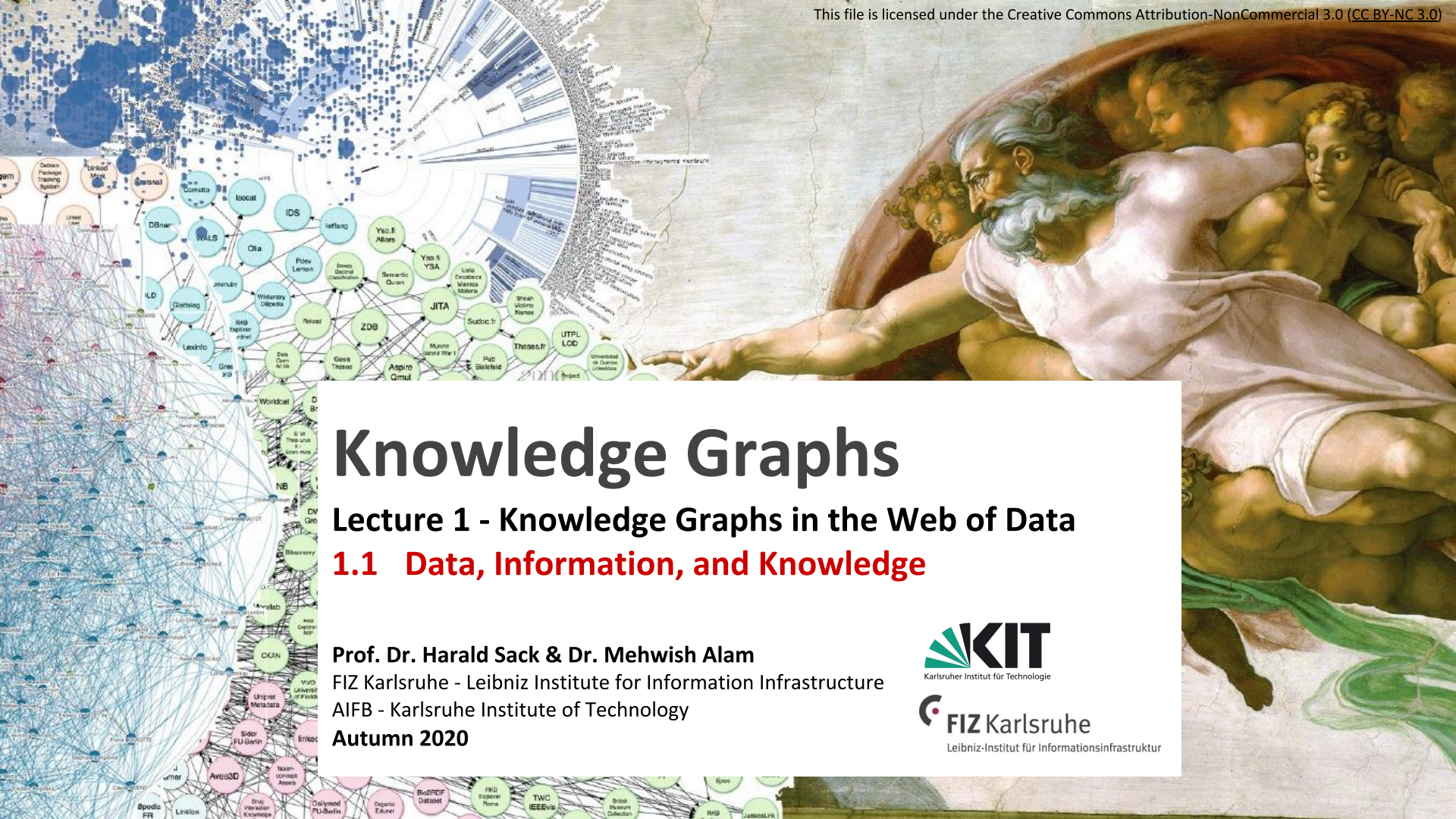


Knowledge Graphs

Lecture 1 - Knowledge Graphs in the Web of Data

1.1 Data, Information, and Knowledge

Prof. Dr. Harald Sack & Dr. Mehwish Alam
FIZ Karlsruhe - Leibniz Institute for Information Infrastructure
AIFB - Karlsruhe Institute of Technology
Autumn 2020

Karlsruher Institut für Technologie

FIZ Karlsruhe
Leibniz-Institut für Informationsinfrastruktur

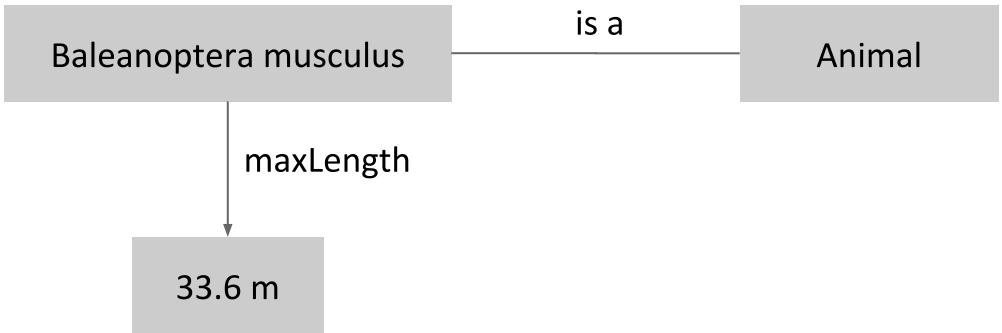
Knowledge Graphs

Lecture 1: Knowledge Graphs in the Web of Data

33.6

33.6 m

33.6m

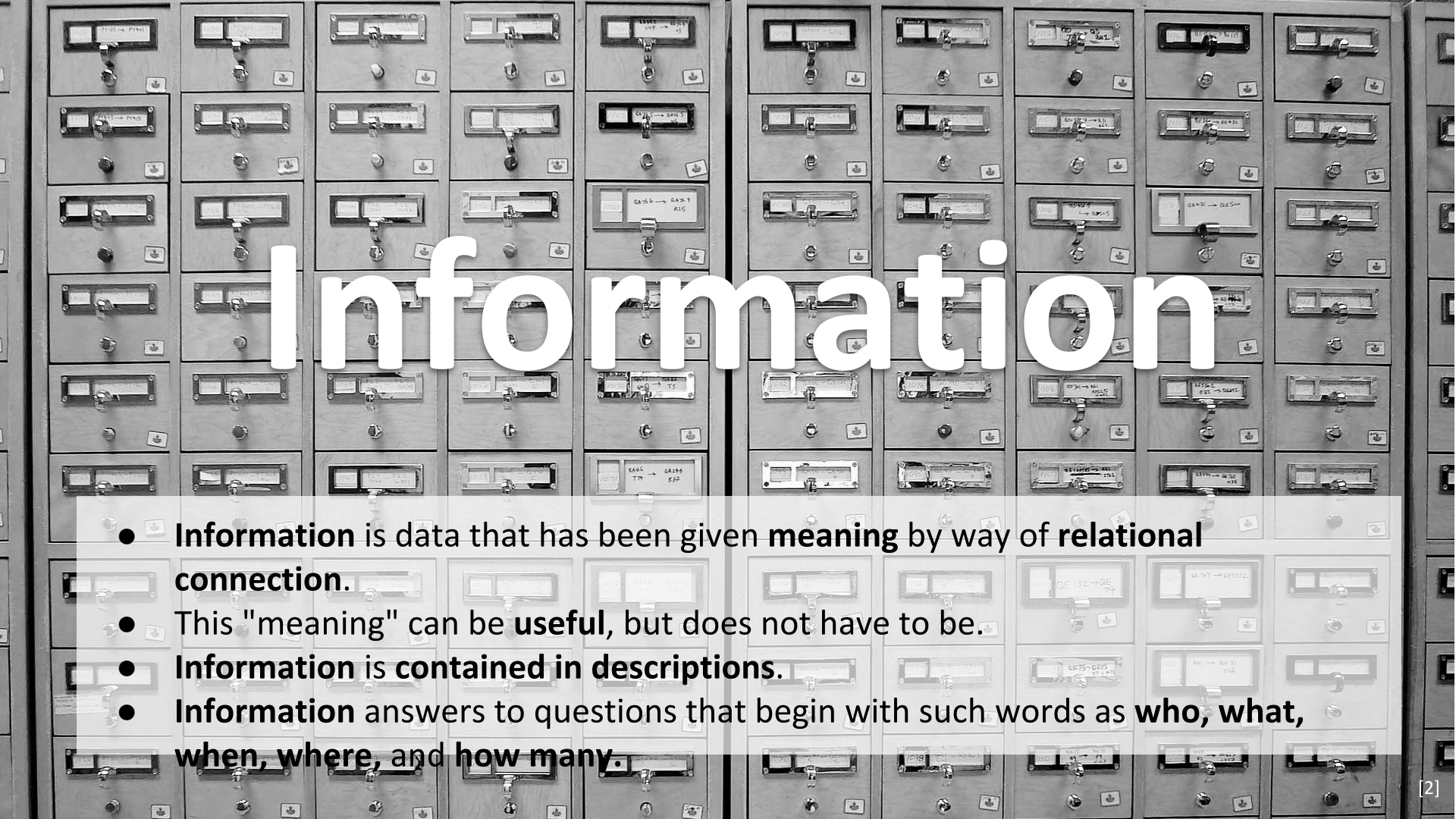


$\texttt{BaleanopteraMusculus} \sqsubseteq \texttt{Animal} \sqcap \forall \texttt{maxLength}.\leq 33.6$

Data

- **Data** is raw.
- It simply exists and has **no significance** beyond its existence (in and of itself).
- It can exist **in any form**, usable or not.

[1]



Information

- **Information** is data that has been given **meaning** by way of **relational connection**.
- This "meaning" can be **useful**, but does not have to be.
- **Information** is **contained in descriptions**.
- **Information** answers to questions that begin with such words as **who, what, when, where**, and **how many**.

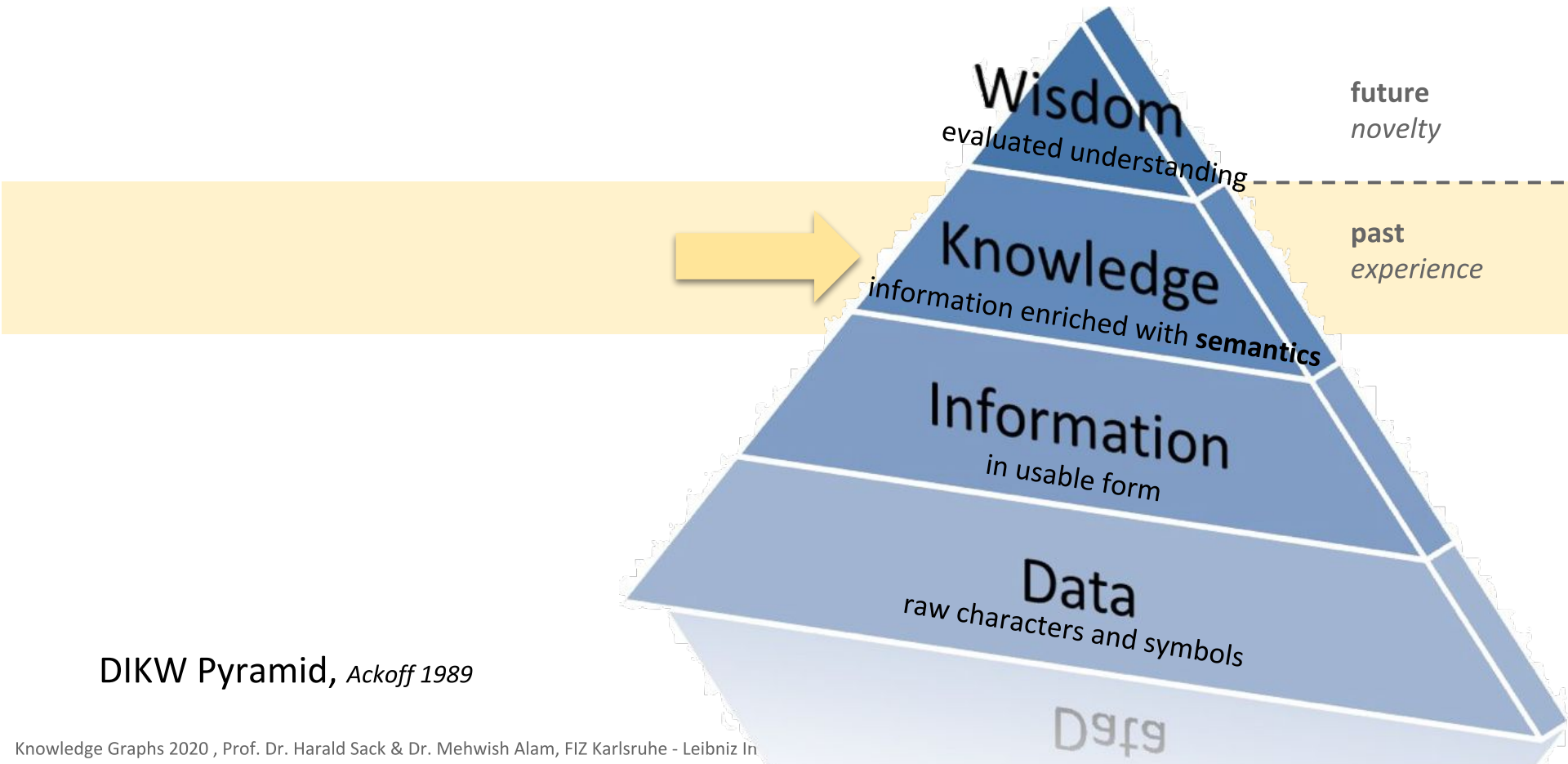
[2]

Knowledge

- **Knowledge** is the appropriate collection of information, such that it's intent is to be **useful.**
- **Wisdom** is the ability to make **sound judgments** and **decisions.**
- **Understanding** is a continuum that leads from **data,** through **information** and **knowledge,** and ultimately to **wisdom.**

Data transforms to **information** by *convention*, **information** to **knowledge** by *cognition*, and **knowledge** to **wisdom** by *contemplation*.

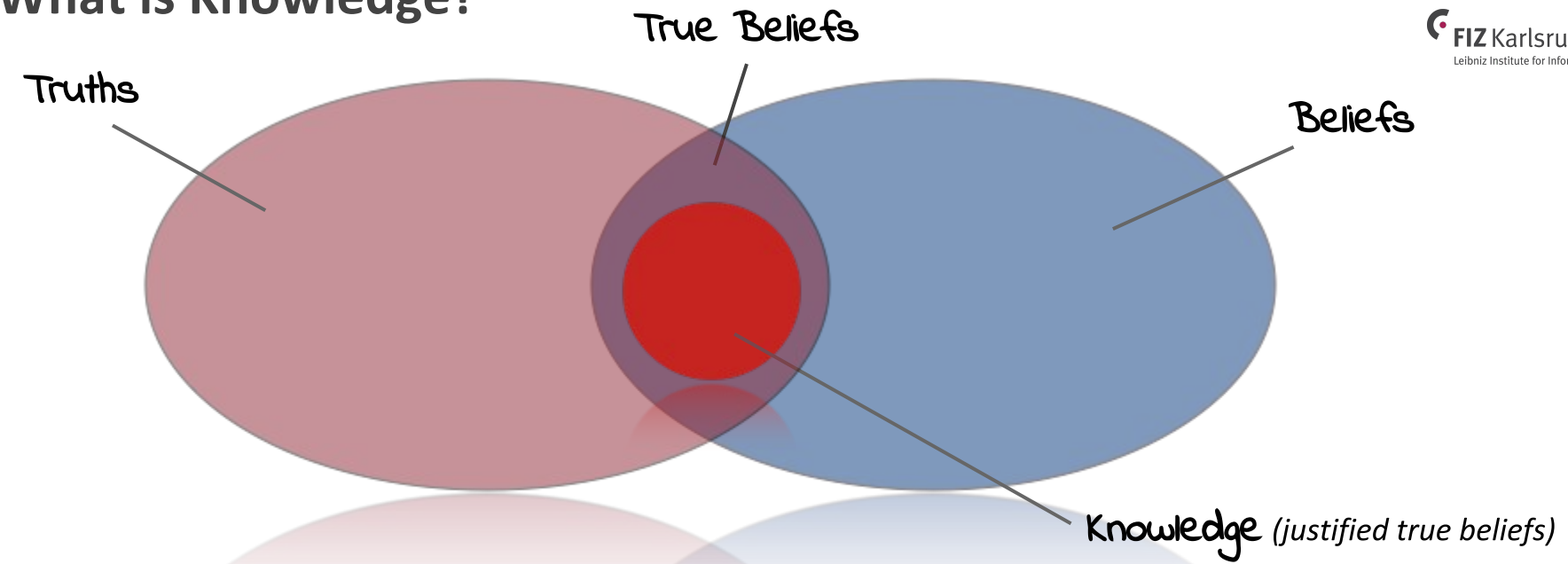
From Data to Knowledge



DIKW Pyramid, *Ackoff 1989*

What is Knowledge?

What is Knowledge?

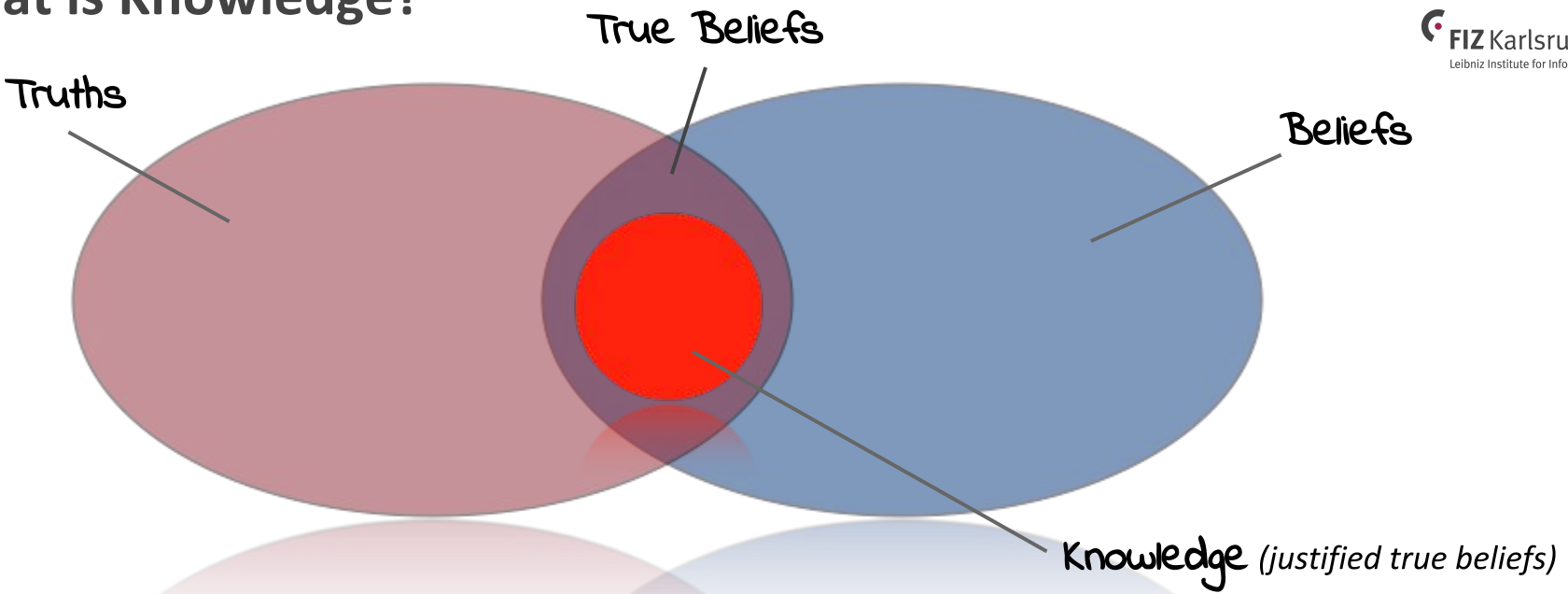


The Tripartite **Analysis of Knowledge**: *S* knows that *p* iff

- *p* is true;
- *S* believes that *p*;
- *S* is justified in believing that *p*.

The Analysis of Knowledge, *Stanford Encyclopedia of Philosophy, 2001.*

What is Knowledge?



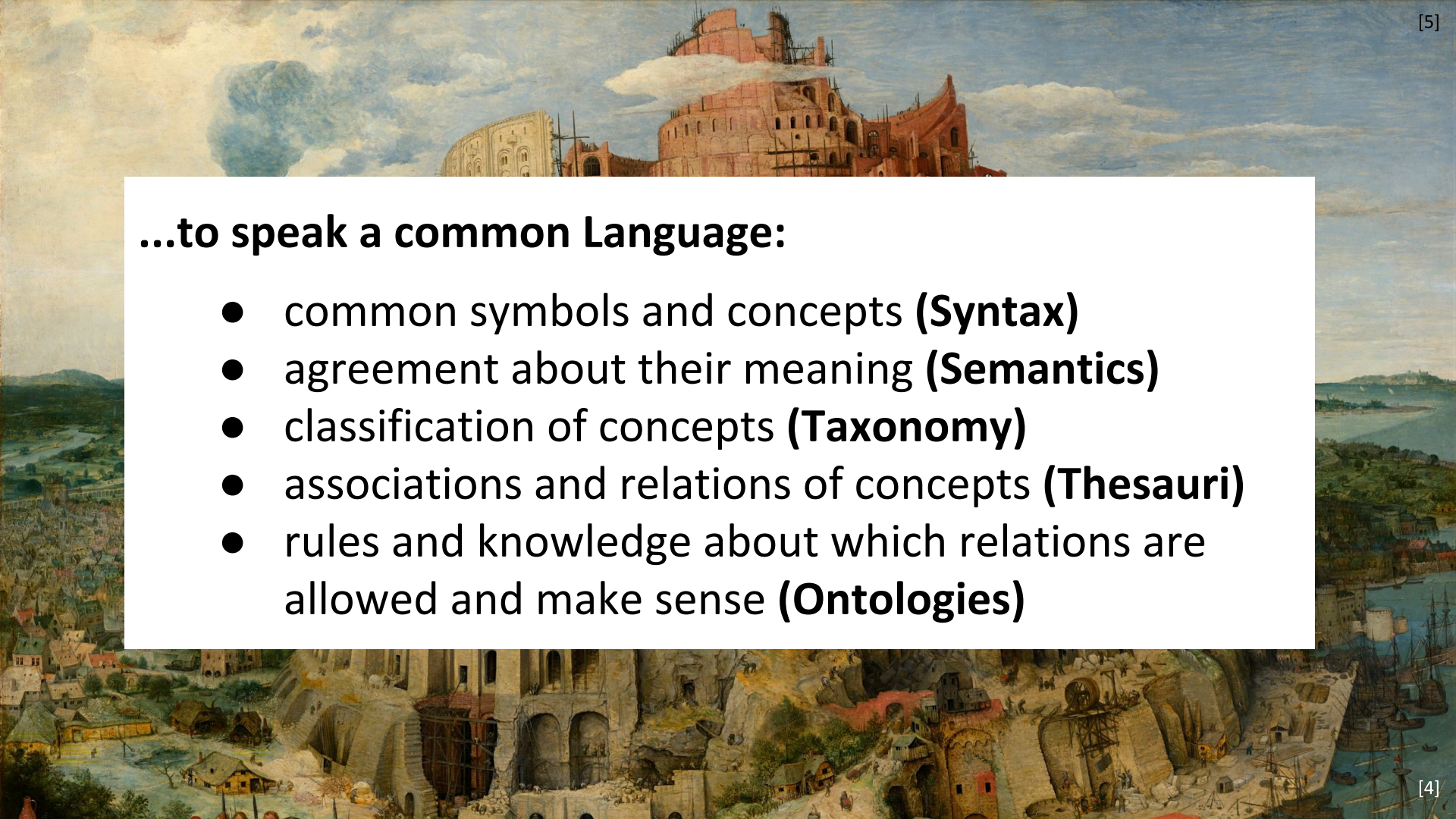
Traditional Definition: „*Knowledge is a justified subset of all true beliefs*“

To represent knowledge, we need a **formal knowledge representation** = **Ontologies**

[5]

„People can‘t share knowledge if they don‘t speak a common language“

Thomas Davenport (1997) [4]

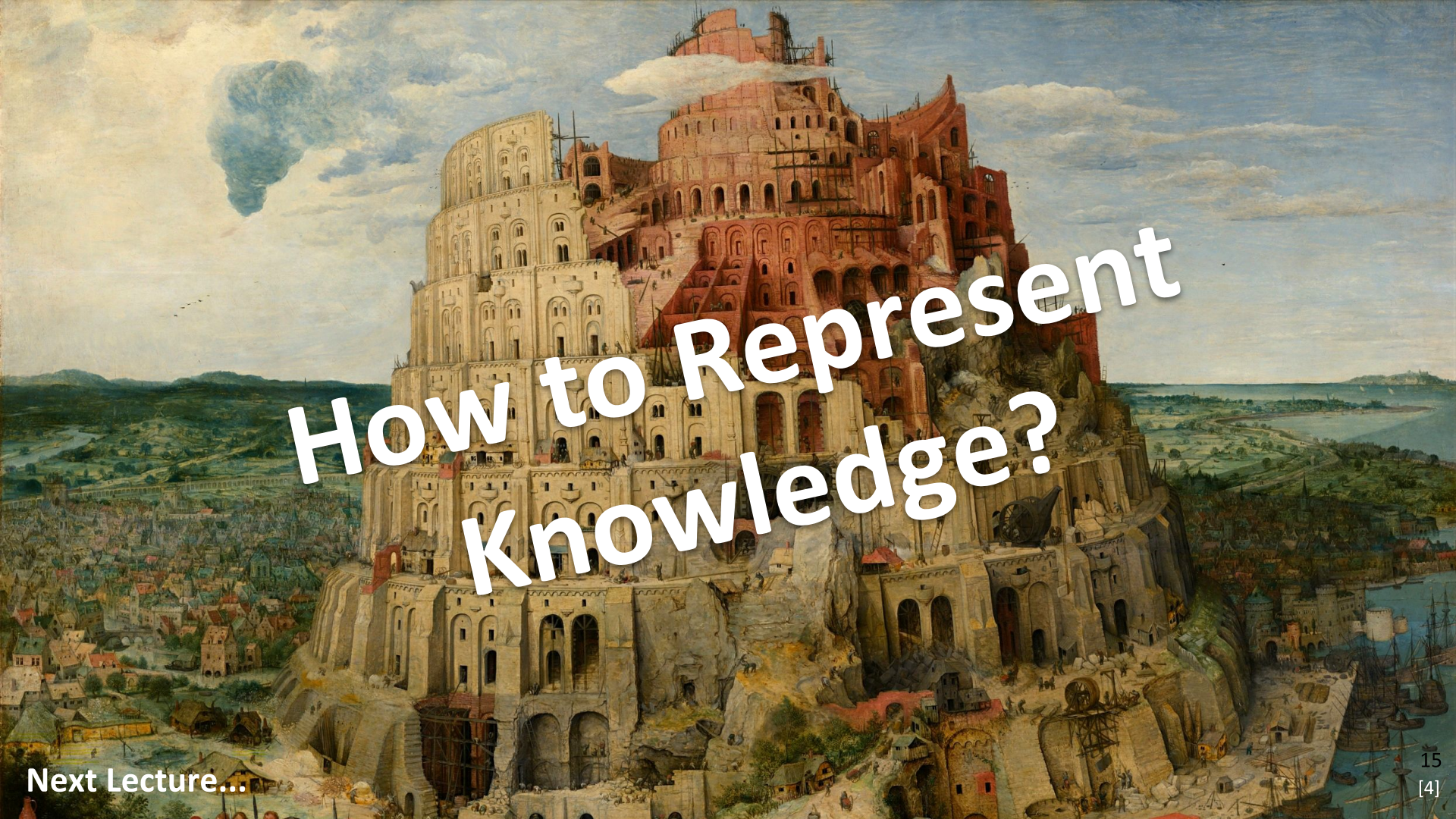


...to speak a common Language:

- common symbols and concepts **(Syntax)**
- agreement about their meaning **(Semantics)**
- classification of concepts **(Taxonomy)**
- associations and relations of concepts **(Thesauri)**
- rules and knowledge about which relations are allowed and make sense **(Ontologies)**

[5]

[4]



Next Lecture…

[4]

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Picture References:

- [1] Matrix Computer Screen, https://pixabay.com/illustrations/matrix-code-computer-pc-data-356024/
- [2] UBC Library Card Catalog, Paul Joseph, cc-by-2.0, https://commons.wikimedia.org/wiki/File:2009_3544505541_card_catalog.jpg
- [3] Tree of knowledge based on the French Encyclopedie from 1780, https://commons.wikimedia.org/wiki/File:Essai_d%27une_distribution_g%C3%A9n%C3%A9alogique_des_sciences_et_des_arts_principaux,_1780.jpg
- [4] Pieter Bruegel the Elder, The Tower of Babel (1563) https://commons.wikimedia.org/wiki/File:Pieter_Bruegel_the_Elder_-_The_Tower_of_Babel_(Vienna)_-_Google_Art_Project.jpg