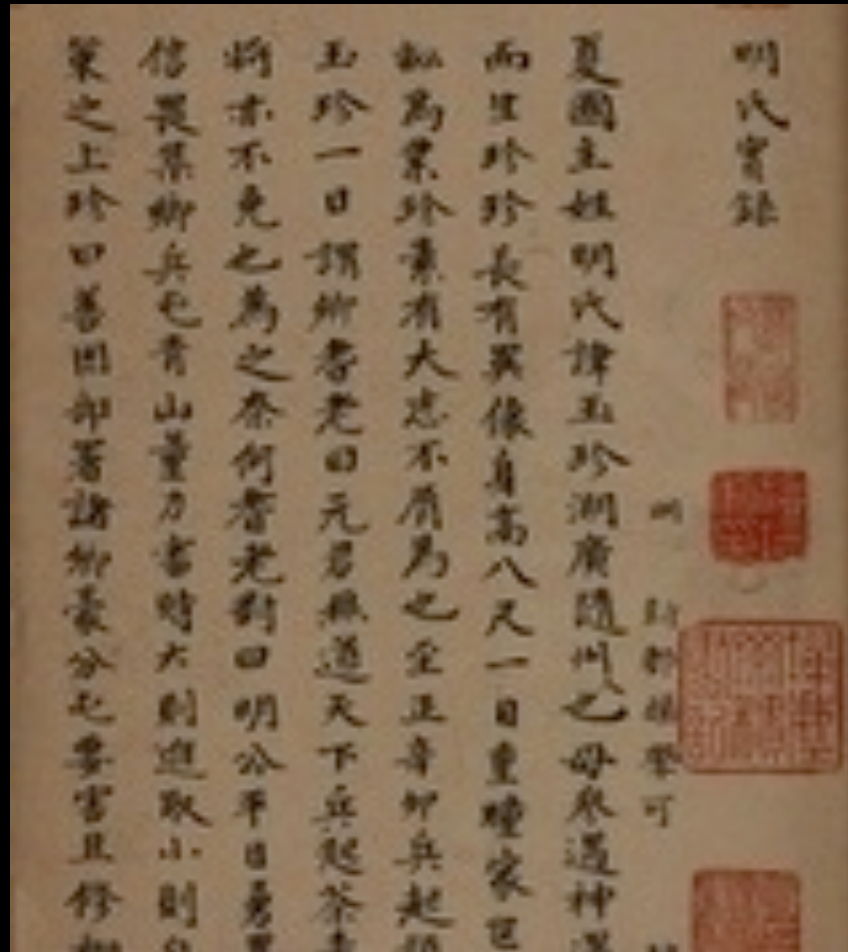


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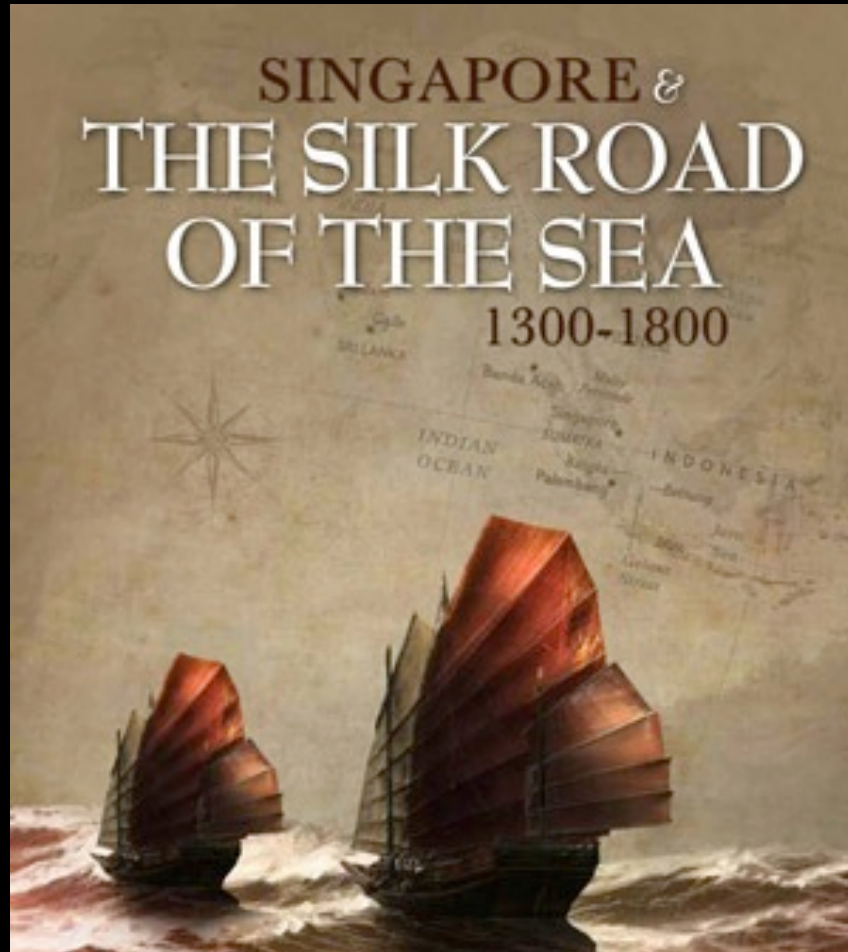
35

The Ming Shi-lu and Geoffrey Wade

<http://epress.nus.edu.sg/msl/>



Maritime Archaeology and John Miksic



history in a global perspective



... to test theories such as

- The **world systems** theory, developed by sociologist Immanuel Wallerstein (1930-)
- an approach to **world history** and social change that suggests there is a **world economic system** in which some countries benefit while others are exploited

1205-1533

ADVANTAGED TIME PERIOD FOR THE SCALABILITY OF THE CASE STUDY

just enough but not too much facts/evidence

The time period 1205-1533 is significantly interesting from a data point of view as well, because there is just enough but not too much historical evidence for feasible tests of new ontologies to organize texts, images, and sounds in a relational database suitable to develop a systemic approach to the study of complex interactions between key subjects of the historical landscape.

Books as layers of Metadata

In our data perspective, every new book is a layer of metadata with an author, which has to be validated. For all of them, as Fra Mauro did for his map, we need workflow tools (provenance tools) to trace back how the authors came to certain conclusions. Our vision is to train AI to decode the semantics on which they based their knowledge, that is differentiate disparate data, trace back information, and present them in a synoptic visual report which will work as gateway to academic literature and primary sources.

Interactive Global Histories

DATASET AND ONTOLOGY

Visual Analytics

DEFINITION

Visual analytics combines automated analysis techniques with interactive visualisations for an effective understanding, reasoning and decision making on the basis of very large and complex datasets.

(definition by Keim, Daniel, Jörn Kohlhammer, Geoffrey Ellis, and Florian Mansmann (eds.). *Mastering the Information Age Solving Problems with Visual Analytics*. Goslar, Germany: Eurographics Association, 2010, p. 7)

INTERPRETATION/SCOPE

creation of tools and techniques to enable people to

- Synthesise information and derive insight from massive, dynamic, ambiguous, and often conflicting data.
- Detect the expected and discover the unexpected.
- Provide timely, defensible, and understandable assessments.
- Communicate these assessment effectively for action.



Home > Search Tools

Search Tools



ADVANCED SEARCH

Work Stuff

When (From YYYY.MM.DD)

When (To YYYY.MM.DD)

Where

Who (agent)

Governments

What (thing)

How (event)

Search



Home > General > Fabriano (prov. di Ancona)

Fabriano (prov. di Ancona)

General Jun 21, 2014

0 0 22

ADVANCED SEARCH

Work Stuff

When (From YYYY.MM.DD)

When (To YYYY.MM.DD)

Where

Who (agent)

Governments

What (thing)

How (event)

Search

43°20'21.17"N 12°54'02.39"E

[show_on_map_1 link]

FABRIANO (prov. di Ancona) (FRBIAM)

> el signor da Frabiam Morasini Codex 88063.0554-0557

Si veda anche [Marca anconitana](#).

City/Town/Village | Fabriano | Frabiam

Twitter | Facebook | LinkedIn | RSS | Print

PREVIOUS ARTICLE
Government of Camerino

NEXT ARTICLE >
Fano (prov. di Pesaro Urbino)

NO COMMENTS

information society as a complex system



An Experimental Database

DIGITAL MAPS AND AUTOMATIC NARRATIVES

Limitations of Fra Mauro's *Mappa Mundi*

- Outdated when completed
- No updating possible
- Few perspectives on the world
- Reflect the interests of the creator and sponsor
- No enhancement of user experience

Limitations of Chronicles

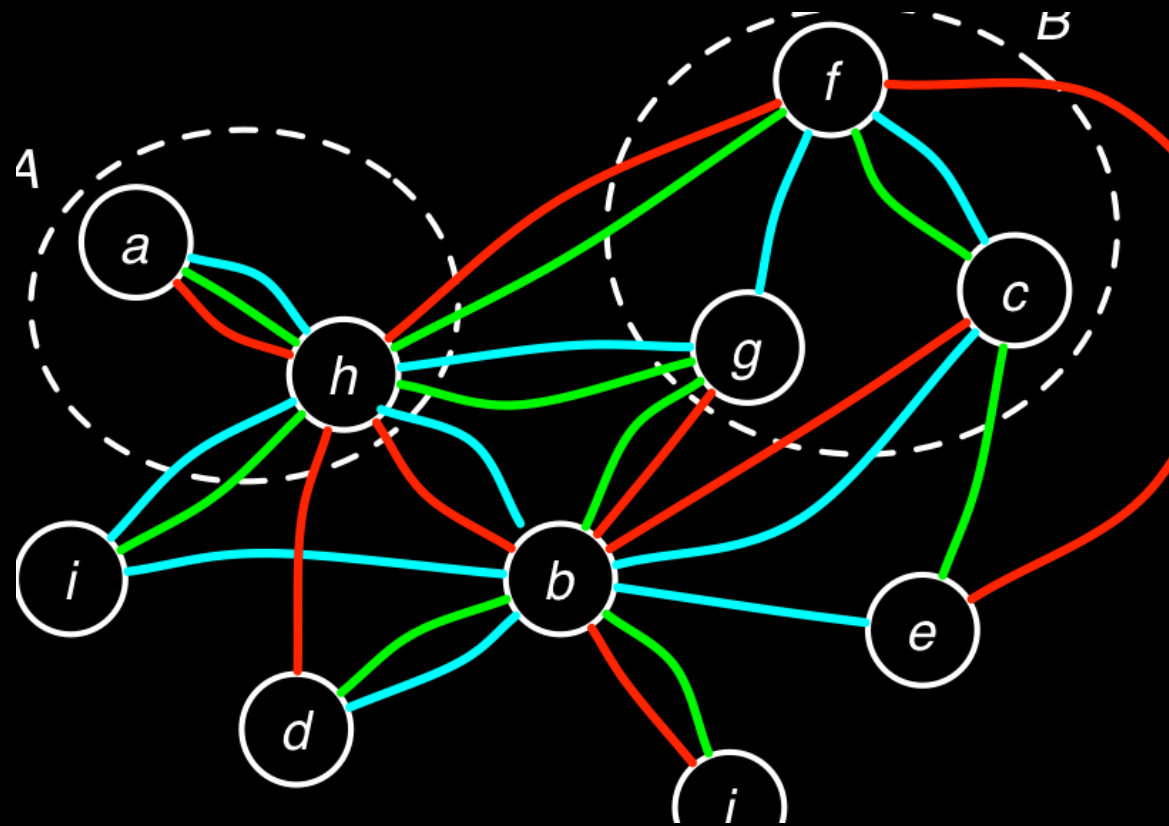
- Event Facts Evidence Chain
- Outdated when completed
- No updating possible
- Few perspectives on the world
- Reflect the interests of the creator
- No enhancement of user experience

Limitations of Archaeology

- Event Facts Evidence Chain
- Outdated when completed
- No updating possible
- Few perspectives on the world
- Reflect the interests of the creator
- No enhancement of user experience

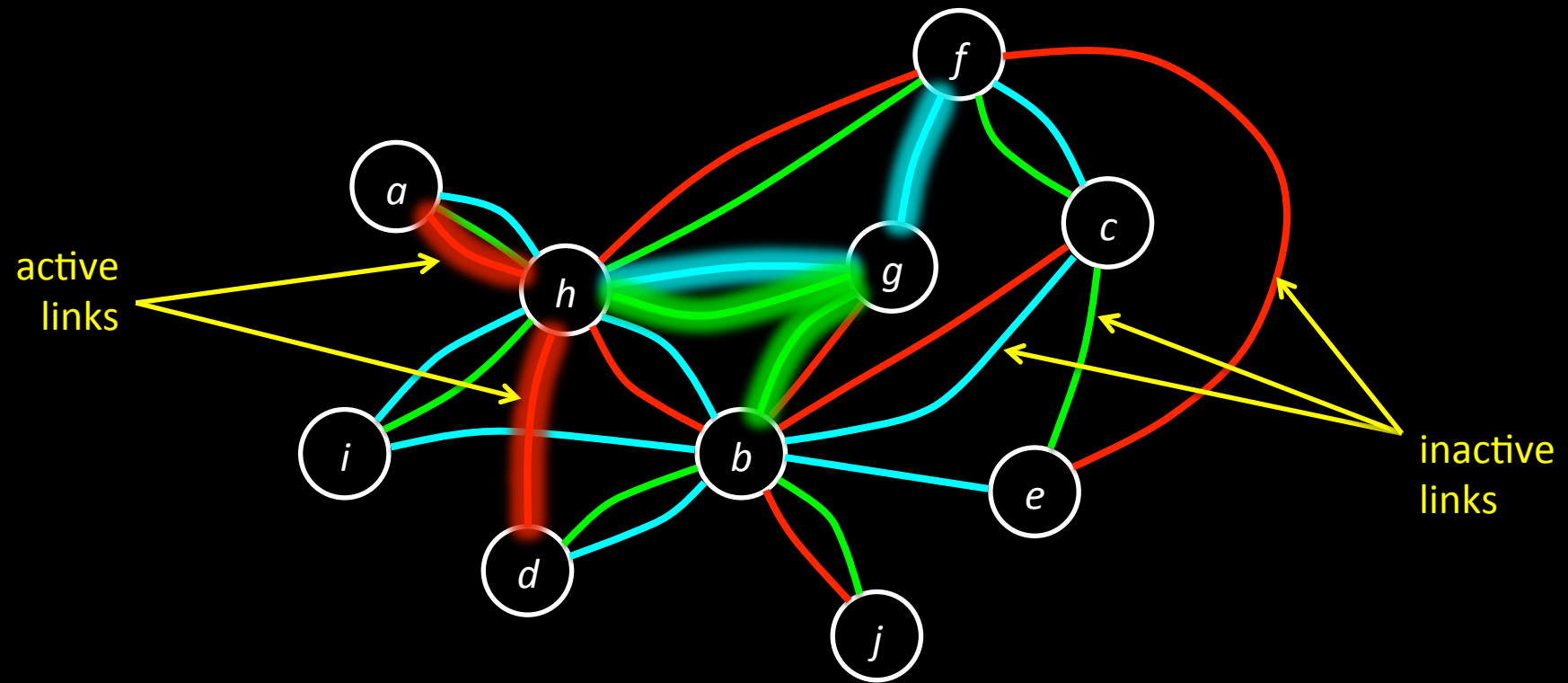
Automatic Narratives Extraction

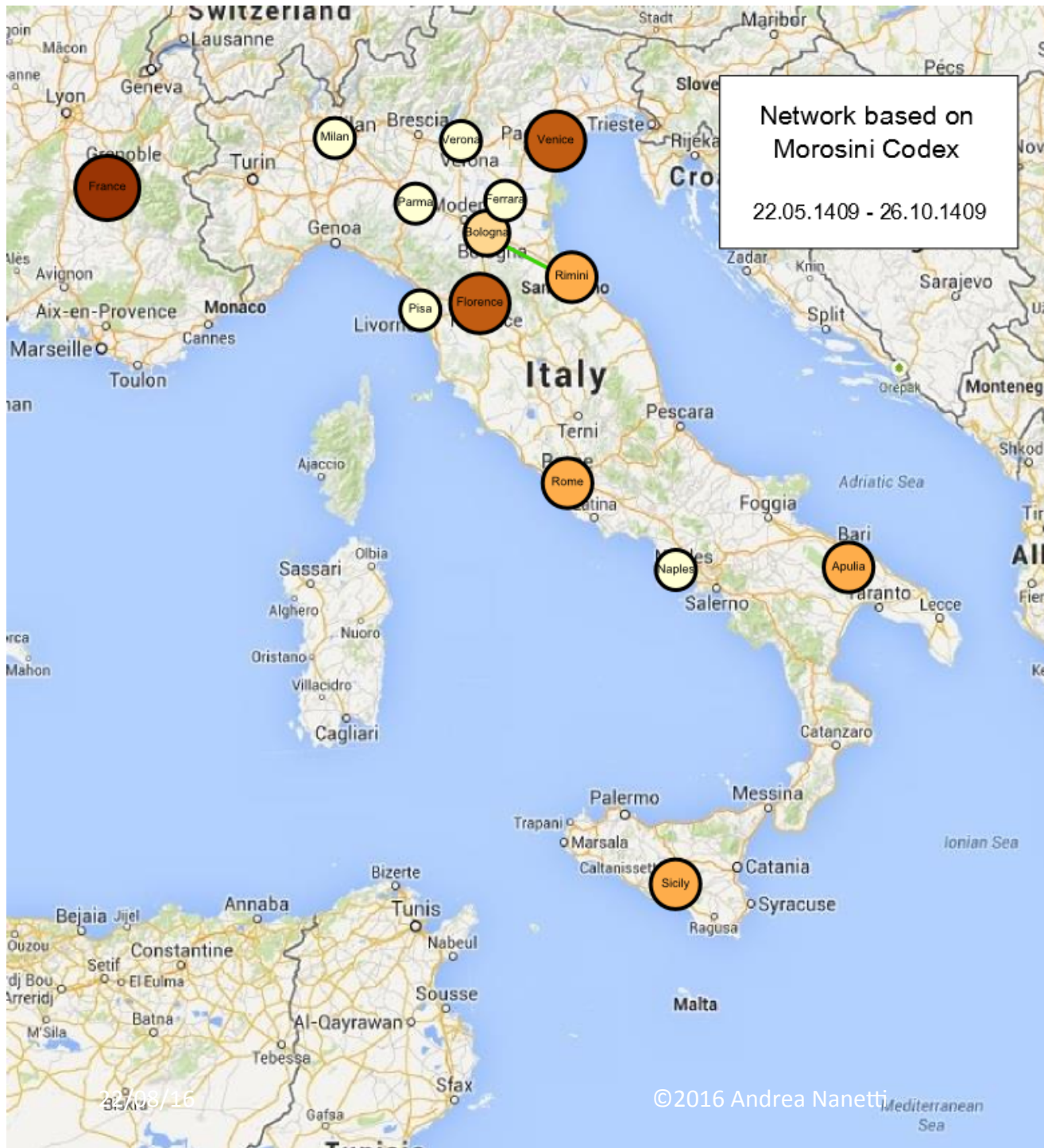
- WHO?
 - Key Actors
- WHAT?
 - Key Events
- WHEN?
 - Key Periods
- WHERE?
 - Key Locations
- WHY?
 - Key Factors
- HOW?
 - Key Actions



time-integrated network

Time-Resolved Dynamics

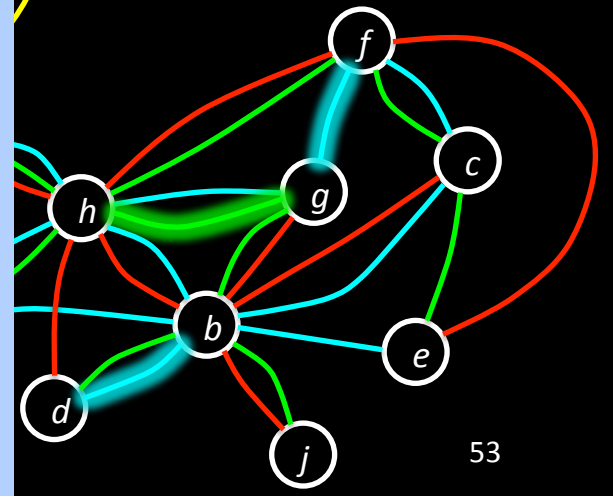




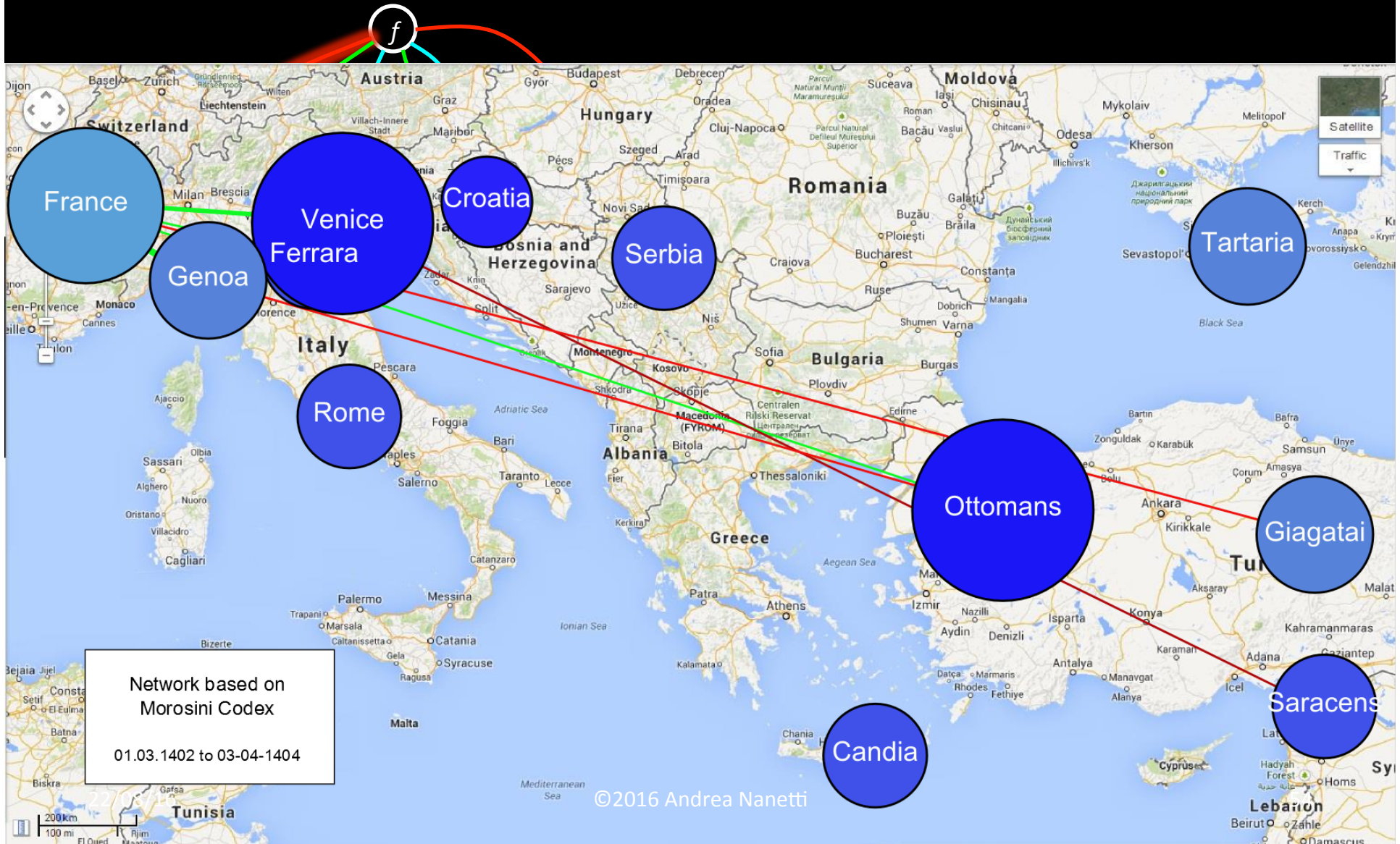
Network based on
Morosini Codex
22.05.1409 - 26.10.1409

Key Period!

key period
= high intensity
of events



Key Events



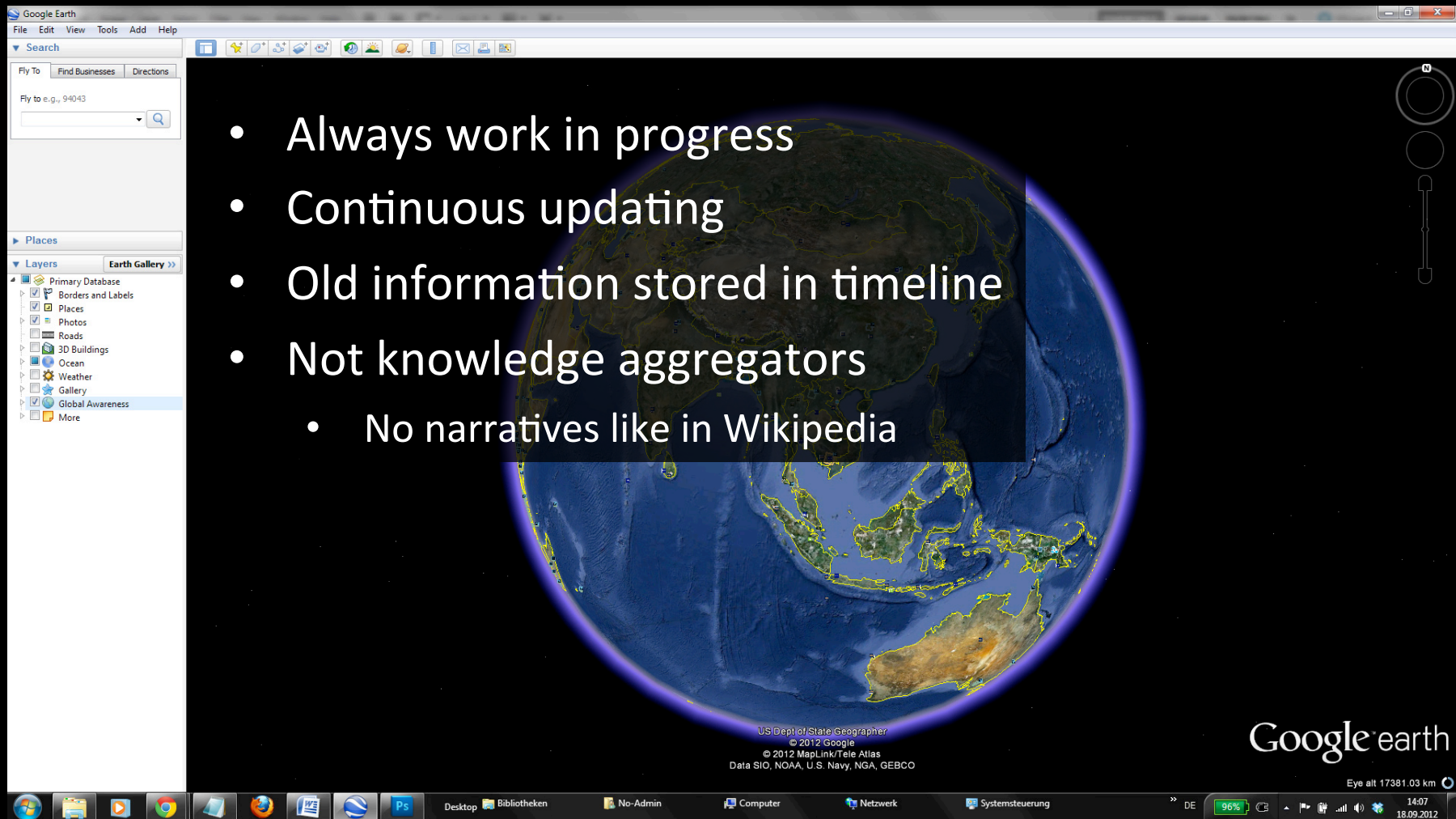
Fra Mauro's *Mappa Mundi*



Fra Mauro
(1400-1464)



Digital Maps



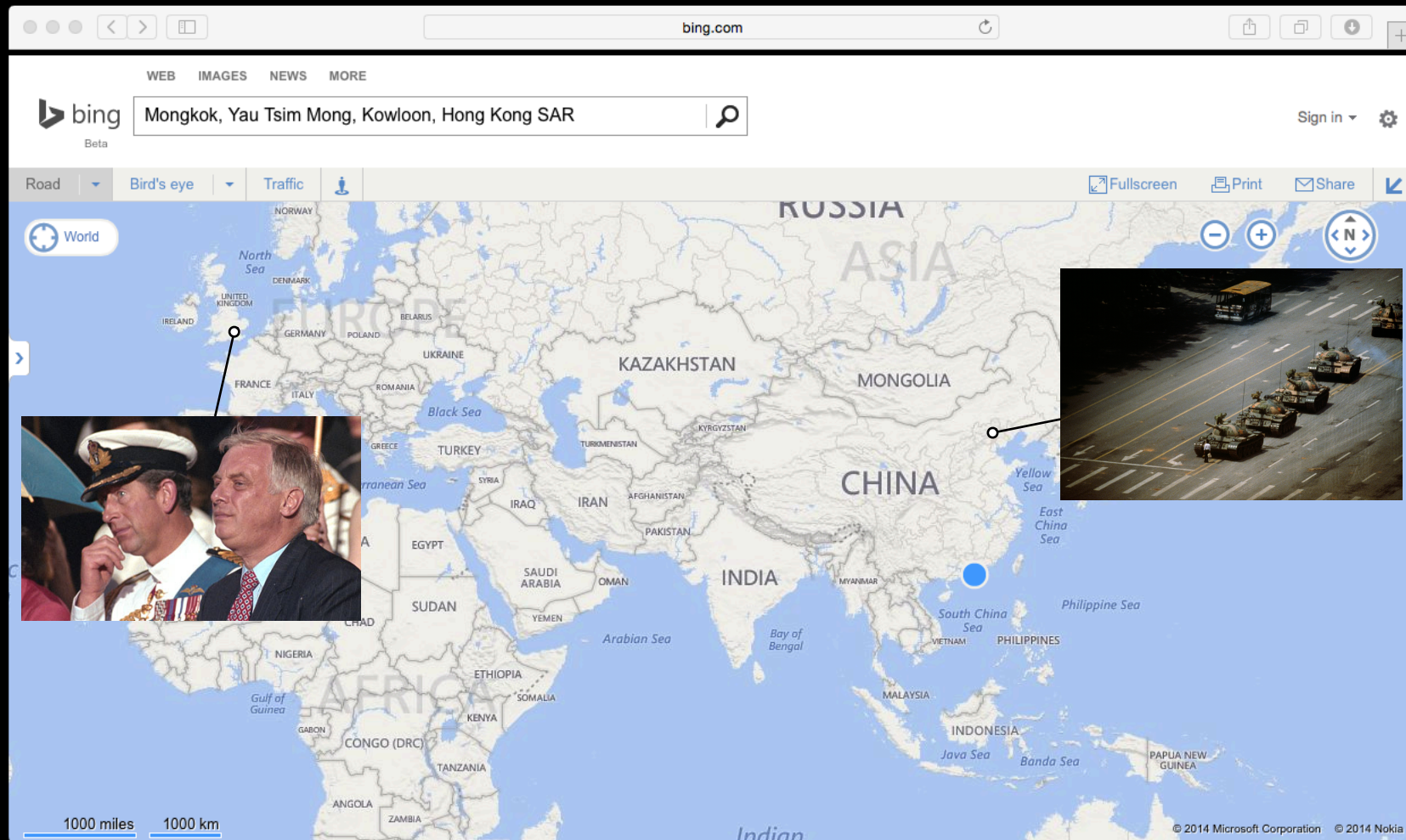
The screenshot shows the Google Earth desktop application. The main window displays a 3D satellite view of the Earth, centered on the Pacific Ocean. On the left side, there is a 'Layers' panel with a tree view containing items like 'Primary Database', 'Borders and Labels', 'Places', 'Photos', 'Roads', '3D Buildings', 'Ocean', 'Weather', 'Gallery', 'Global Awareness', and 'More'. At the top, there is a search bar and navigation controls. The bottom of the window shows a Windows taskbar with various application icons and system tray information including the date '18.09.2012' and time '14:07'.

- Always work in progress
- Continuous updating
- Old information stored in timeline
- Not knowledge aggregators
 - No narratives like in Wikipedia

A Digital Silk Road

The screenshot shows a Bing search engine interface. The search bar contains the text "Mongkok, Yau Tsim Mong, Kowloon, Hong Kong SAR". The map displays the Kowloon Peninsula and surrounding areas, with a purple line representing a digital Silk Road route. A black arrow points to the Yau Tsim Mong area. On the left, there are two inset images: a modern glass skyscraper and a busy street market. On the right, there is a news snippet from BBC News China titled "Why is Hong Kong protesting?" with a photo of a large crowd and a video player showing a young man speaking.

User-Driven Knowledge Aggregation



An Experimental Database

CONCLUSIONS AND FUTURE WORK

next steps

Data processing. Opportunities & constraints

Crowdsourcing

- + uploading new data
- + tagging existing data
- need for strong reference supervision

Examples:

- Wikipedia
- Wikimapia

Data aggregation

- + exploitation of the existing databases
- individual approach in order to unify data

Examples:

- The Ming Shi-lu
- National & public libraries
- Online resources

Thank You!

www.andreananetti.com

