



The History of Ontologies

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Ontologies in Computer Science

- A shared conceptualisation (Gruber 1993).

Or more formal:

- An ontology O is a 4-tuple $\langle C; R; I; A \rangle$, where C is a set of concepts, R is a set of relations, I is a set of instances and A is a set of axioms.

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Philosophy I

- Plato and Aristotle (400, 350 BC)
the science of being *with regard to the aspect of being* -> **Categories of Being**

- Descartes (1630)

Subject, Relationship, Object

What exists, What is, What am I,
What is describing this to me

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Philosophy II

- Heidegger (1930)

Being and Time

What does it mean to say that an entity *is*?
ontology of *Da-sein* is a fundamental one

- Wittgenstein (1950): philosophy of **language**
- Quine (1970)

Word and Object, ontological relativity

No entity without identity.

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Interrogative pronouns

Equivalent in Philosophy

- | | |
|---------|---------|
| • What | Object |
| • Who | Subject |
| • When | Time |
| • Where | ... |

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Holistic Views

- Philosophy
- Libraries
- Information Science

Problem:
lack of depth



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Library Classifications

- **DDC** Dewey Decimal Classification (1870)
America, 10 main classes, 10 classes, 10 sub classes, 21 edition, 30 languages
- **UDK** Internationale Universale
Dezimalklassifikation (Europe)
- **RVK** Regensburger Verbund Klassifikation
(1960), German speaking countries
34 classes for different fields



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DDC: The Ten Main Classes

- 000 **Computer science**, information & general works
- 100 Philosophy & psychology
- 200 Religion
- 300 Social sciences
- 400 Language
- 500 Science
- 600 Technology
- 700 Arts & recreation
- 800 Literature
- 900 History & geography

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DDC: Second Summary

- 000 Computer science, knowledge & systems
- 010 Bibliographies
- 020 Library & information sciences
- 030 Encyclopedias & books of facts
- 040 [Unassigned]
- 050 Magazines, journals & serials
- 060 Associations, organizations & museums
- 070 News media, journalism & publishing
- 080 Quotations
- 090 Manuscripts & rare books

Sorted by

language

location

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RVK: 34 classes



A	Allgemeines
B	Theologie und Religionswissenschaften
CA - CI	Philosophie
CL - CZ	Psychologie
D	Pädagogik
E	Allgemeine und vergleichende Sprachwissenschaft. Indogermanistik. Außereuropäische Sprachen und Literaturen
F	Klassische Philologie. Byzantinistik. Mittellateinische und Neugriechische Philologie. Neulatein
G	Germanistik. Niederlandistik. Skandinavistik
H	Anglistik. Amerikanistik
I	Romanistik
K	Slavistik
LA - LC	Ethnologie
LD - LG	Klassische Archäologie
LH - LO	Kunstgeschichte
LP - LY	Musikwissenschaft
MA - ML	Politologie
MN - MW	Soziologie
MX - MZ	Militärwissenschaft
N	Geschichte
P	Rechtswissenschaft
Q	Wirtschaftswissenschaften
R	Geographie
SA - SP	Mathematik
SQ - SU	Informatik
TA - TD	Allgemeine Naturwissenschaft
TE - TZ	Geologie und Paläontologie
U	Physik
V	Chemie und Pharmazie
W	Biologie
WW - YV	Medizin
ZA - ZE	Land- und Forstwirtschaft Gartenbau, Fischereiwirtschaft Hauswirtschaft
ZG - ZS	Technik
ZX - ZY	Sport



Sub classes



- SQ Referateblätter und Zeitschriften
- SR Nachschlagewerke. Didaktik
- SS Enzyklopädien und Handbücher
Kongreßberichte Schriftenreihe. Tafeln und
Formelsammlungen
- ST Monographien (books)
- SU 100 - SU 500 Populäres, Sonderdrucke
- SU 670 - SU 740 Dienstprogramme
alphabetisch nach Firmen



Structure, Coverage, Usage

- Hierarchical lists
- Main classes, sub classes
- Subject, formal criteria
- All scientific fields
- Used in university libraries



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ICC – Information Coding Classification

0 Allg. Form- und Sachgebiete	01 Theorie, Prinzipien	02 Gegenstand, Bestandteile	03 Prozesse, Methodik	04 Eigenschaften	05 Personen	06 Institutionen	07 Technik, Herstellung	08 Anwendung, Determination	09 Verbreitung, Synthese
1 Form- & Struktur	11 Logik	12 Mathematik	13 Statistik	14 Systemforschung	15 Organisation	16 Messwesen	17 Kybernetik	18 Normung	19 Prüfungs- & Kontrollwesen
2 Materie & Energie	21 Mechanik	22 Materiephysik	23 Allg. & technische Physik	24 Elektronik	25 Physikalische Chemie	26 Chemie der Stoffe	27 Technische Chemie	28 Energiewesen	29 Elektrotechnik
3 Kosmos & Geo	31 Astronomie & Astrophysik	32 Weltraumforschung & Technologie	33 Grundlagen Geowissenschaften	34 Atmosphären wi & Technik	35 Hydro- & Ozeanologie	36 Spez. Geologie & Mineralogie	37 Bergbau	38 Hüttenwesen & Werkstoffwi	39 Geographie
4 Bio	41 Allg. Biologie & Grundwissenschaften	42 Mikrobiologie	43 Pflanzenbiologie & Kultivierung	44 Tierbiologie & -haltung	45 Veterinärmedizin	46 Landwirtschaft	47 Forstwirtschaft	48 Lebensmittel- & Technologie	49 Ökologie & Umwelt
5 Human	51 Humanbiologie	52 Gesundheitswesen	53 Pathologie und Medizin	54 Operative & therapeutische Medizin	55 Psychologie	56 Pädagogik	57 Beruf, Arbeit & Freizeit	58 Sport	59 Haushalt & Häusliches Leben
6 Sozio	61 Soziologie	62 Staat und Politik	63 Verwaltung	64 Finanzwesen	65 Sozialhilfe / -politik	66 Recht	67 Raumplanung & Urbanistik	68 Wehrwesen	69 Geschichte
7 Wirtschaft & Produktion	71 Allg. Wirtschaftswi	72 Betriebswi u. -wirtschaft	73 Allg. Technik & Technologie	74 Geräte & Maschinenbau	75 Bauwesen	76 Warenlehre	77 Fahrzeugwesen	78 Verkehrswesen	79 Versorgung & Dienstleistung
8 Wi & Information	81 Wirtschaftswi	82 Infowi	83 Informatik	84 Allg. Infowesen	85 Kommwi	86 Publizistik	87 Graphische Technik & Wirtschaft	88 Nachrichtentechnik	89 Semiotik, Zeichenwesen
9 Geisteswi & Kultur	91 Sprache	92 Literatur & Philologie	93 Musik	94 Bildende Kunst	95 Darstellende Kunst, Theater	96 Kulturwi	97 Philosophie	98 Religion	99 Theologie



Dahlberg 1980

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Structure

- 9x9 matrix with meta elements
- Columns: 9 ontical groups (general object areas), ordered by evolution, each subdivided in 3 classes: *Structure and Matter, Living Beings, Products of Man (Artefacts)*
- Rows: 9 systematifier facets *Theories & Principles, Object & Component, Activity & Process; Property & Attribute, Persons, Institutions, Technology & Production, Application & Determination, Distribution & Synthesis*

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Domain specific

- Subject classifications
- Thesauri

Problem:
interdisciplinary overlap

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Subject classification

- **AMC** Association for Computing Machinery Computing Classification System (1998)
- **MSC** 2000 Mathematic Subject Classification (started 1991)
- **PACS** 2001 Physics and Astronomy Classification Scheme
- **IPC** International Patent Classification (started 1954, 1971 spread around)



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Thesauri

- Ethics in the Life Sciences (2004)
12 fields 2,505 descriptors; Engl. / German
- AAT (Art & Architecture 2003)
133,000 terms and descriptors; Engl.
- MeSH (Medical Subject Headings 2000)
15 fields 22,568 descriptors; Engl.
- Tourism and Leisure Activities (WTO 2000)
20 fields 1,805 descriptors; Engl., Fr., Spanish



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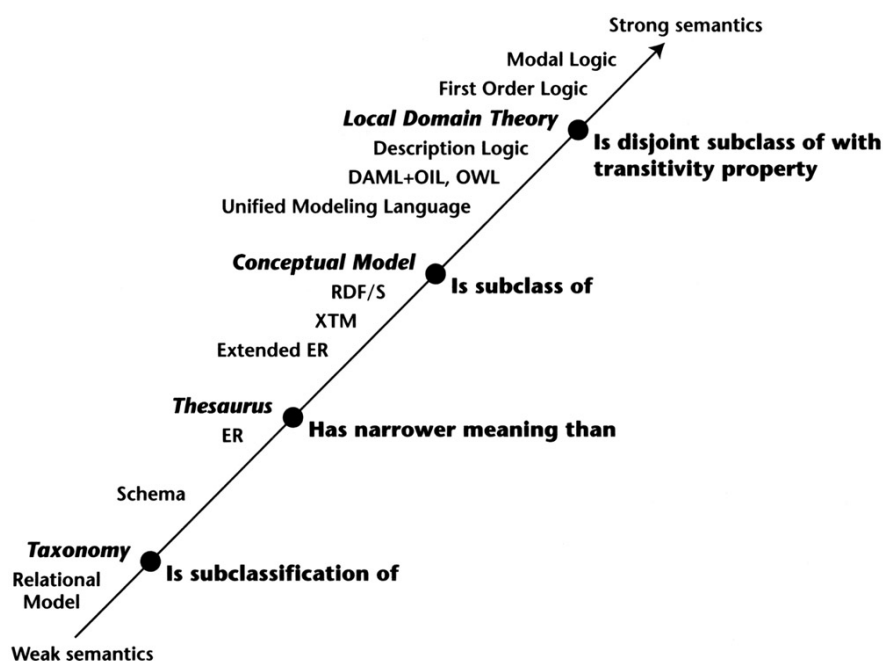
Definitions

- **Terminology:** vocabulary of a specific field
- **Taxonomy:** a former hierarchical classification especially of plants and animals.
- **Thesaurus:** a vocabulary of controlled indexing language and formally organised so that the a priori relationship between concepts are made explicit (ISO 2788).
- **Classification:** putting together of similar things, or more fully described, it is the arranging of things according to likeness and unlikeness. It is the sorting and grouping of things, but, in addition, classification of books is a knowledge classification with adjustments made necessary by the physical form of books (Mann 1943).

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Semantics



The ontology spectrum (Daconta et.al 2003)

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Relations

Interrogative pronouns

- What
- Who
- When
- Where
- How

Ontologies

- Topic
- Person
- Time / Event
- Location
- Meta

So far

- SC
- FOAF
- DC
- DC
- ?



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Conclusions

- Ontologies are not new
- Classification takes time & intellectual input
- Schemes changed
from general/overall to (domain) specific
from experts to community
- Context and ideology behind are important
- Copyright issue



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The End

Thanks for your attention!

Questions, Comments?



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