Interaction between Elementary Structures in Universes of Knowledge

Richard P. Smiraglia
Charles van den Heuvel
Thomas M. Dousa

Int. UDCC Seminar 2011 Classification&Ontology - The Hague 19 - 20 September 2011
Elementary structures: universe of knowledge or universe of concepts?

components of elementary structures of knowledge in relation to classification
Charles van den Heuvel

relations between elementary structures of knowledge by considering classifications as artificial languages, interplay between syntax and semantics in the notational mnemonics
Thomas Dousa

interactions between elementary structures of interaction between universes of knowledge and of concepts.
Richard P. Smiraglia
Statements

• No transition from a universe of knowledge to a universe of concepts. Ranganathan is not revolutionary but makes part of longer theoretical development (need for new histories)

• Syntax and semantics cannot be completely separated (need for new studies of classification as language)

• No data integration with an universal classification but interfaces to knowledge interaction in a multiverse (need for new mechanisms in knowledge organization)
Historiography: From the universe of knowledge to the universe of concepts?

“The first modern bibliographic classifications were top-down systems that started at the universe of knowledge and subdivided the universe downward to minute subclasses. After the invention of faceted classification by S.R. Ranganathan, the ideal was to build bottom-up classifications that started with the universe of concepts and built up to larger and larger facetted classes”

“From the Universe of Knowledge to the Universe of Concepts: The Structural Revolution in Classification for Information Retrieval”

Beghtol 2008, 131
“Thought is multi-dimensional. But we are one-dimensional beings – that is we still prefer all things to be handled to be arranged in one-dimension […] This means that classification is essentially a transformation of a many-dimensional universe into a uni-dimensional, uni-directional one.

S.R. Ranganathan 1951, 96
Elements and Classification: Fundamental Schemes 1908
Elements and Theoretical Notions 1: Atomist - Atomic Theory - Universes

Atomist theories – Universe of Knowledge

- Richardson, Bliss and others
- Boltzmann - Ostwald - Otlet
- Monographie Prinzip - Monographic Principle

Atomic theories – Universe of Concepts

“The laws applicable to macro-physical objects are not applicable to micro-physical objects.”

Otlet, Monde 1935, 30
Elements and Theoretical Notions 2: analytic-synthetic classification

Fundamental schemes 1908

Theory of the UDC 1941
Elements and Theoretical Notions 3: facets and flexibility

“Apart from the fact that the UDC also has the property of growing like a banyan tree, the intercalation method produces for the physiologist unusual demonstration of linear branches of alternating their botanical genus. In fact the intercalation principle renders it possible a scheme of subdivision according to a certain principle over a quite another scheme of subdivision still in the same dimension and to switch back again.”

Donker Duyvis, 1951: 99-100.
Elements and Theoretical Notions 4: events and evolution

Left: Otlet discussing Alexander, Russell and Whitehead with notions of events (evenements and implications for synthesis – 1927
Right: Otlet discussing growth and development of element in place and time - 1931
Elements and Operations:

The ultimate problem of scientific knowledge is to know all reality, its being, its phenomena, its laws that it is possible to desintegrate everything that exists, to reconstitute it and to reorder it in different ways. “

Paul Otlet, Monde 1934, p. 390
“Classification numbers will [...] be complex numerical expressions made up of different factors whose respective meanings when juxtaposed will express a complex idea after the fashion of compound words in spoken languages”

Otlet, 1895-1896, p. 52

“The creation of a synthetic classification with a concise notation of ideas, needs the expression of a language, written in an universal way that is able to react on the form of thought”

Otlet, Monde 1934, p. 389
Classifications as artificial languages

Otlet’s systematization of Dewey’s mnenomic notation had two implications for bibliographic classification:

• 1 shift in notational structure from almost entirely paradigmatic relations to a balance of these relations with syntagmatic ones
• 2 shift from a more stable universe of knowledge to a more configurable universe of concepts
New Mechanisms for KO

• "We are in need in a fundamental reexamination of the universe of knowledge/universe of concepts metaphors to organize knowledge and must therefore begin working on a new theory that can handle the interactions between different universes of knowledge or, if one will, universes of concepts. [...] But, if we are to embrace the idea of multiple universes of knowledge articulated by concepts, we will need additional mechanisms for representation and interaction."
Specifically ...

- Interactions between elementary structures of knowledge
- Interaction between classifications, such as the UDC, and other universes of knowledge and of concepts
Parallel or multiple universes

- There must be both planning for and continuing research in (a) the techniques for identification of concepts of knowledge and the ordering of those concepts, (b) the changing contexts of meaningfulness, ... Specifically ... experimentation in the construction of varying conceptual frameworks upon different axes of reference. (Shera 1950, 92-93)
Some parts of an elemental theory

- Ideas are the matter of knowledge bound by intellectual force
- Ideas are expressed with concepts
- Concepts are made up of signs and the expressions that signify them
- Combinations of concepts are information objects, which are subject to instantiation
- Spacetime is the continuum where instantiation takes place
- Semantic and syntactic pathways provide interfaces
- Canons of instantiation networks can be open or closed
Variety exceeds any single KOS

• Instantiation
  - Canons, instantiation networks
  - Ontogeny, scheme versioning

• Semiosis
  - Signified/signifier, Representamen, Interpretant, Object
Interactions in and from KOS

• UDC connects “points de vue” (points of view) via its auxiliary tables.

• Auxiliaries can be used to make links to external KO systems, such as those being created for use in the Semantic Web.

• This facility to link to external systems is relevant to overcome a fundamental limitation that all classification systems share, which is that they aim at the organization of one single universe of knowledge.
Thank You

smiragl@uwm.edu
charles.van.den.heuvel@huygens.knaw.nl
tdousa2@illinois.edu