

2nd Brazilian ISKO Conference
Rio de Janeiro, 27-29 May 2013



ISKO-BRASIL
International Society
for Knowledge Organization



Knowledge organization for its own sake

Relationships between theory and applications

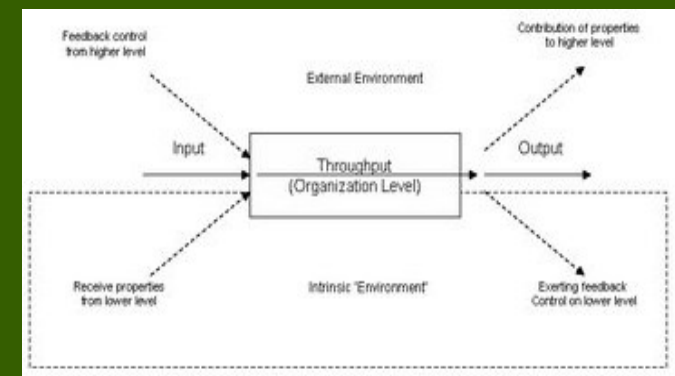
Video keynote



Claudio Gnoli
University of Pavia (Italy)

The domain of knowledge organization (KO) consists of several layers...





KO theory

looks for principles to arrange the parts of human knowledge into consistent views: systems theory, prototype theory...

KO theory

KO systems (KOS)

provide structures
and symbols
to do that: UDC,
LCSH, thesauri...

Subject Area	Classification
Generalities	0
Philosophy	1
Religion.	2
Social Sciences. Sociology, etc.	3
Not used	4
Pure Sciences	5
Applied Sciences. Medicine. Technology	6
Fine Arts. Applied Arts, etc.	7
Literature and Languages	8
Geography. Biography. History	9

KO theory

KO systems (KOS,

KO representation

records these as
formalized (digital) data:

MARC, XML, RDF,
SKOS, OWL, LLD...

```
"skos:ConceptScheme": {  
  "skos:Collection": {  
    "https://data.primal.com/adventure/.  
      "skos:prefLabel": "adventure"  
    },  
    "https://data.primal.com/skiing/..."  
      "skos:prefLabel": "skiing"  
    }  
  }  
}
```

KO theory

KO systems (KOS)

KO representation

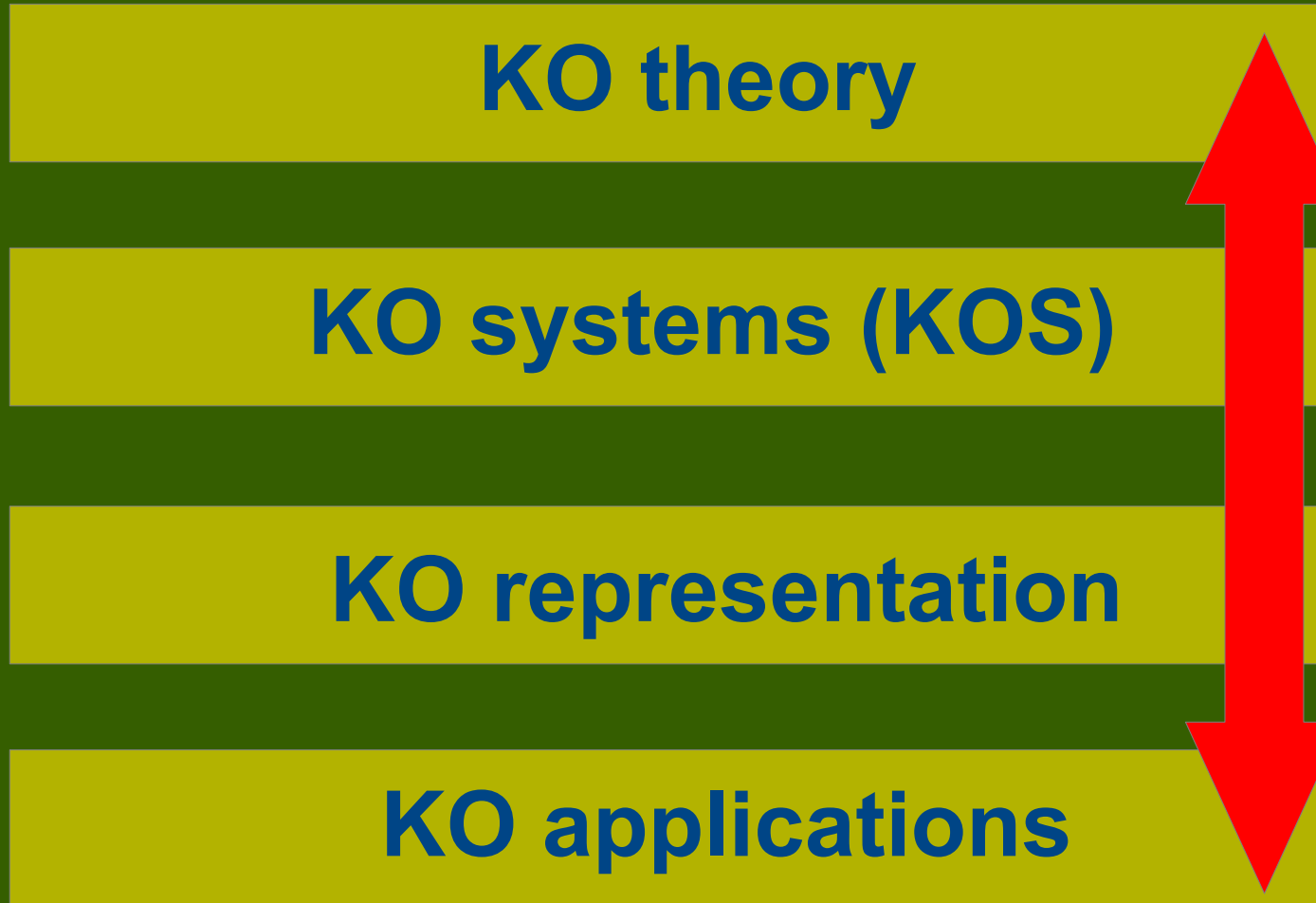
KO applications

make use of all this
for the needs of
information services:

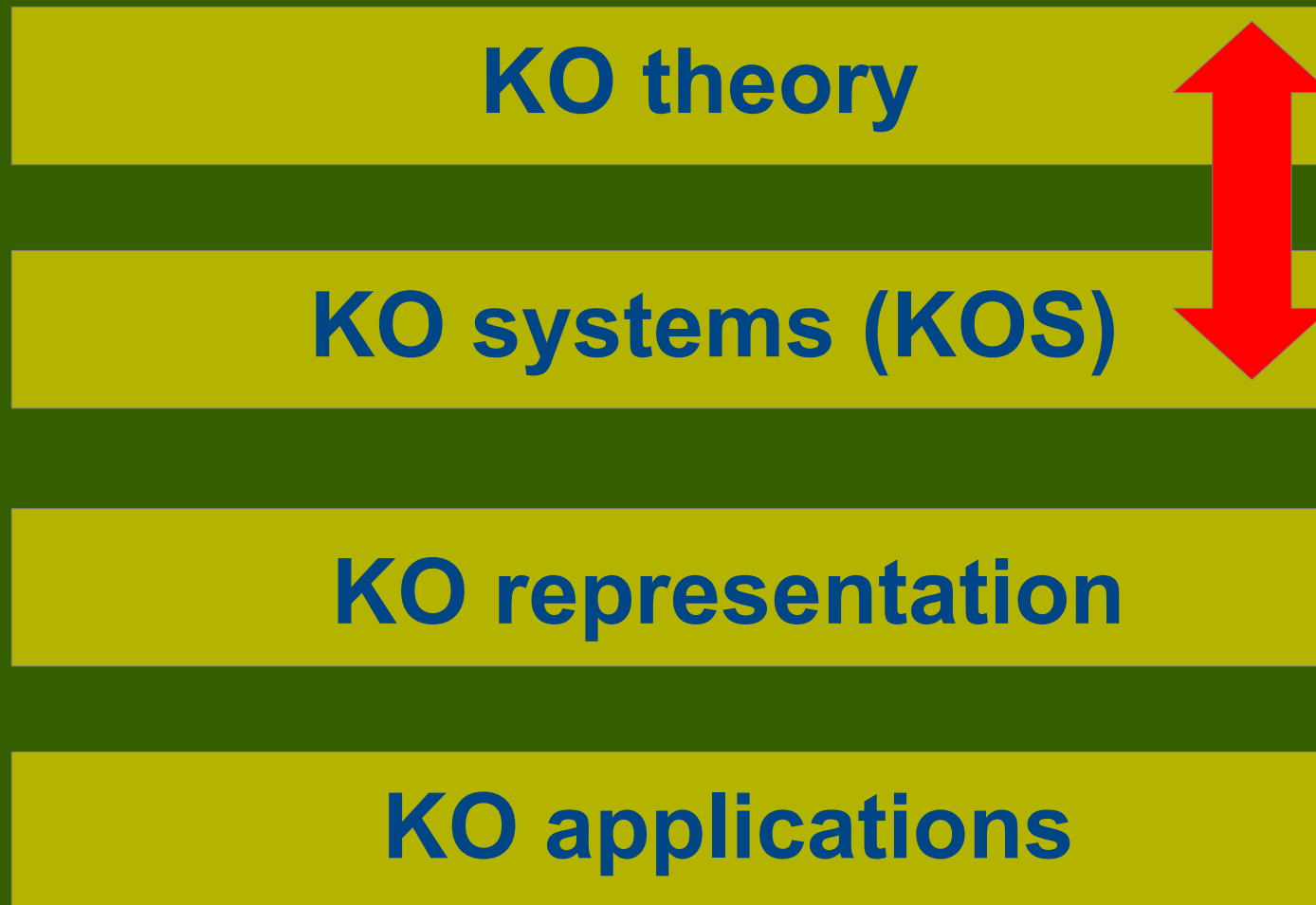
bibliographies,
library catalogues,
museum catalogues,
web directories...



Each layer should be properly related to the other ones...



C Gnoli, *Ontological foundations in KO: the theory of integrative levels applied in citation order*, Ibersid 2011, in Scire, 17, n. 1, p. 29-34



C Gnoli et al., *Representing the structural elements of a freely faceted classification*, in Slavic & Civallero eds., *Classification and ontology*, Ergon, Würzburg 2011, p. 193-206

KO theory

KO systems (KOS)

KO representation

KO applications



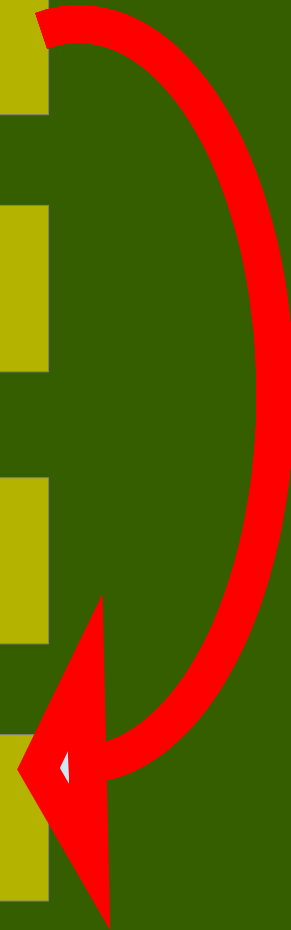
this presentation

KO theory

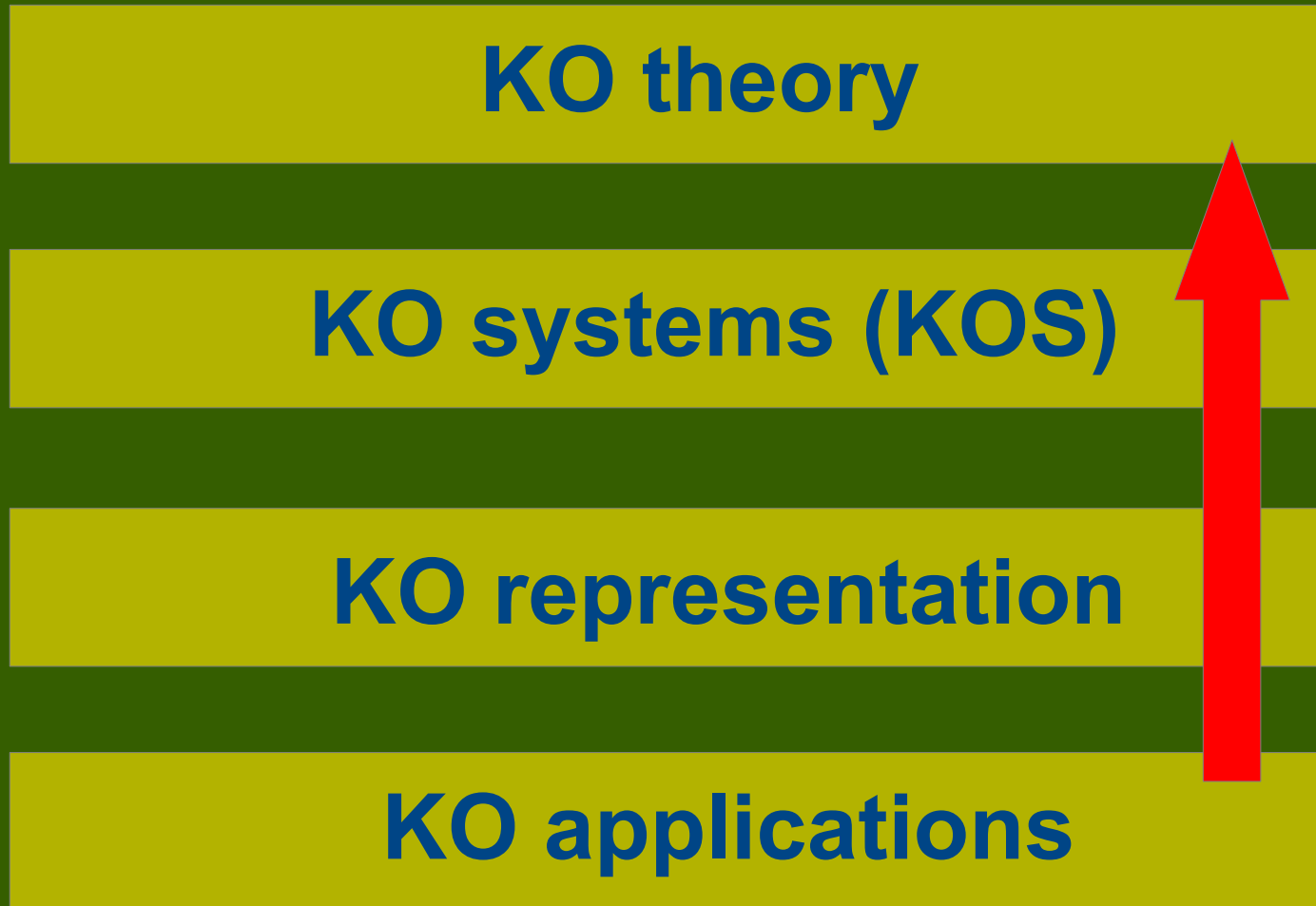
KO systems (KOS)

KO representation

KO applications



User-centered approach



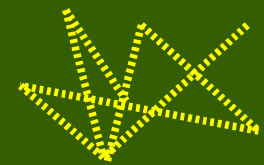
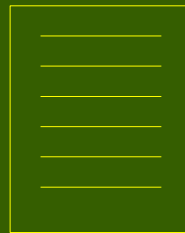
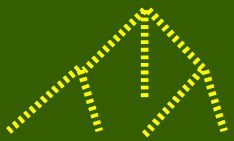
User surveys as a major source for KO theory

e.g. reader-interest classification

[Martínez-Ávila & San Segundo, *KO*, 2013, 2]

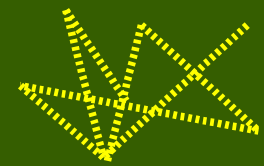
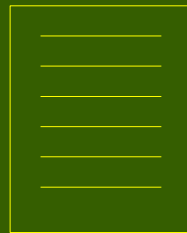
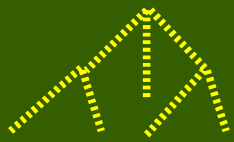
Domain analysis

Each community would need,
and produce, a different KO...



Domain analysis

...which would make interoperability impossible



The opposite possibility

KO theory

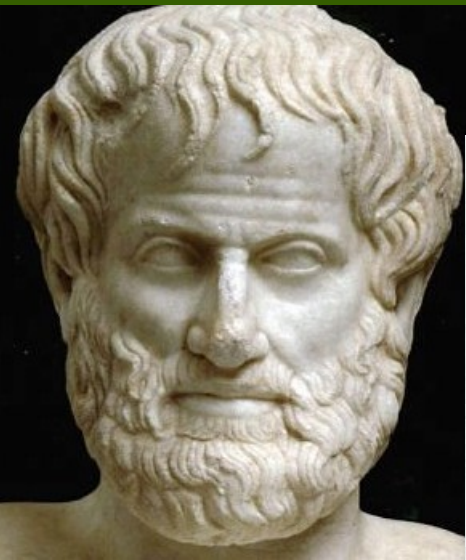
KO systems (KOS)

Not comply any particular need, beside the intellectual satisfaction of understanding the world !



KO for its own sake

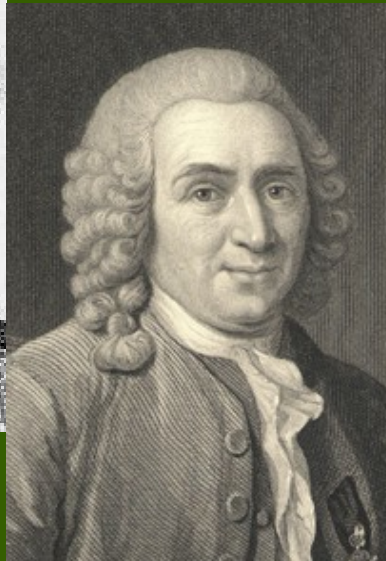
Such a desire has existed among humans in all times...



Aristotle



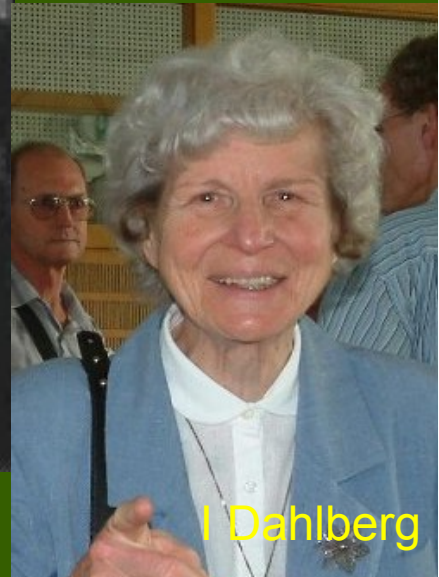
F Bacon



C Linnaeus



HE Bliss [cnpd.fr]



I Dahlberg

KO for its own sake

...although it is now often forgotten,
due to the dominance of technology
and pragmatics in modern life.

Playtime, by J. Tati



KO for its own sake

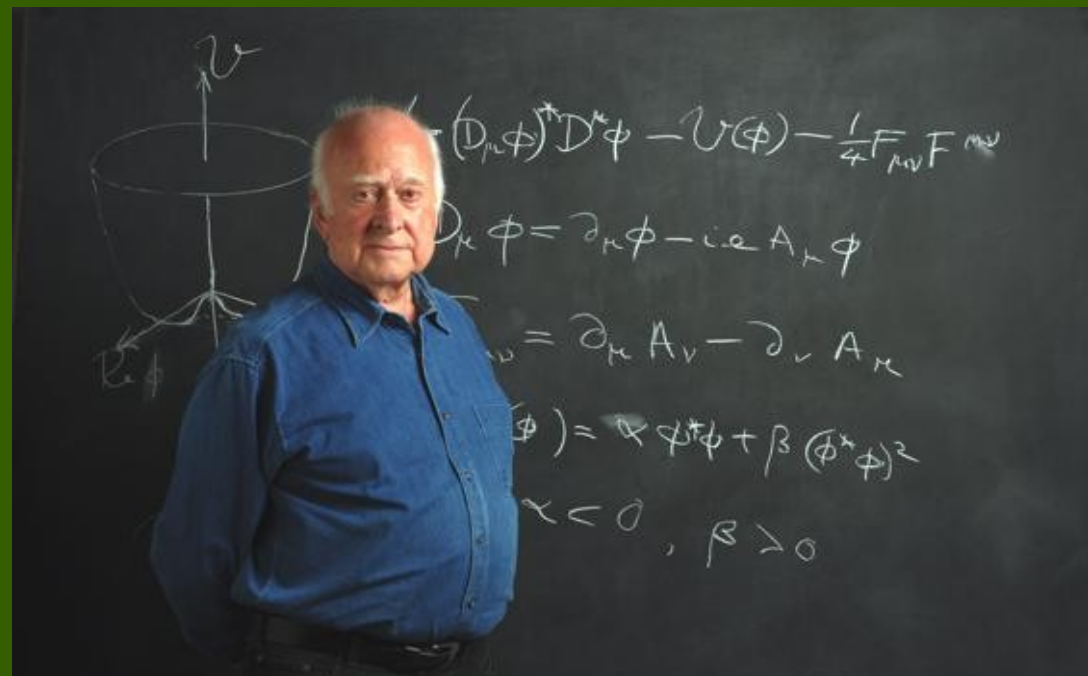
Is it a useless luxury
that we cannot afford?...



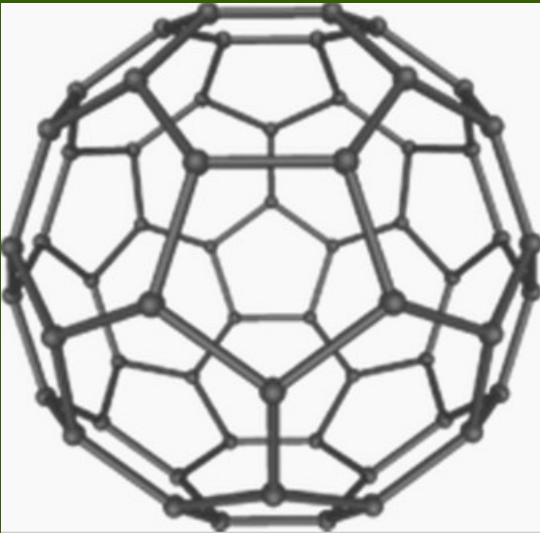
“Useless” knowledge

Many major innovations originated from purely theoretical research !

Which will ever be the applications of Higgs boson discovery?...



“Useless” knowledge



Research on fullerenes
– spheres and tubes of carbon atoms –
in the 1970s and 1980s
had no apparent purpose...



Journal of Crystal Growth

Volume 50, Issue 3, November 1980, Pages 675–683



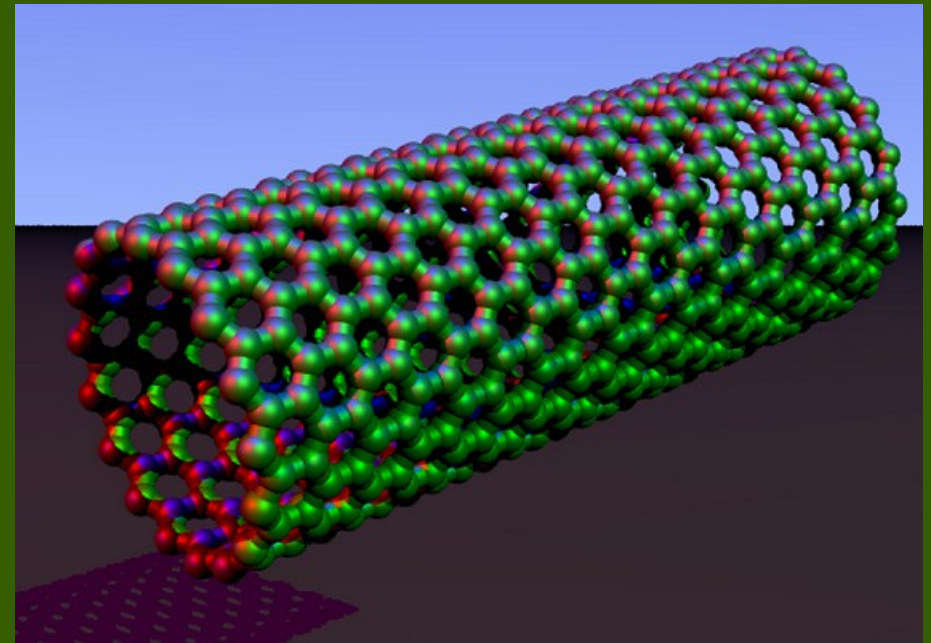
Direct observation of the tetrahedral bonding in graphitized carbon black by high resolution electron microscopy

Sumio Iijima

Center for Solid State Science, Arizona State University, Tempe, Arizona 85281, USA

“Useless” knowledge


...However, fullerenes were later found to be useful in materials science, in electronics, in nanotechnology, in cancer therapy, ...



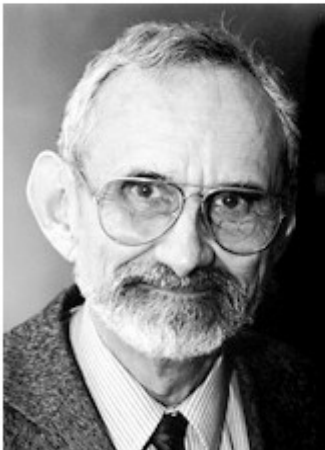
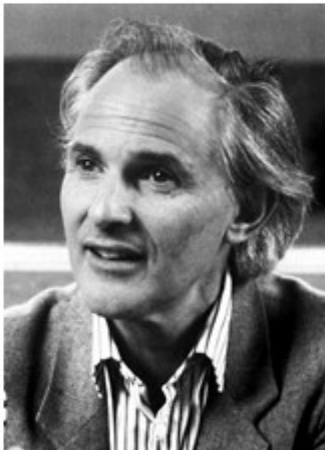
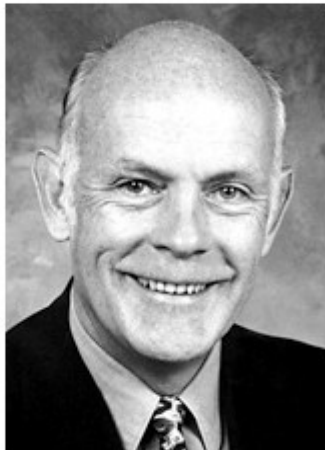
“Useless” knowledge

... their discoverers were awarded
the Nobel Prize in Chemistry 1996 ...

Nobel Prize Award Ceremony

 **The Nobel Prize in Chemistry 1996**
Robert F. Curl Jr., Sir Harold Kroto, Richard E. Smalley

The Nobel Prize in Chemistry 1996

Robert F. Curl Jr. Sir Harold W. Kroto Richard E. Smalley

The Nobel Prize in Chemistry 1996 was awarded jointly to Robert F. Curl Jr., Sir Harold W. Kroto and Richard E. Smalley *"for their discovery of fullerenes"*.

“Useless knowledge”

...and the topic earned celebrity.



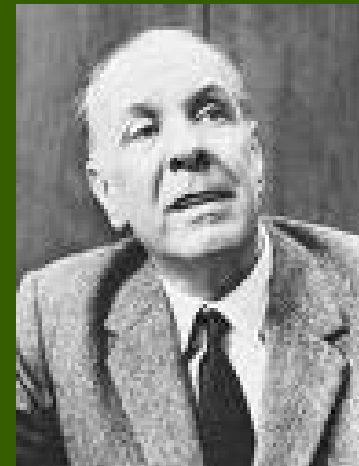
“Useless” knowledge

In the same way,
why not looking for an optimal KOS
for its own sake?

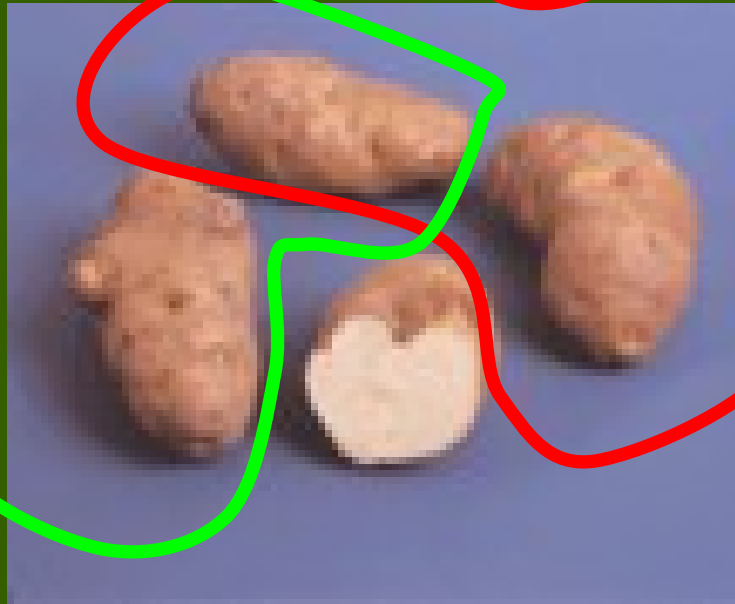
Biased KOSs

Of course, one is free to build a KOS based on any special purpose... [Borges 1964; Langridge 1992]

- a animals that belong to the Emperor
- b embalmed animals
- c animals that are trained
- d suckling pigs
- e mermaids
- f fabulous animals
- g stray dogs
- h animals included in the present classification
- i animals that tremble as if they were mad
- j innumerable animals
- k animals drawn with a very fine camelhair brush
- l other animals
- m animals that have just broken a flower vase
- n animals that from a long way off look like flies



Folk taxonomies



Peasants acknowledge potato varieties that are hard to distinguish for a modern researcher!
[Angelini 2005]

Folk taxonomies

Are they different from scientific taxonomies?...

- 93% same **bird** species identification
7% strictly-related species [Diamond 1966]
- almost all same species of **birds**
but no distinction between **ants** [Mayr in Wilson 1992]
- **plant** species in Chiapas:
82 underdifferentiated
68 exactly corresponding (incl. 40 introduced)
50 overdifferentiated

[Berlin et al. 1966]



General KOSs also work for IR

“Biological classifications have two major objectives: to serve as a basis of biological *generalizations* in all sort of comparative studies and to serve as a key to an *information storage* system. [...]

Is the classification that is soundest as a basis of generalizations *also most convenient* for information retrieval? This, indeed, seems to have been true in most cases I have encountered”

[Mayr 1981]

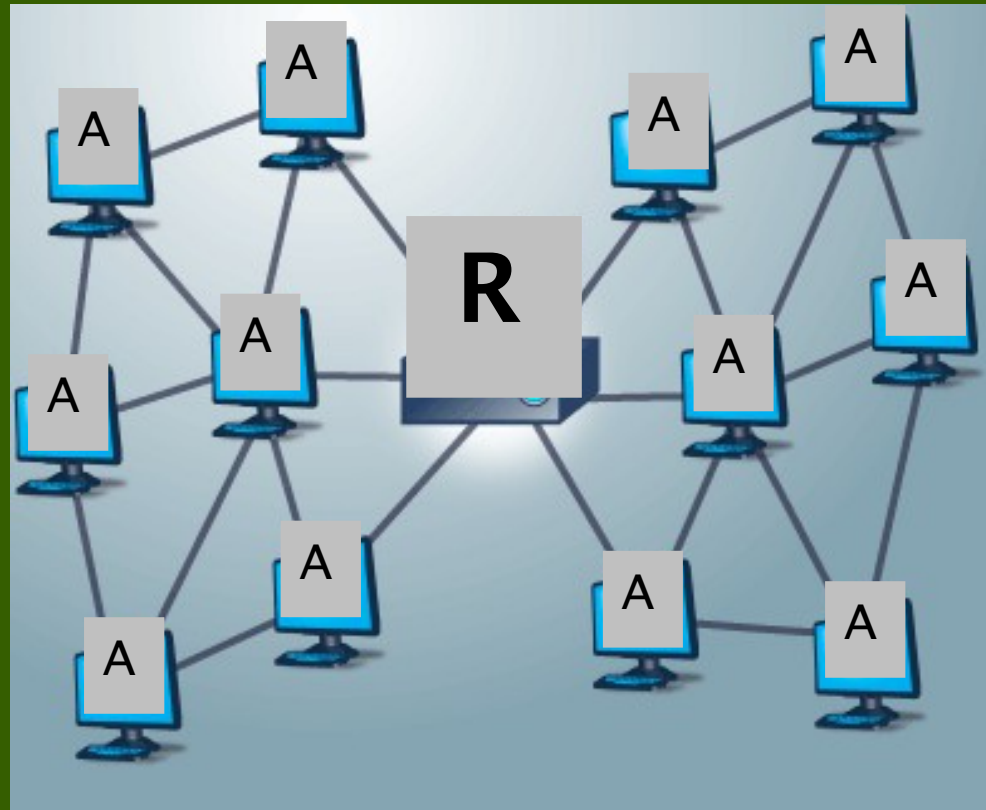


Interoperability



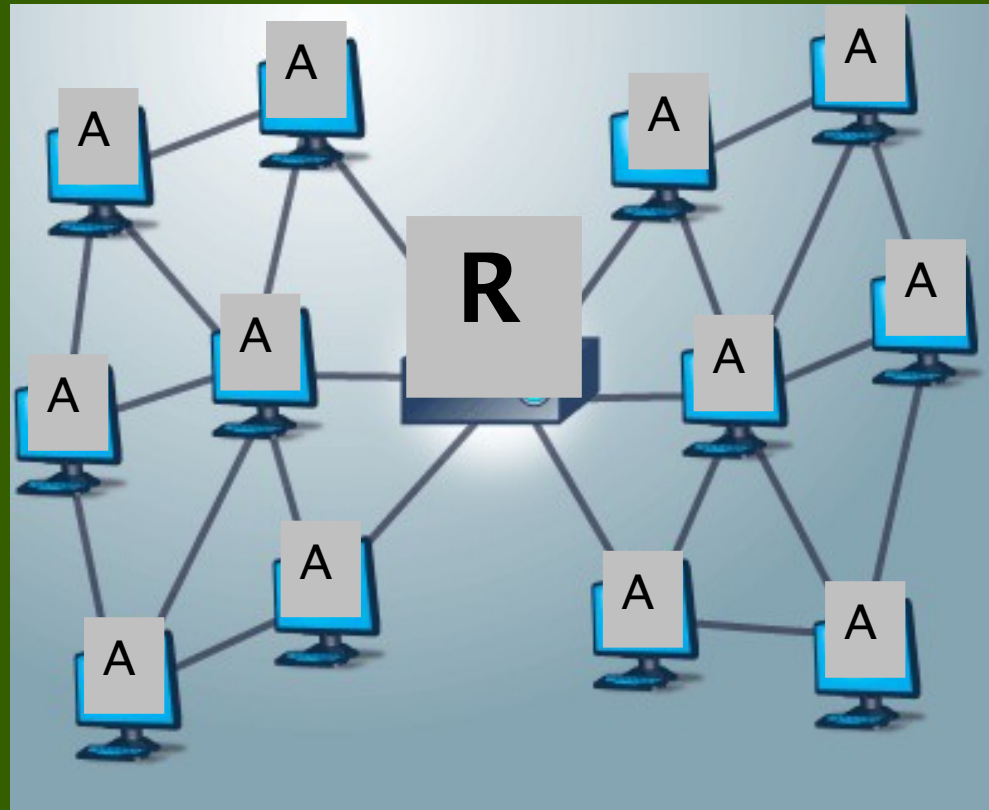
Biased KOSs are legitimate,
but get problematic
when used in shared
environments

A-R system



A more promising architecture for KO [Wåhlin 1974;
cfr. Parsons 1996; Beghtol 1998; Boteram 2009; Giunchiglia et al. in prep.]

A-R system



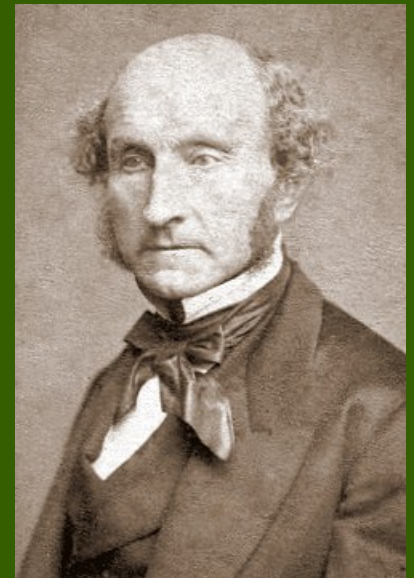
... What can work as “R” ?

Natural vs. artificial KOSs

“The ends of scientific classification are best answered, when the objects are formed into groups respecting which a greater number of *general propositions can be made*, and those propositions more important, than could be made respecting any other groups into which the same things could be distributed [...]

A classification thus formed is properly scientific or philosophical, and is commonly called a Natural, in contradistinction to a Technical or Artificial, classification or arrangement.”

[JS Mill 1872
in Hjørland 2013]



Natural vs. artificial KOSs

“For example, we could define as **interplanetary lumps** all non-spherical objects orbiting around the Sun and spinning anticlockwise.

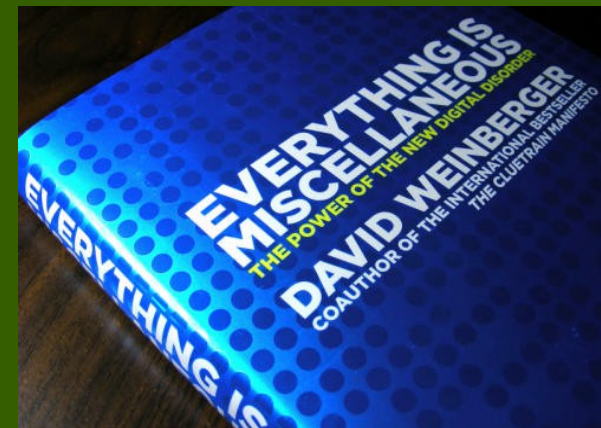
But we don't, because interplanetary lumps don't share any other property apart from those that define them.

There is nothing more to say about them, just as there is nothing more to say about

what is shared by all extra-large T-shirts with a filth spot on their left sleeve.”



[Weinberger 2007
retransl. from It. ed.]



Natural vs. artificial KOSs

So, let's look for “natural” KOSs
(as far as current knowledge allows)
with no particular purpose,

KOSs “for their own sake”
based on general principles,

then use them as the best available reference
for interoperability.

Deictic classes in ILC

mḡA [mḡ98u (6i (955 (a) tḡ (2mo)))] animals belonging to the emperor

mḡB [...] embalmed animals

mḡC [...] animals that are trained

...

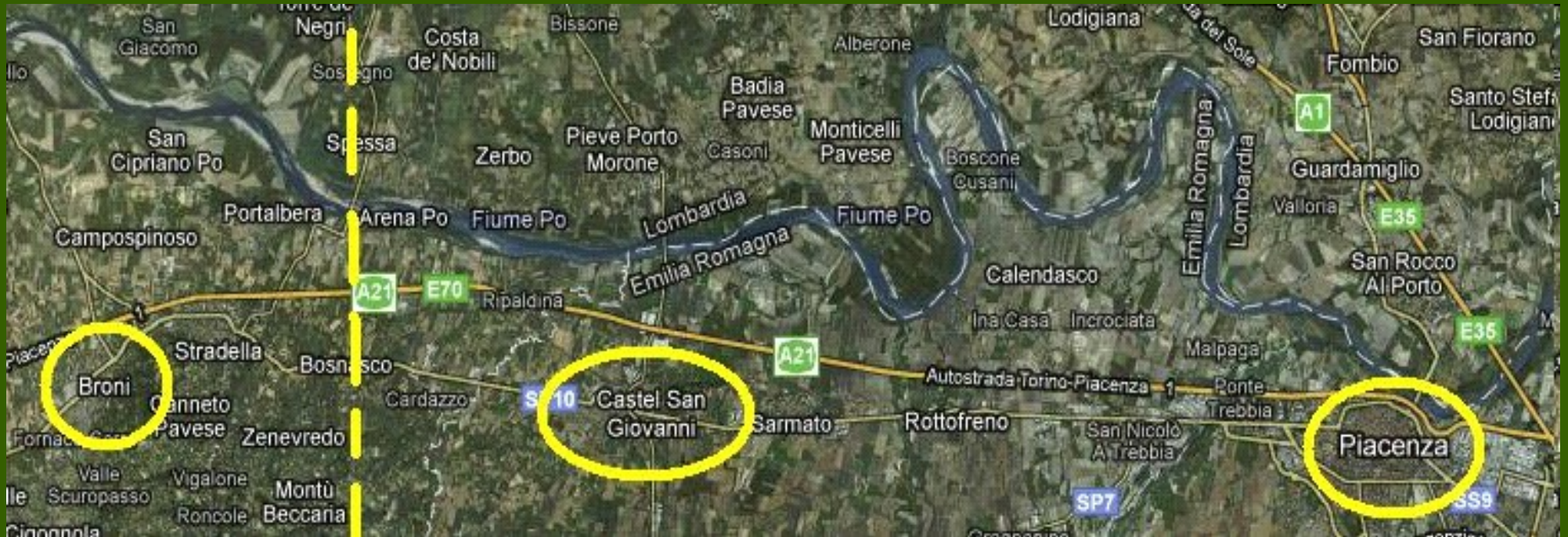
[Gnoli 2011]

Do natural classes exist?

Dialects change continuously across villages and neighborhoods.
So what can a class like **Emilian dialects** actually mean?...



Do natural classes exist?



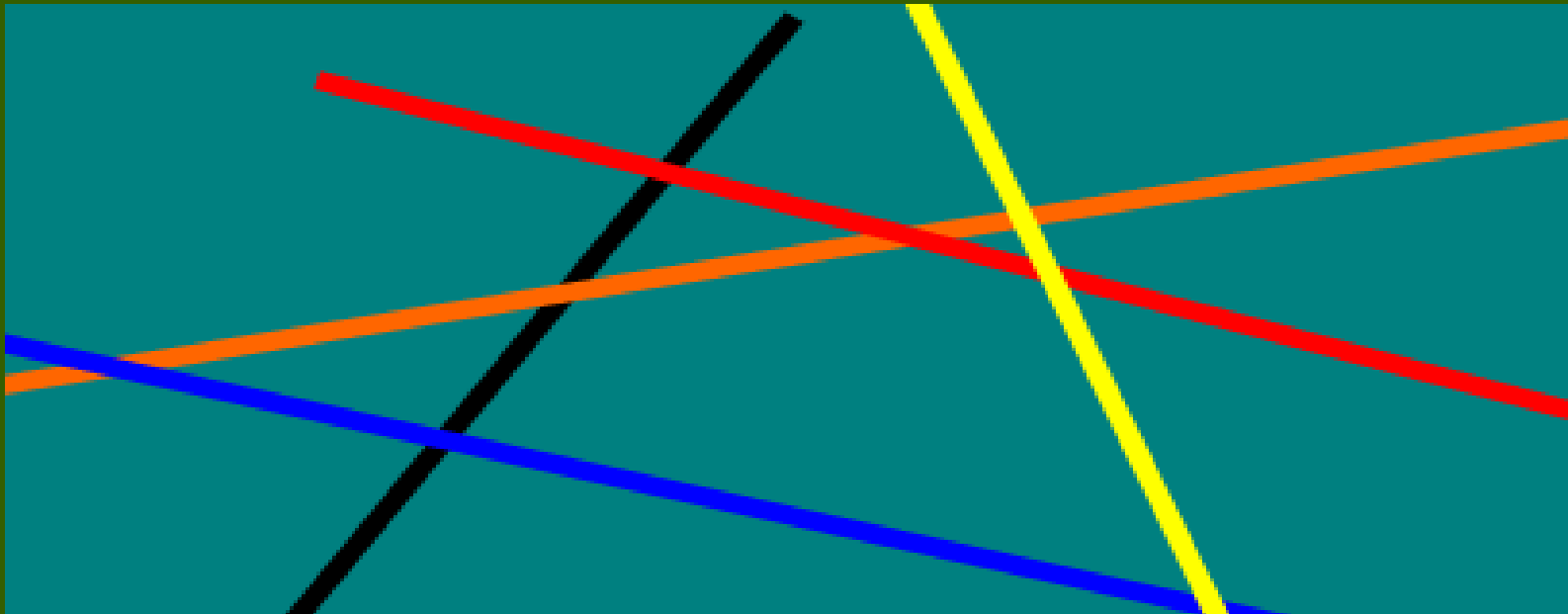
mangi no

a [n'] mang miga = “I don't eat”

[D. Vitali in prep.]

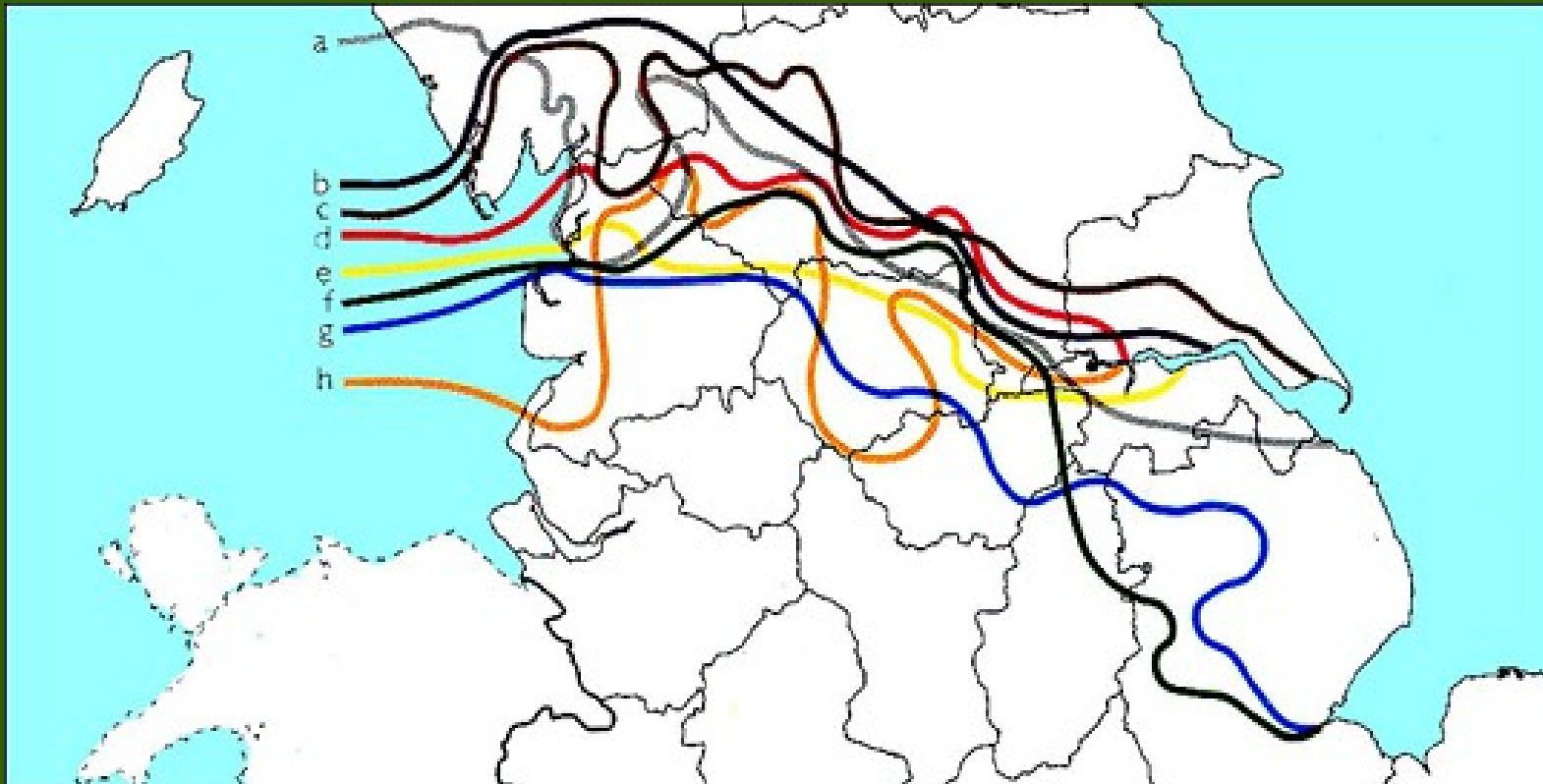
Do natural classes exist?

Problem: for different linguistic traits,
isoglossae are different...



Do natural classes exist?

However, at a greater scale,
bundles of isoglossae can be observed...



Conclusion

KO theory,
and KO systems reflecting it,
should be allowed to develop freely

without necessarily having
any particular application in sight.

This will eventually produce
good applications as well.

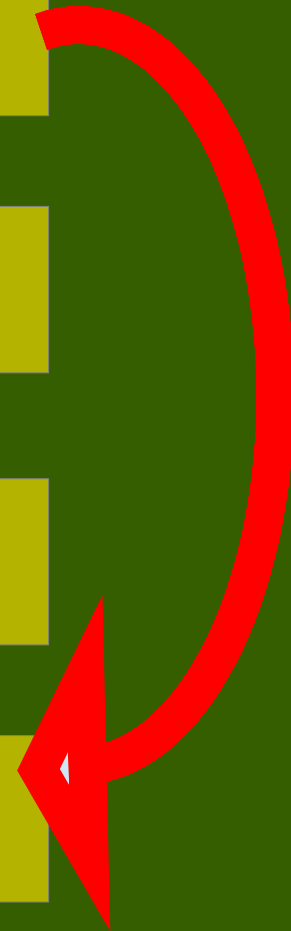


KO theory

KO systems (KOS)

KO representation

KO applications



... Thanks for your attention !

`gnoli@aib.it`



`@scritur`