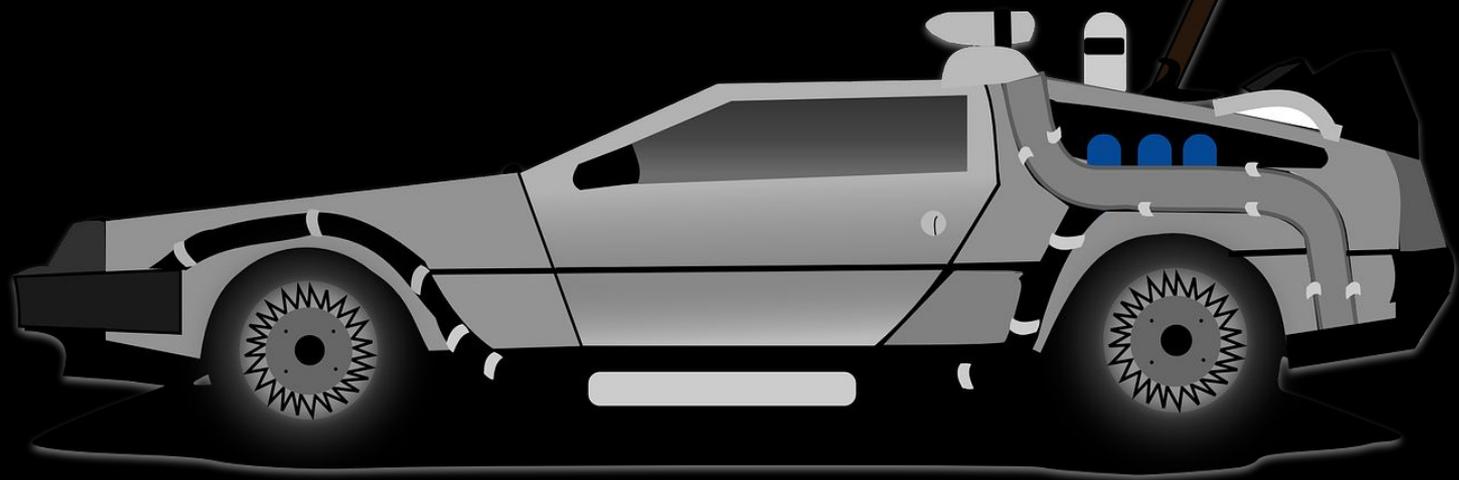


“Die Welt ist klein und man trifft sich immer zweimal...”



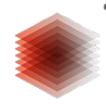
oder
Forschungsdateninfrastrukturen und die Renaissance der Normdaten

Prof. Dr. Harald Sack
GNDCon 2.0
Frankfurt, 7. Juni 2021



2011





2011



Digitalisierung ▶ visuelle Analyse ▶ semantische Analyse ▶ semantische Annotation



[4]

Digitalisierung ▶ **visuelle Analyse** ▶ semantische Analyse ▶ semantische Annotation

01 Einführung, Kommunikationsmedium Internet Dr. Harald Sack
Rechnernetze und Internettechnologie

To bookmark current scene,
right mouse click [here](#).

Tagging | Lecture Series | Slides | Discussions

my all Tags current all Video(s)

1500bc ablauf agamemnon
ägypten aischylos alphabet
alteuropäisch alteuropäische
altsumerisch amalia amman analical

anekdote

anna
annaamalia antike archivierung
artefakte österreich attischer augustus
ausprache austausch autoren bücher
babbage babylon bagdad balkan
bandbreite bandkeramik bankkeramik
bedeutung beförderung begrenzung belgien
belgrad bell bernstein bestattung
bestattungsunternehmer bibliothek
blog boten botenstaffetten brand brief
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top 50 | all

new tag

Rechnernetze und Internettechnologien

1.1 Kommunikationsmedien - von der Höhlenmalerei zu HDTV

Entwicklung der Schrift (3/5)



Babylonische Keilschrift
ab ca. 3500 v. Chr.



Ägyptische
ab ca. 3000 v. Chr.



Rechnernetze und Internettechnologien

1.1 Kommunikationsmedien - von der Höhlenmalerei zu HDTV

Entwicklung der Telekommunikation (1/5)

- Telefon und Individualkommunikation
 - 1. Jhd. v. Chr. - Katakomben-Fibel, Selbstverleumdung
 - 10. Jhd. - Ismael Nasir's Fingerring
 - 1875, Philip Reis, erster Telephonversuch
 - 1876, A.G. Bell und E. Gray, erstes Telefon
 - 1885, Gründung der AT&T
 - 1898, A.S. Bruggen, Selbstverleumdung
 - 1902, Ismael Nasir's Fingerring



Corpuslinguistik
Statistische Lernverfahren
Explizite Wissensrepräsentationen

unstrukturierte Daten
Audio, Video, Bilder & Texte



Digitalisierung ▶ visuelle Analyse ▶ **semantische Analyse** ▶ **semantische Annotation**

Search for people, places, topics ... Search

05 Semantic Web Technologien - Ontologies



Platon
(427-347 BC)

Ontology in Classical Greek Philosophy

Platons Cave Parabel

- from Platon's 'Politeia', 7. Book, ca. 370 BC

★

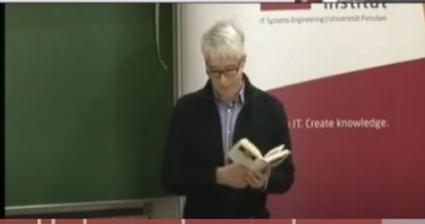




HÖHLE ANGEKETTET. SEHEN NUR SCHATTEN. WIRKLICHKEIT HALTEN.

EINER ENTKOMMT. ER VERLÄSST DIE HÖHLE UND SIEHT DIE WÄHRLEICHE WELT.

ER KEHRT ZURÜCK, DOCH ER SCHEINT, BENOMMEN VOM LICHT, DÜMMER ALS ZUVOR.



32:04 | 01:30:18

SERIES ANNOTATIONS TRANSCRIPT

Search ...

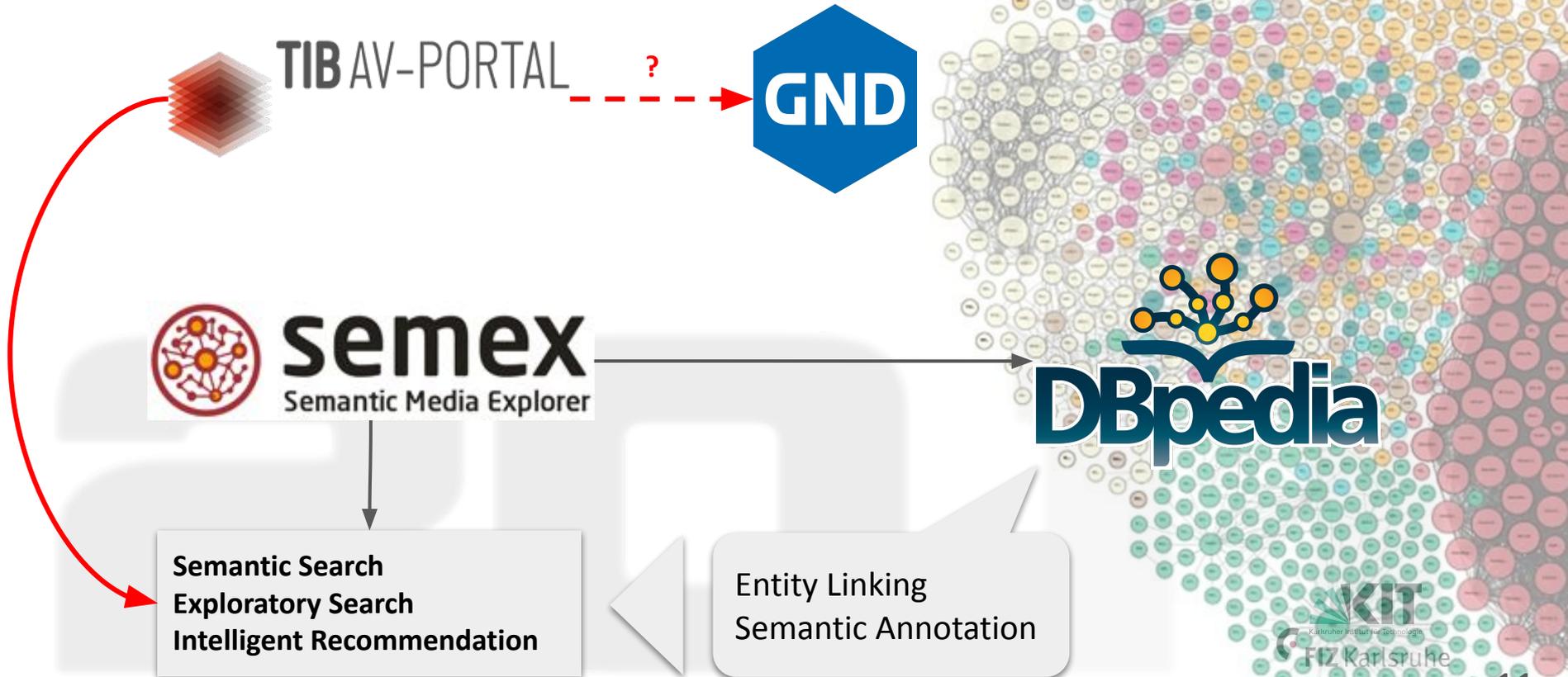
Speech Text Image

- Beam (structure)
- Social class
- Platonic solid
- Series (mathematics)
- Quantum state
- SOKRATES <Bibliotheksinformationssystem>
- ACID
- Set (mathematics)
- Term (mathematics)
- Category of being
- Position
- Bioinformatik
- Systems <München>
- Predicate (grammar)
- Graph minor
- Abbildung <Physik>
- MUISE <Lernprogramm>
- Object (grammar)
- Curve fitting

Innovative Informationssysteme

- verbessertes Retrieval
- Semantische Suche
- Explorative Suche
- Ähnlichkeitsbasierte Suche
- Intelligente Empfehlungen

GND und Semantic Web?



Problem 1: Ambiguität und (fehlender) Kontext

GND	
Link zu diesem Datensatz	http://d-nb.info/gnd/4190617-2
Sachbegriff	Zeitreise ←
Quelle	Spektrum Lex. Physik
Erläuterungen	Verwendungshinweis: Ohne HZ Motiv
Synonyme	Zeitmaschine Zeitreise <Motiv>
Oberbegriffe	Beispiel für: Motiv
Systematik	12.4 Literarische Motive, Stoffe, Gestalten ; 13.1c Sachliche Motive in der Kunst
Typ	Zweifelsfall (szz)
Andere Normdaten	LCSH: Time travel RAMEAU: Voyages dans le temps
Thema in	1290 Publikationen 1. [Magic tree house] Das magische Baumhaus Leipzig : Deutsche Nationalbibliothek, 2021 2. Die Rückkehr der Templer Leipzig : Deutsche Nationalbibliothek, 2021 3. ...
Maschinell verknüpft mit	151 Publikationen 1. Außendienst Weber-Lortsch, Christian-Ludwig. - Wiesbaden : Springer Fachmedien Wiesbaden, 2021, 1. Auflage 2021 2. Bernár auf Zeitreise Stachel, Wolf. - Berlin : epubli, 2021, 2. Auflage 3. ...

GND

Alle Normdaten

- Personen (1)
- Werke (12)
- Sachbegriffe (1)
- Organisationen (6)
- Veranstaltungen (20)
- Musiklabel (1)

Problem 2: Vollständigkeit und Updatezyklen

	
Link zu diesem Datensatz	http://d-nb.info/gnd/4190617-2
Sachbegriff	Zeitreise
Quelle	Spektrum Lex. Physik
Erläuterungen	Verwendungshinweis: Ohne HZ Motiv
Synonyme	Zeitmaschine Zeitreise <Motiv>
Oberbegriffe	Beispiel für: Motiv
Systematik	12.4 Literarische Motive, Stoffe, Gestalten ; 13.1c Sachliche Motive
Typ	Zweifelsfall (szz)
Andere Normdaten	LCSH: Time travel RAMEAU: Voyages dans le temps
Thema in	1290 Publikationen <ol style="list-style-type: none"><i>[Magic tree house]</i> <i>Das magische Baumhaus</i> Leipzig : Deutsche Nationalbibliothek, 2021<i>Die Rückkehr der Templer</i> Leipzig : Deutsche Nationalbibliothek, 2021...
Maschinell verknüpft mit	151 Publikationen <ol style="list-style-type: none"><i>Außendienst</i> <i>Weber-Lortsch, Christian-Ludwig. - Wiesbaden : Springer</i> 1. Auflage 2021<i>Bernár auf Zeitreise</i> <i>Stachel, Wolf. - Berlin : epubli, 2021, 2. Auflage</i>...



WIKIPEDIA
Die freie Enzyklopädie

Zeitreise (Begriffsklärung)

Zeitreise steht für:

- **Zeitreise**, Bewegung in der Zeit
- **Zeitreise (Geodaten)**, Bewegung in der Zeit als Darstellung von Geodaten
- Leben von Schauspielern in einer der Vergangenheit nachempfundenen Umgebung, siehe [Living History](#)
- Fernsehsendung auf [N24](#)
- **Zeitreise (Unheilig-Album)**, Musikalbum der deutschen Rockband Unheilig
- **Zeitreise (Schiller-Album)**, Musikalbum des deutschen Musikprojekts Schiller
- **Zeitreise Live**, Musikalbum des deutschen Musikprojekts Schiller
- **Terra X: Zeitreise**, dreiteilige Dokumentation der [Terra X](#) Reihe von 2014

Siehe auch:

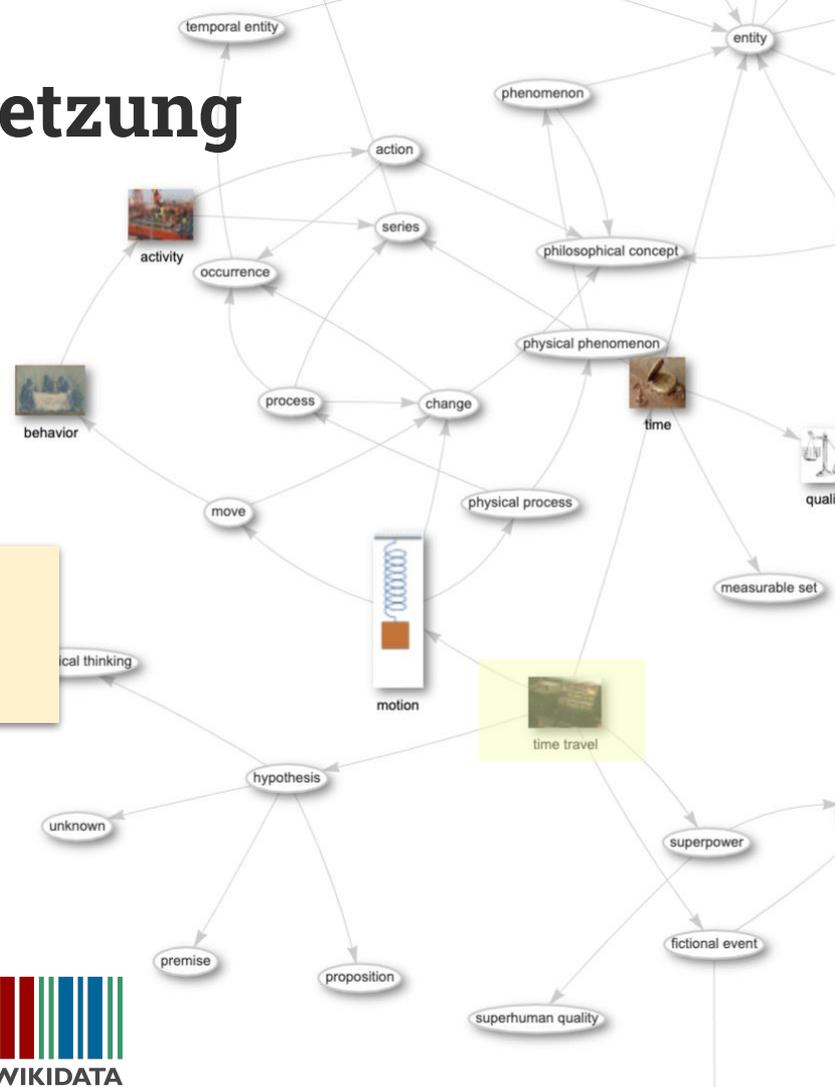
- [Zeitreihe](#)

Problem 3: fehlende Quervernetzung

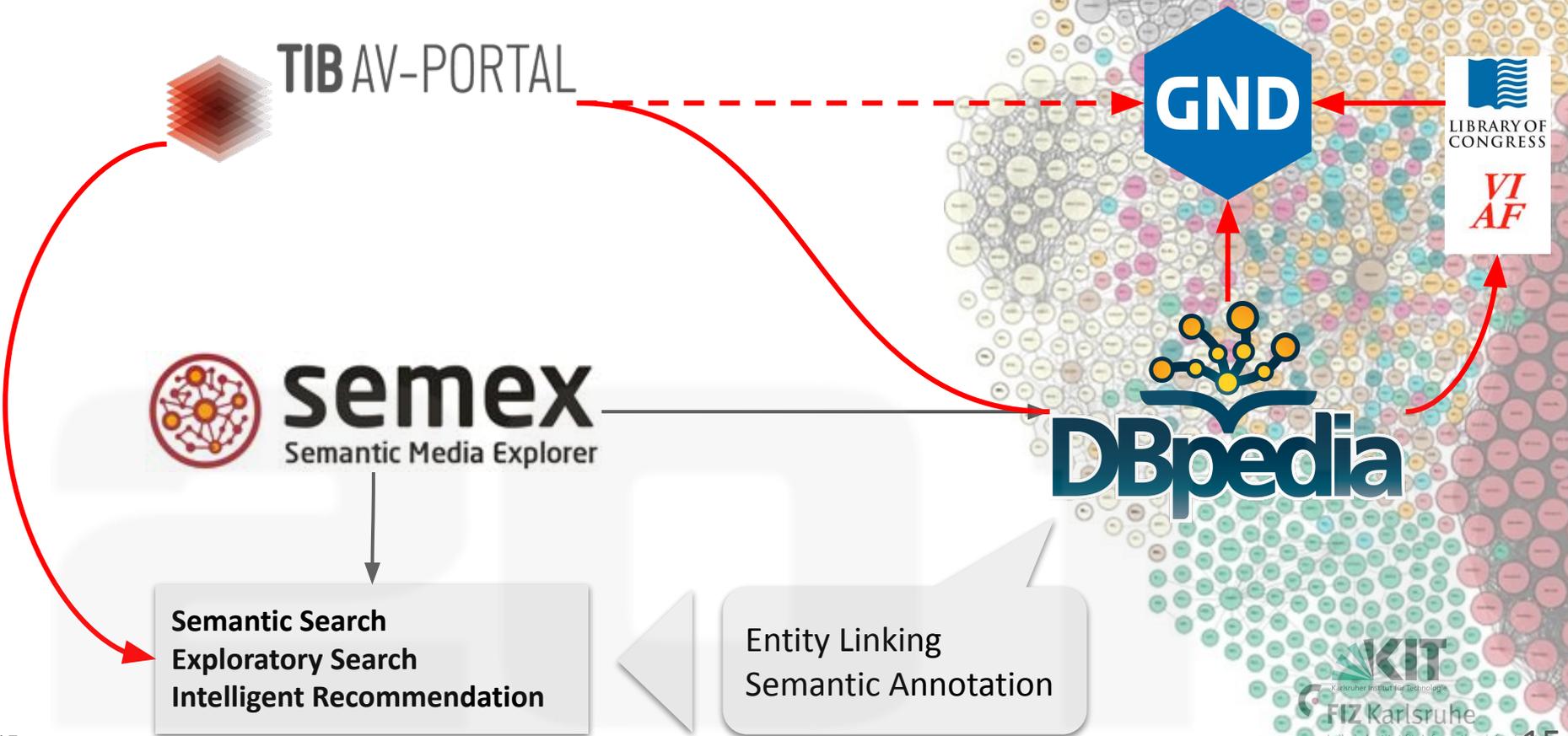
GND	
Link zu diesem Datensatz	http://d-nb.info/gnd/4190617-2
Sachbegriff	Zeitreise
Quelle	Spektrum Lex. Physik
Erläuterungen	Verwendungshinweis: Ohne HZ Motiv
Synonyme	Zeitmaschine Zeitreise <Motiv>
Oberbegriffe	Beispiel für: Motiv
Systematik	12.4 Literarische Motive, Stoffe, Gestalten ; 13.1c Sachliche Motive in der Kunst
Typ	Zweifelsfall (szz)
Andere Normdaten	LCSH: Time travel RAMEAU: Voyages dans le temps
Thema in	1290 Publikationen <ol style="list-style-type: none"> [<i>Magic tree house</i>] <i>Das magische Baumhaus</i> Leipzig : Deutsche Nationalbibliothek, 2011 <i>Die Rückkehr der Templer</i> Leipzig : Deutsche Nationalbibliothek, 2021 ...
Maschinell verknüpft mit	151 Publikationen <ol style="list-style-type: none"> <i>Außendienst</i> Weber-Lortsch, Christian-Ludwig. - Wiesbaden : Springer Fachmedien Wiesbaden, 1. Auflage 2021 <i>Bernár auf Zeitreise</i> Stachel, Wolf. - Berlin : epubli, 2021, 2. Auflage ...

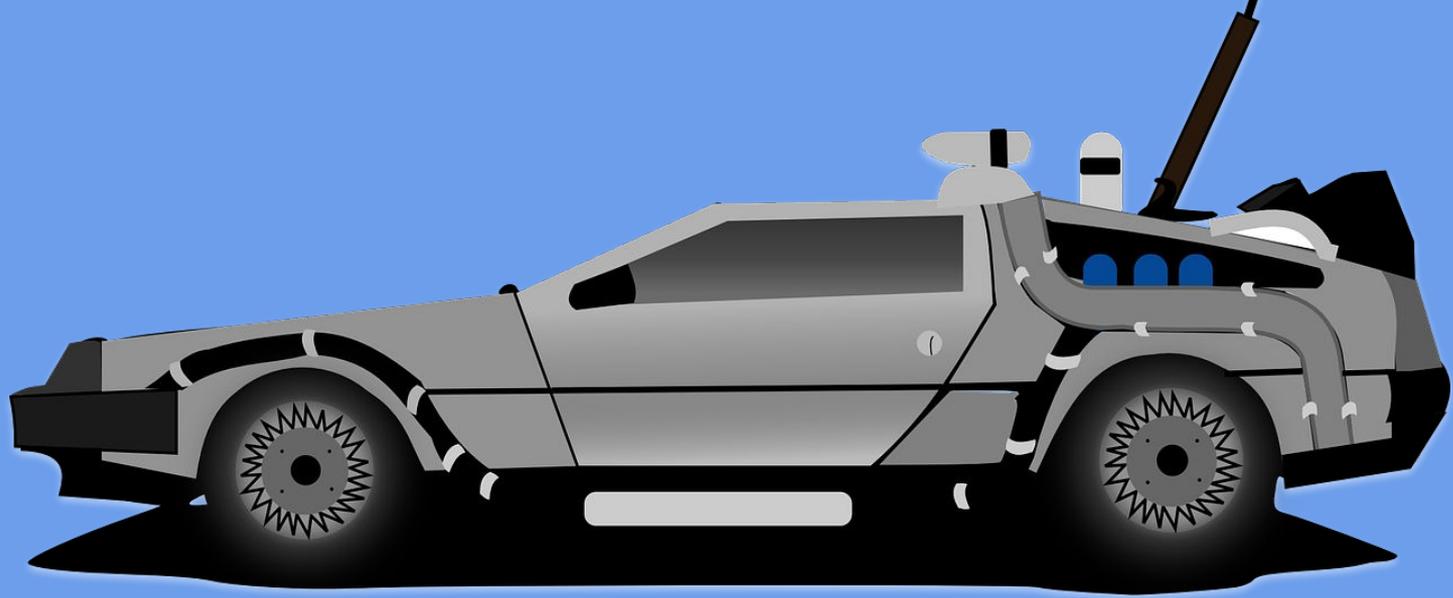


- Einfache Taxonomie
- Systematik als Kategoriensystem



Auf Umwegen ins Semantic Web





2021



Geisteswissenschaften

Naturwissenschaften

Lebenswissenschaften

Sozialwissenschaften

Ingenieurwissenschaften

Forschungsdaten



Forschungs- datensilos

- Forschungsdaten abgeschlossen in **lokalen Datensilos**
- Zugriff nur via **proprietäre APIs**
- Ohne **spezielles Vorwissen** können Forschungsdaten kaum gefunden werden
- **Quervernetzung** zwischen Datenrepositorien **nahezu unmöglich**
- **FAIR Prinzipien** sind oft nur **unzureichend** umsetzbar

vernetzte Forschungsdaten



Beispiel 1:

-21

-21°
24.000

-21°
24.000
Smolensk

-21°
24.000
Smolensk

14. November 1812

	A	B	C	D	E	F	G	H	I
1	24	55	37.6	0	18	Oct	24	54.9	340000
2	25.3	54.7	36	0	24	Oct	24.5	55	340000
3	26.4	54.4	33.2	-9	9	Nov	25.5	54.5	340000
4	26.8	54.3	32	-21	14	Nov	26	54.7	320000
5	27.6	53.9	28.5	-20	28	Nov	28	54.9	280000
6	28.5	54.3	27.2	-24	1	Dec	28.5	55	240000
7	28.7	55.5	26.7	-20	6	Dec	29	55.1	210000
8	29.2	54.4	25.3	-25	7	Dec	30	55.2	180000
9	30.2	55.3	30.3				34.3	55.2	55000
10	30.4	54.5	32				33.3	54.8	37000
11	30.4	53.9	32				32	54.6	24000
12	32	54.8	34.4				30.4	54.4	20000
13	33.2	54.9	35.5				29.2	54.4	20000
14	34.3	55.2	36				28.5	54.3	20000
15	34.4	55.5	37.6				28.3	54.4	20000
16	36	55.5	37.5				24	55.1	60000
17	37.6	55.8	37				24.5	55.2	40000
18	36.6	55.3	36				25.5	54.7	40000
19	36.5	55	35.4				26.6	55.7	40000

-21°

24.000

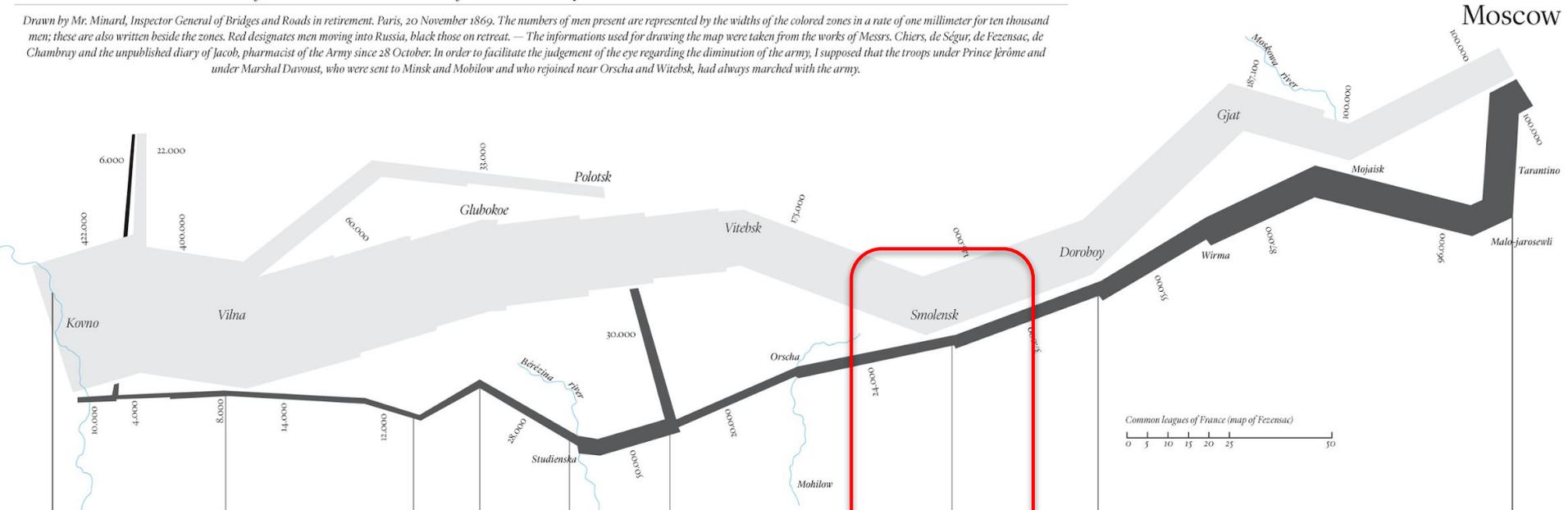
Smolensk

14. November 1812

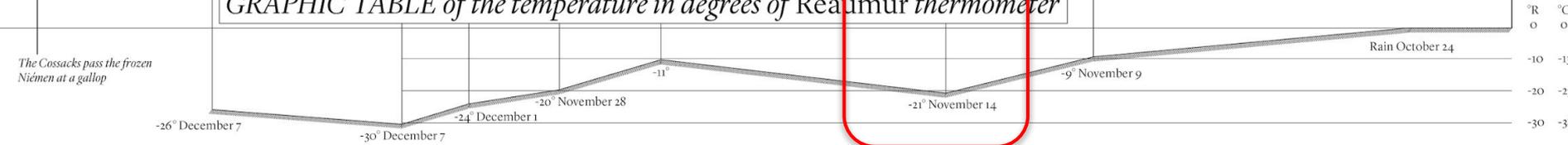


FIGURATIVE MAP of the successive losses in men of the French Army in the RUSSIAN CAMPAIGN OF 1812-1813

Drawn by Mr. Minard, Inspector General of Bridges and Roads in retirement, Paris, 20 November 1869. The numbers of men present are represented by the widths of the colored zones in a rate of one millimeter for ten thousand men; these are also written beside the zones. Red designates men moving into Russia, black those on retreat. — The informations used for drawing the map were taken from the works of Messrs. Chiers, de Ségur, de Fezensac, de Chambray and the unpublished diary of Jacob, pharmacist of the Army since 28 October. In order to facilitate the judgement of the eye regarding the diminution of the army, I supposed that the troops under Prince Jérôme and under Marshal Davoust, who were sent to Minsk and Mohilow and who rejoined near Orscha and Witebsk, had always marched with the army.



GRAPHIC TABLE of the temperature in degrees of Réaumur thermometer



The Cossacks pass the frozen Niemen at a gallop

Infographics by **Charles Minard** (1781-1870) from data of Napoleon's Russian Campaign 1812/13



Beispiel 2:

14

14 m

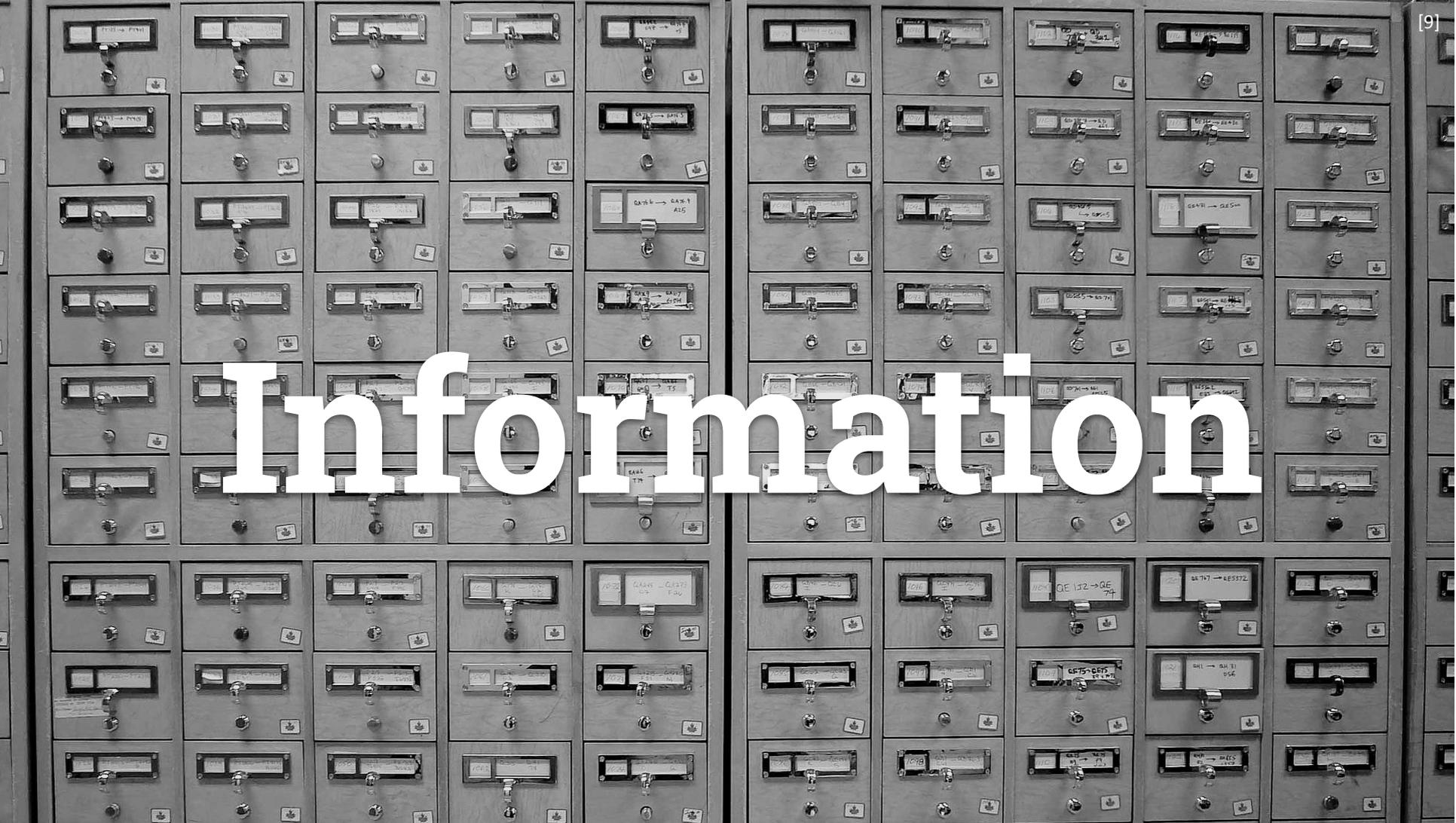
— 14 m —



14 m

Daten

Information





**„People can't share knowledge
if they don't speak a common language“**

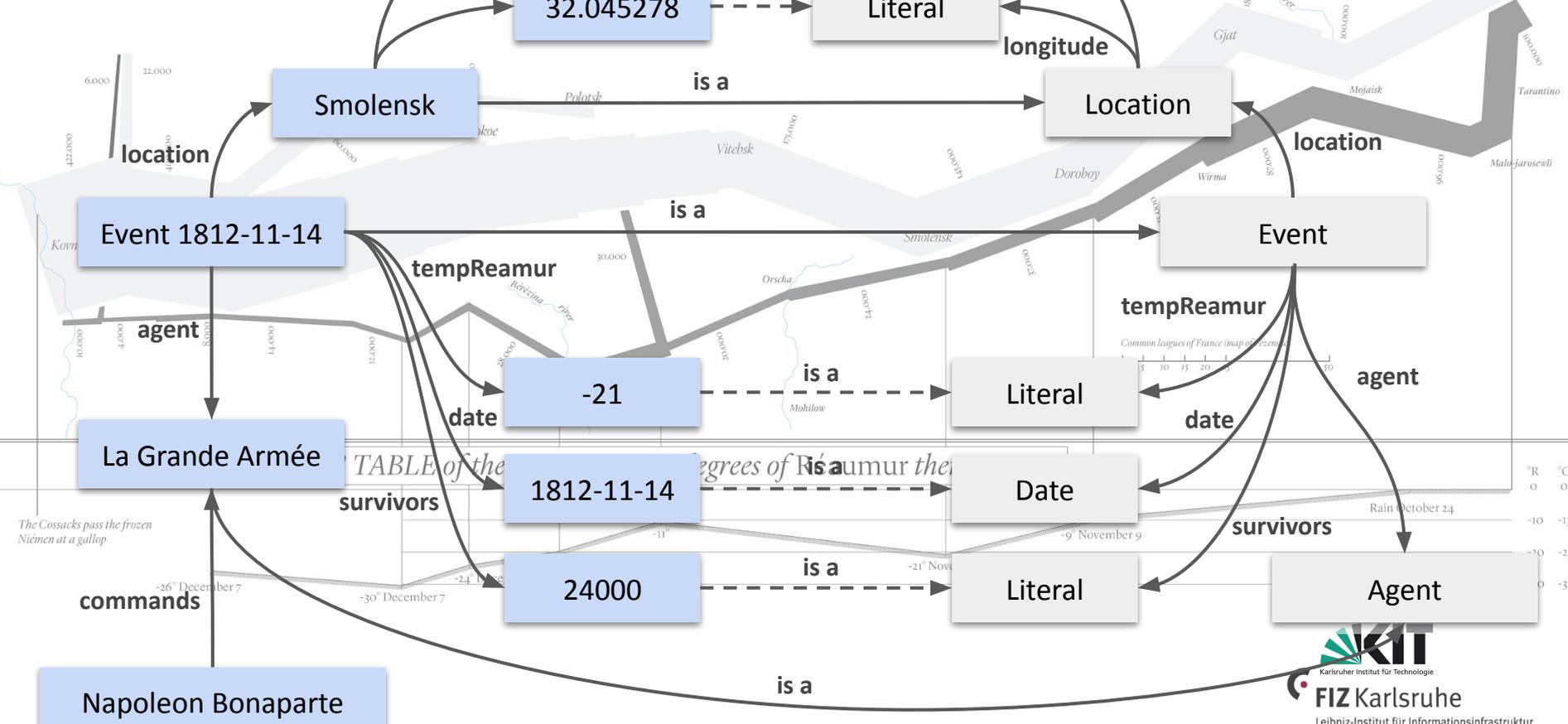
Thomas Davenport (1997)

...eine gemeinsame Sprache sprechen:

- Gemeinsame Symbole und Konzepte (**Syntax**)
- Übereinkunft über deren Bedeutung (**Semantik**)
- Klassifikation von Konzepten (**Taxonomien**)
- Assoziationen und Relationen zwischen Konzepten (**Thesauri**)
- Regeln darüber, welche Relationen erlaubt sind und Sinn machen (**Ontologien**)

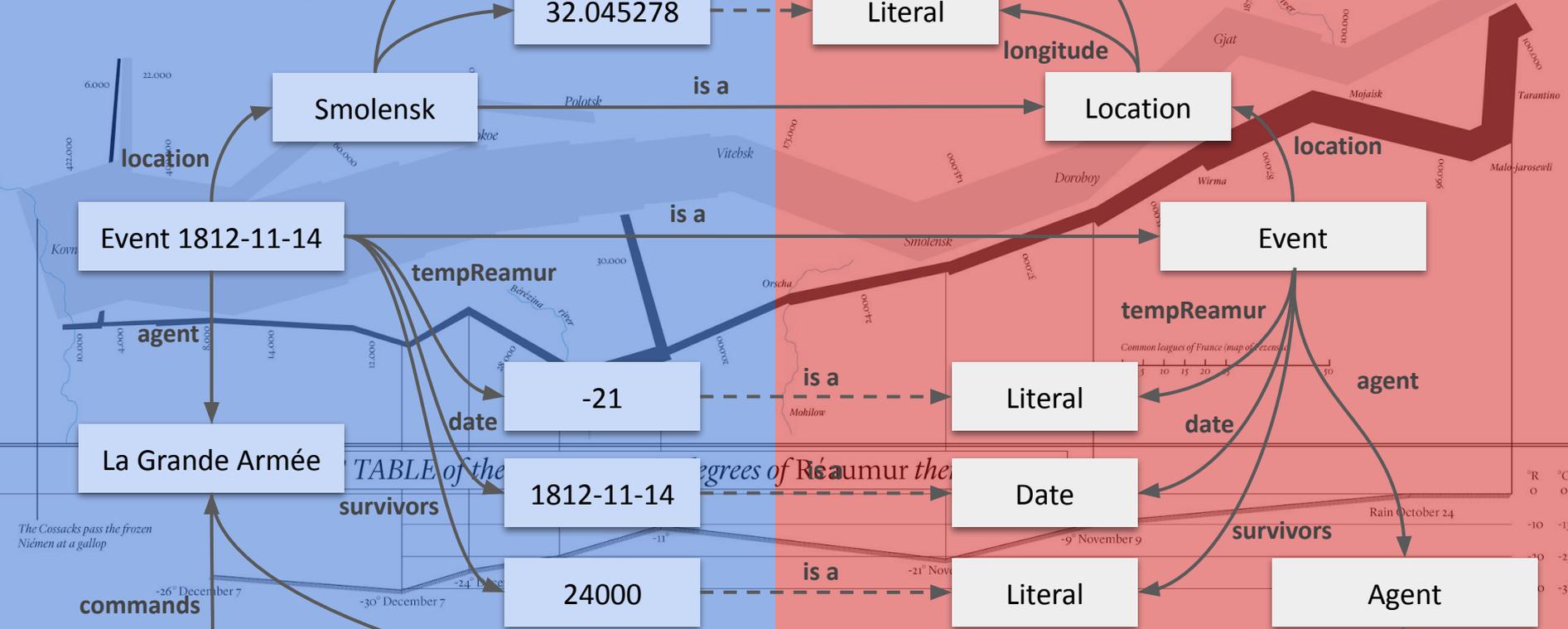
FIGURATIVE MAP of the successive losses in men of the E...

Drawn by Mr. Minard, Inspector General of Bridges and Roads in retirement. Paris, 20 November 1869. The men; these are also written beside the zones. Red designates men moving into Russia, black those on retreat. — The informations used for drawing the map were taken from the works of Messrs. Chiers, de Ségur, de Feneznac, de Chambray and the unpublished diary of Jacob, pharmacist of the Army since 28 October. In order to facilitate the indentment of the map regarding the diminution of the army, I have always is a



FIGURATIVE MAP of the successive losses in men of the Emperor

Drawn by Mr. Minard, Inspector General of Bridges and Roads in retirement. Paris, 20 November 1869. The numbers written beside the zones indicate the number of men remaining at each stage. Red designates men moving into Russia, black those on retreat. — The informations used for drawing the map were taken from the works of Messrs. Chiers, de Ségur, de Pezencas, de Chambray and the unpublished diary of Jacob, pharmacist of the Army since 28 October. In order to facilitate the comparison of the losses, the number of men always is written with the date under Marshal Davoust, who were sent to Minsk and Mohilow and who were killed by the Russians.



54.782778
32.045278

Literal
Literal

1913
latitude
longitude
Location

Smolensk

Location

Event 1812-11-14

Event

La Grande Armée

-21

Literal

1812-11-14

Date

24000

Literal

Agent

Napoleon Bonaparte

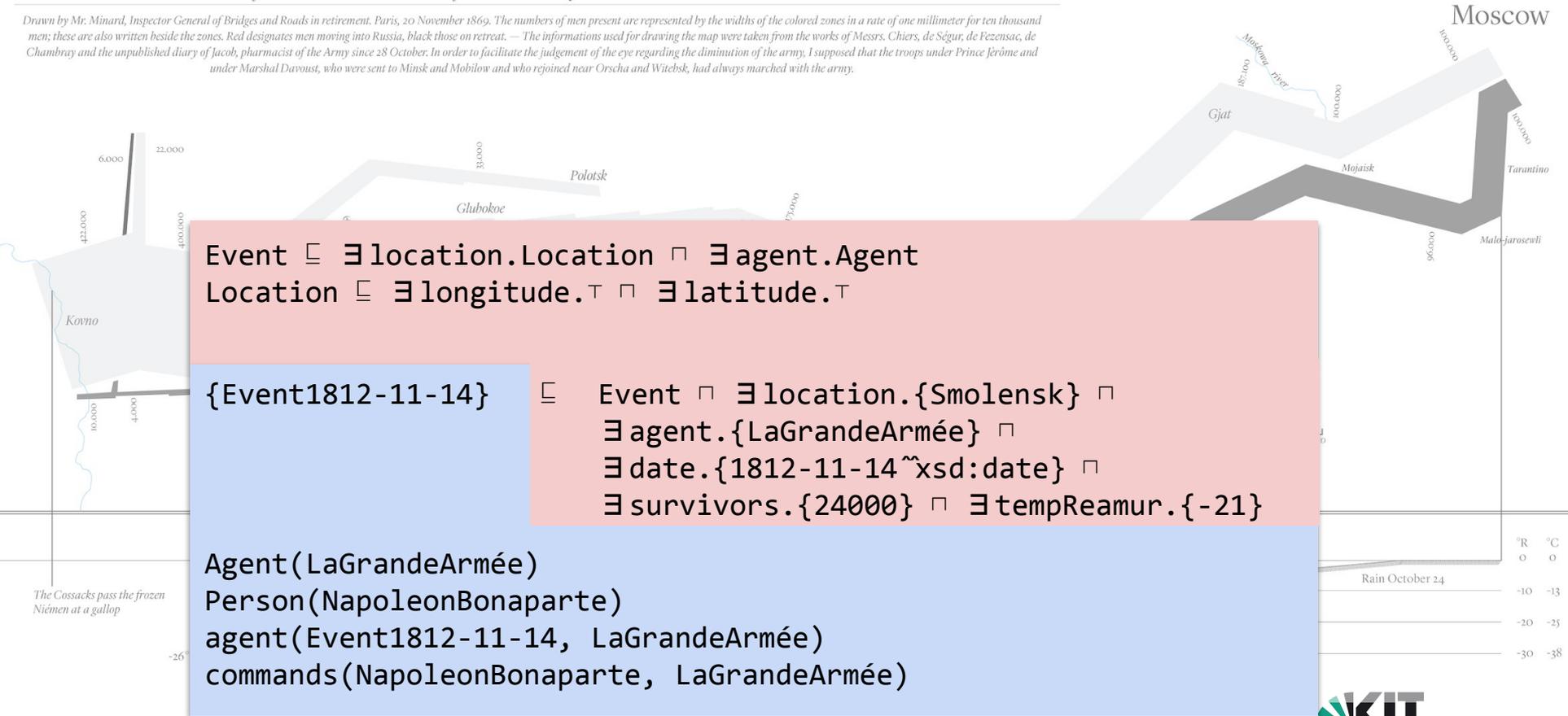
Assertionales Wissen

Terminologisches Wissen

is a

FIGURATIVE MAP of the successive losses in men of the French Army in the RUSSIAN CAMPAIGN OF 1812-1813

Drawn by Mr. Minard, Inspector General of Bridges and Roads in retirement. Paris, 20 November 1869. The numbers of men present are represented by the widths of the colored zones in a rate of one millimeter for ten thousand men; these are also written beside the zones. Red designates men moving into Russia, black those on retreat. — The informations used for drawing the map were taken from the works of Messrs. Chiers, de Ségur, de Fenezac, de Chambray and the unpublished diary of Jacob, pharmacist of the Army since 28 October. In order to facilitate the judgement of the eye regarding the diminution of the army, I supposed that the troops under Prince Jérôme and under Marshal Davoust, who were sent to Minsk and Mobilow and who rejoined near Orscha and Witebsk, had always marched with the army.

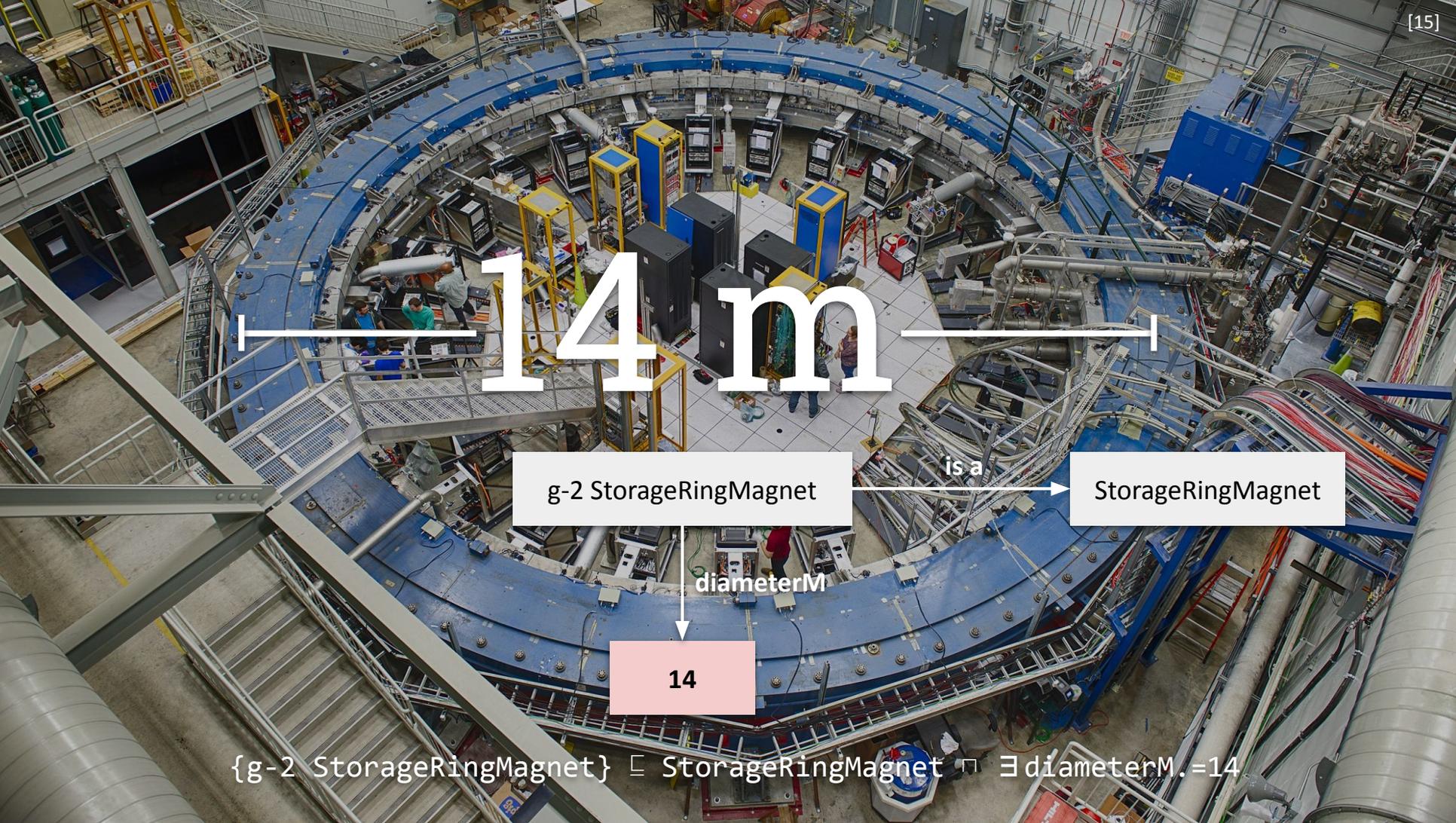


Event \sqsubseteq \exists location.Location \sqcap \exists agent.Agent
 Location \sqsubseteq \exists longitude. \top \sqcap \exists latitude. \top

{Event1812-11-14} \sqsubseteq Event \sqcap \exists location.{Smolensk} \sqcap
 \exists agent.{LaGrandeArmée} \sqcap
 \exists date.{1812-11-14 ~xsd:date} \sqcap
 \exists survivors.{24000} \sqcap \exists tempReamur.{-21}

Agent(LaGrandeArmée)
 Person(NapoleonBonaparte)
 agent(Event1812-11-14, LaGrandeArmée)
 commands(NapoleonBonaparte, LaGrandeArmée)

The Cossacks pass the frozen Niemen at a gallop



14 m

g-2 StorageRingMagnet

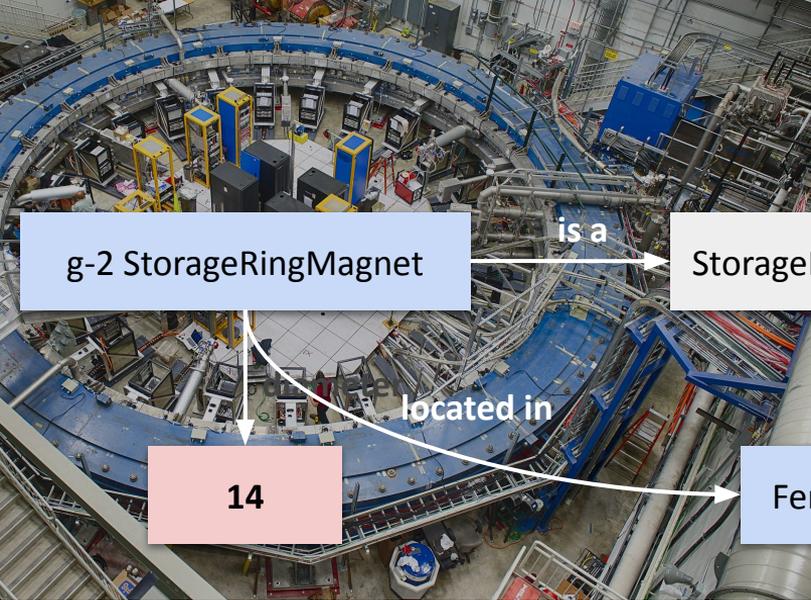
StorageRingMagnet

is a

diameterM

14

{g-2 StorageRingMagnet} ⊆ StorageRingMagnet ⊃ ∃ diameterM.=14



g-2 StorageRingMagnet

is a

StorageRingMagnet

part of

Experiment

Exhibit

14

located in

FermiLab

located in

conducted at

Laboratory

→ ≠ ←

Gallery

exhibited at

located in

Batavia, Illinois

located in

Location

is a

located in

```
{g-2 StorageRingMagnet} ⊆ StorageRingMagnet ⊧ ∃ diameterM.=14 ⊧ ∃ locatedIn.{FermiLab}
{FermiLab} ⊆ Laboratory ⊧ ∃ locatedIn.{BataviaIllinois}
Location(BataviaIllinois)
```

```
StorageRingMagnet ⊆ Thing
Laboratory ⊆ Thing
Gallery ⊆ Thing
```

```
locatedIn(Thing, Location)
partOf(StorageRingMagnet, Experiment)
Laboratory ⊧ Gallery ≡ ∅
```

```
conductedAt(Experiment, Laboratory)
exhibitedAt(Exhibit, Gallery)
```



Vernetzte Forschungsdaten

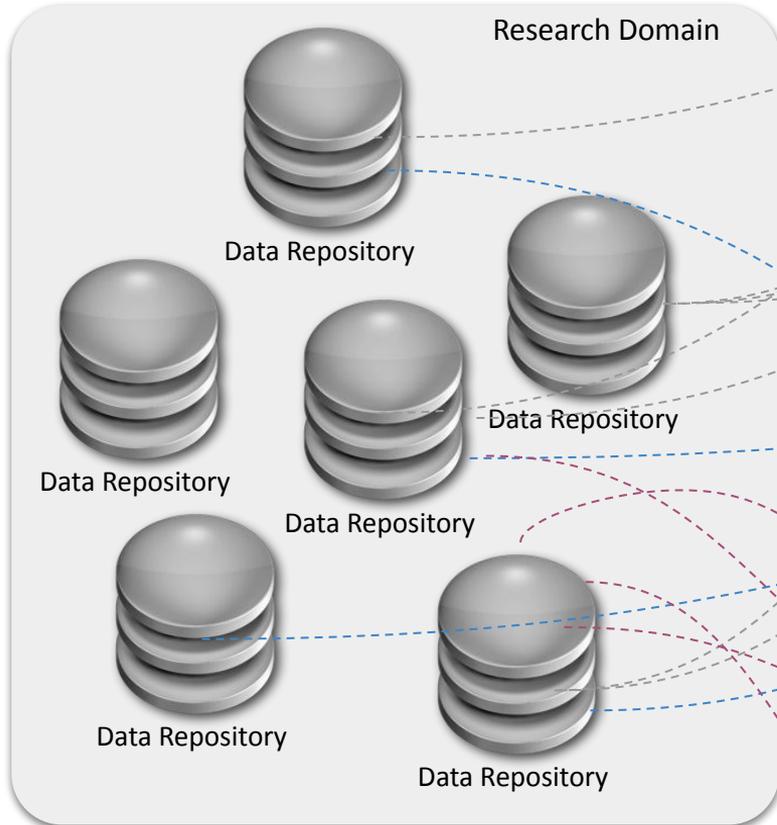


- **Standardisierung** von Metadaten
- Nutzung von **Normdaten** →
- **Ontologien** und semantische Technologien
- **Wissensgraphen**
- Umsetzung der **FAIR Prinzipien**
 - **F**indability
 - **A**ccessibility
 - **I**nteroperability
 - **R**eusable



FAIR Research Data Management

with Ontologies and Knowledge Graphs



Knowledge Graphs

Implement all 4 FAIR Principles

- **F**indability
- **A**ccessibility
- **I**nteroperability und
- **R**eproducibility

for Research Data Management

Knowledge Graph 1

Knowledge Graph 2



Problem 2: Vollständigkeit und Updatezyklen Revisited...

time travel (Q182154)

concept of moving between different points in time
 chronoportation

[edit](#)

▼ In more languages

Configure

Language	Label	Description	Also known as
English	time travel	concept of moving between different points in time	chronoportation
German	Zeitreise	ungewöhnliche, teilweise theoretisch mögliche Bewegung durch die Zeit	Zeitsprung Zeitreisen
French	voyage dans le temps	thématique de science fiction	machine à voyager dans le temps voyage temporel machine à remonter le temps remonter le temps
Bavarian	No label defined	No description defined	

All entered languages

Statements

instance of	superpower edit
	▼ 0 references + add reference
	hypothesis edit
	▼ 0 references + add reference + add value

subclass of	motion edit
	▼ 0 references + add reference
	fictional event edit
	▼ 0 references + add reference + add value



- Vokabulare, Metadaten, Normdaten & Wissensgraphen müssen sich laufend an Veränderungen anpassen.
- Typische Standardisierungszyklen sind zu lang.
- Die gesamte Nutzergemeinschaft sollte dabei mithelfen können.

time travel (Q182154)

concept of moving between different points in time
 chronoportation ✎ edit

▼ In more languages

Configure

Language	Label	Also known as
English	time travel	points in chronoportation
German	Zeitreise	theoretisch mögliche Bewegung durch die Zeit
French	voyage dans le temps	thématique de science-fiction de voyager dans le temps voyage temporel machine à remonter le temps remonter le temps
Bavarian		is not defined

All entered languages

Statements

instance of	<div> superpower ✎ edit </div> <div> ▼ 0 references </div>	<div> + add reference </div>
	<div> hypothesis ✎ edit </div> <div> ▼ 0 references </div>	<div> + add reference </div> <div> + add value </div>

subclass of	<div> motion ✎ edit </div> <div> ▼ 0 references </div>	<div> + add reference </div>
	<div> fictional event ✎ edit </div> <div> ▼ 0 references </div>	<div> + add reference </div> <div> + add value </div>



- **Probleme mit Wikibase:**

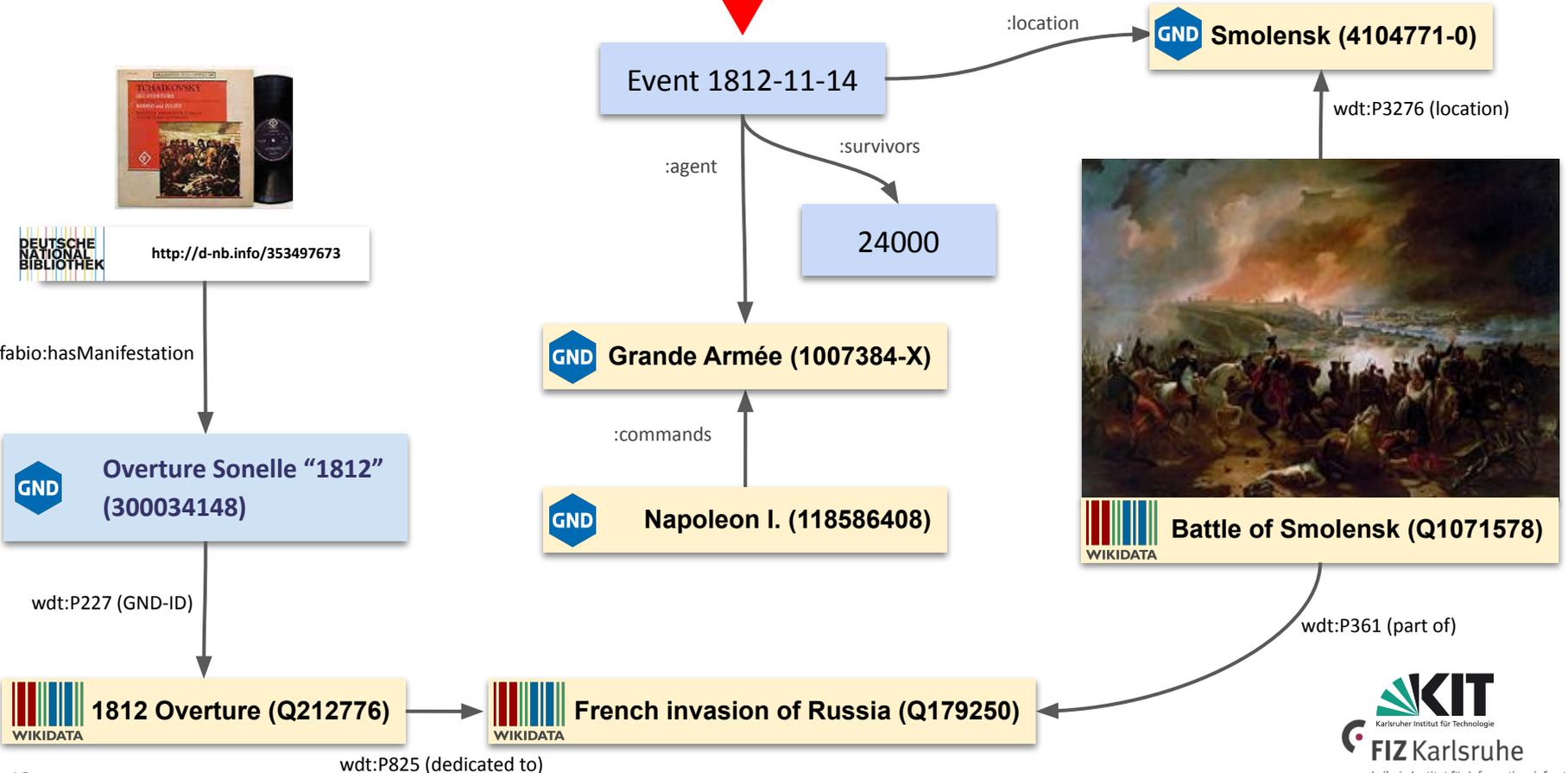
- Eingeschränkte Vernetzbarkeit
- kein W3C konformes Vokabular (RDF, RDFS, OWL) nutzbar
- keine **explizite Semantik** (damit auch kein **Reasoning** möglich)
- kein dezidiertes **Rechte- und Zugriffsmanagement**
- komplexe Architektur erfordert **aufwändige Anpassungen**
- Abhängigkeit von Wikimedia Foundation



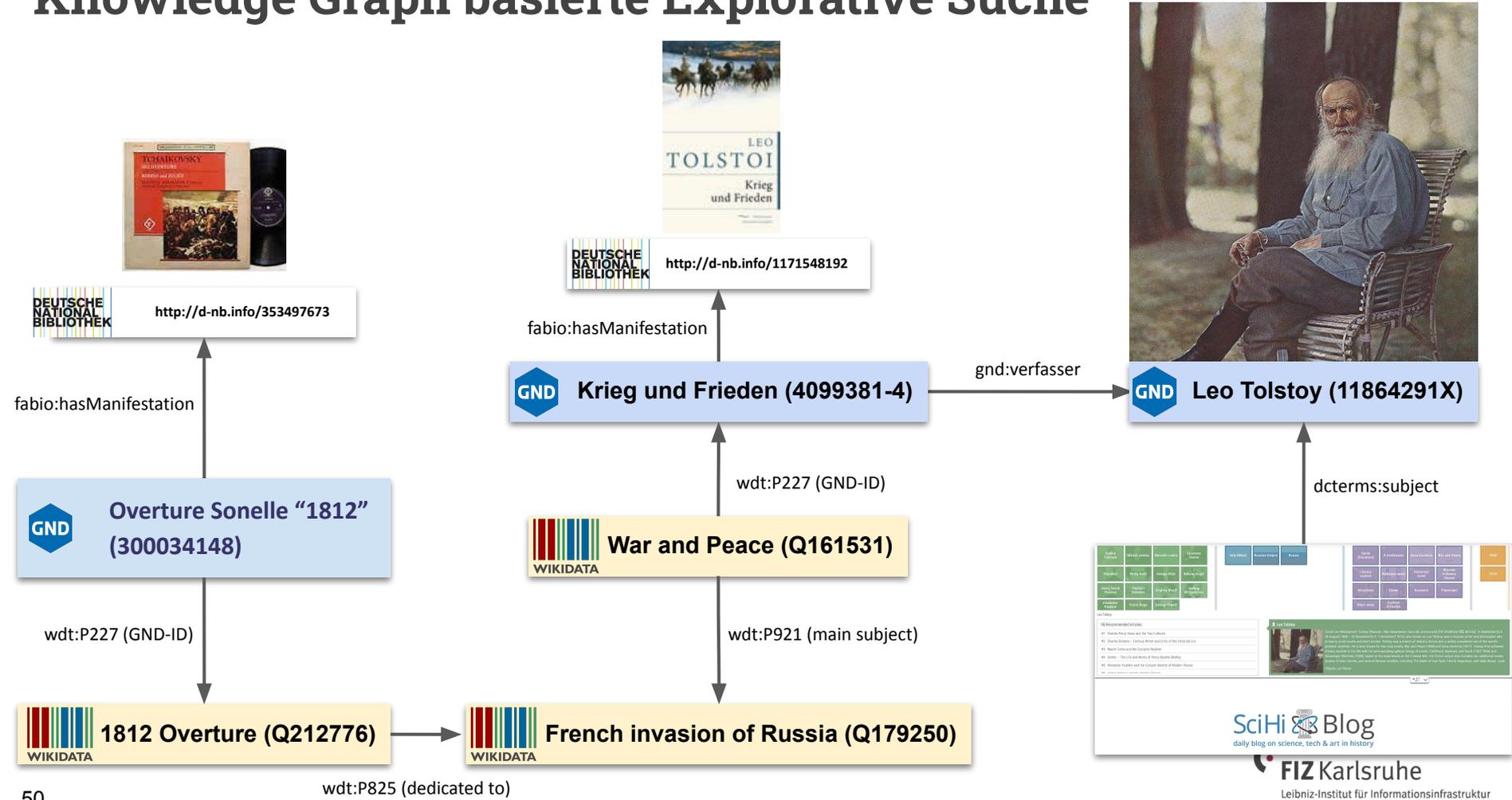
Innovative Informationssysteme

- Verbessertes Retrieval
- Föderierte Suche
- Semantische Suche
- **Explorative Suche**
- Ähnlichkeitsbasierte Suche
- **Intelligente Empfehlungen**

Knowledge Graph basierte Explorative Suche

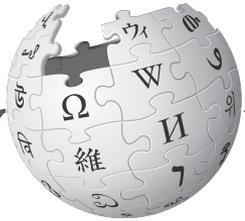


Knowledge Graph basierte Explorative Suche

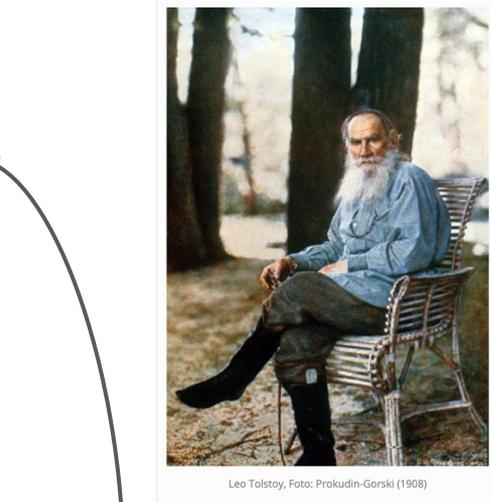


Knowledge Graph basierte Explorative Suche

<http://scih.org/>



DBpedia



Leo Tolstoy, Foto: Prokudin-Gorski (1908)

On September 9, 1828, Russian writer Count **Ljov (also Lev) Nikolayevich Tolstoy**, usually referred to in English as **Leo Tolstoy**, was born. Tolstoy is considered one of the greatest authors of all times. His main works **War and Peace** and **Anna Karenina** are classics of the realistic novel.

War and Peace
War and Peace (Pre-reform Russian: «Война и миръ», *Voyna i mir*) is a novel by the Russian author Leo Tolstoy, first published in 1869. The

media type Hardcover

literary genre Historical novel

author Leo Tolstoy

literary genre Philosophical fiction

literary genre Romance novel

publisher The Russian Messenger

...another, each unhappy family is unhappy in its own

...1877), first sentence

...n noble Tolstoy family. He was the fourth of five children. His

...ch Tolstoy (1794-1837), his mother Marija Nikolajevna, née

...he became an orphan at the age of nine, his father's sister

...ying oriental languages at the University of Kazan in 1844.

After a change to the law faculty, he discontinued his studies in 1847 in order to improve the situation of

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15 Recommended Articles:

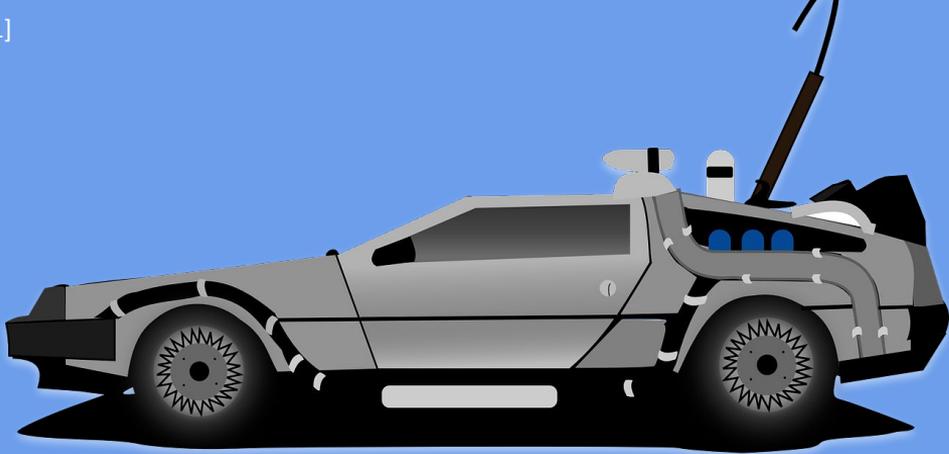
- 1) Charles Percy Snow and the Two Cultures
- 2) Charles Dickens – Famous Writer and Critic of the Victorian Era
- 3) Maxim Gorky and the Socialist Realism
- 4) Gothic – The Life and Works of Percy Bysshe Shelley
- 5) Alexander Pushkin and the Cultural Identity of Modern Russia
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“Die Welt ist klein und man trifft sich immer zweimal...”

oder

Forschungsdateninfrastrukturen und die Renaissance der Normdaten

Prof. Dr. Harald Sack

GNDCon 2.0, Frankfurt, 7. Juni 2021

Twitter: <https://twitter.com/lysander07>

Take Home Messages:

- **Intelligente Informationssysteme** sind immer (noch) ein wichtiges Forschungsthema.
- Die **Vernetzung von Daten, Informationen und Wissen** wird immer wichtiger.
- **Ontologien und Wissensgraphen** helfen bei der effektiven Umsetzung der **FAIR Prinzipien**.
- Die **NFDI** bietet die Chance der großflächigen (intelligenten) Vernetzung von Forschungsdaten.
- **Normdaten**, wie die GND werden dabei eine wichtige Rolle spielen.

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