

UE: Scientific Methods and Writing

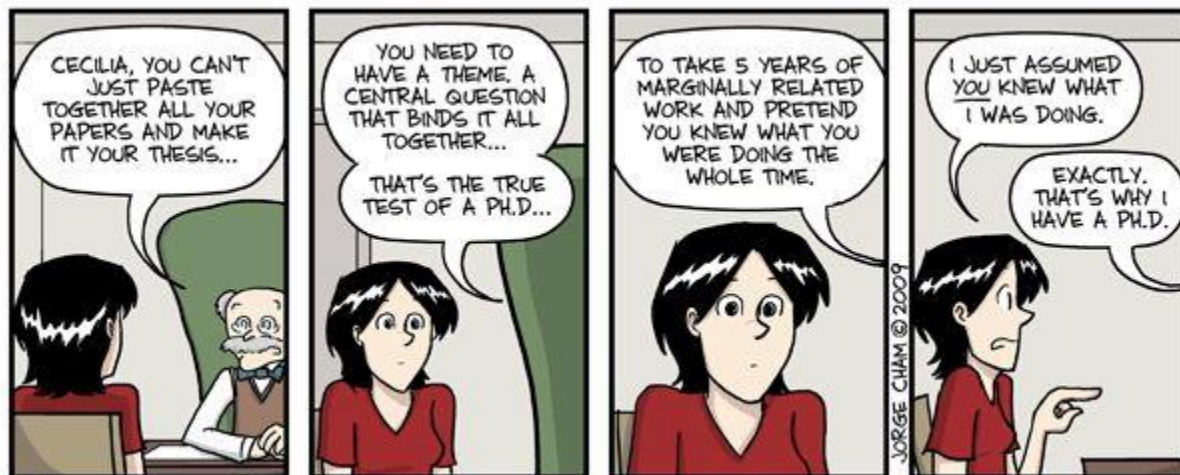
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Assoc.-Prof. Stefan LANG & Hannah Augustin, MSc



University of Salzburg
Department of Geoinformatics – Z_GIS

Thinking & writing



Generic writing skills
Writing to aid thinking
Collaborative platforms

Assignment #2

Your free essay

- Briefly reflect:
- *What was your main idea, which were the guiding thoughts?*
- *How did you get along with the 5-paragraph structure?*
- *What (research) questions came into your mind?*
- *(When) did you find your flow?*

Writing – generic skills

- **Transferable skills**
 - **Summarising** (ability to extract the core of the matter)
 - Information **retrieval** and **processing** (collecting, sorting, filtering)
 - **Communicating** (expressing thoughts clearly and concisely)
 - **Critical thinking** (reflection and flexibility)

- **1** Summarizing

- Extracting the **essence** of a statement, paper, book, etc.
- Get to the heart of the matter
- **Abstract**: short and **comprehensive**, not ‘part of the truth’, mention what has been done and **results**, not just (intention)

“All birds can fly.”

***False!** Because there are some birds that cannot fly.*



“Birds (usually) can fly.”

“However, some birds cannot, e.g. a penguin.”

(Formally) **valid**
statement, but not **true**

Valid statement, but not
comprehensive, part of the truth

Valid statement,
comprehensive

See lecture “Reasoning and formal errors”

Writing – generic skills



- **2** Information retrieval and processing
 - Know (your) **sources** and **places** where to find them (University libraries, online resources)
 - Google and **semantic web technology** in general are supportive tools, but require filtering and critical selection as any other repository such as libraries
 - Wikipedia is a collaborative online lexicon, moderated and peer-reviewed; still, take caution should be paid on the quality of particular entries; consider reference to original sources
 - Information needs to be **processed** to be used (extracted, filtered, ordered)
 - Sources need to be correctly cited (**when** and **how** to cite – dedicated lesson)

Example information processing – 'condensation'

The importance of electrical discharges and current challenges

The atmospheric electric discharge is a fundamental process of nature that converts electric energy into ionization radiation, chemical products and heat: Lightning discharges create perturbations to green house gases distributions that significantly influence the earth's radiation balance, and they pose a threat to lives and to our increasingly vulnerable infrastructure based on microelectronics and on advanced materials and technology. Here electric discharges can have catastrophic effects, but they can also be of immense value in industrial applications. Nevertheless, although studied since the time of Jaques de Romas and Benjamin Franklin in the 18th century, much of their physics escapes quantification. A proof of point is the discovery that lightning can reach from thunderstorm clouds to the ionosphere at 80 km altitude¹.

The concentration and distribution of greenhouse agents in the atmosphere are affected by thunderstorms: Lightning is a major source of mono-nitrogen oxides (NO_x) playing a key role in the ozone conversion. Understanding NO_x production by lightning allows understanding the possible feedback mechanisms between climate changes and thunderstorms. However, in spite of many attempts, including aircraft campaigns of the EU-funded EULINOX project, large uncertainties remain in the quantification of NO_x produced by lightning because of complexities of observation and modelling². In addition, thunderstorms pump water vapour pollutants from the surface to the upper troposphere where they have longer lifetimes and spread over intercontinental distances by the strong winds in this region. Subsequent chemical transformation leads to the production of ozone and aerosol particles, which affect the global climate and acid rain^{3,4}. Water vapour is the most important greenhouse gas and it has a large effect on climate⁵. Convectively injected into the stratosphere H₂O increases the total ozone loss and UV dosage⁶ and entrains ozone-rich stratospheric air into troposphere (missing transport pathway for ozone budget in major global models)⁷.

¹ Neubert, T. "On sprites and their exotic kin." *Science (Washington)* 300.5620 (2003): 747-749.

² Schumann, U., and H. Huntrieser. "The global lightning-induced nitrogen oxides source." *Atm. Chem. Phys.* 7.14 (2007): 3823-3907.

³ Bertram, T. H., et al. "Direct measurements of the convective recycling of the upper troposphere" *Science* 315.5813 (2007): 816-820.

⁴ Lyatt Jaeglé, Pumping up surface air, *Science* 9 February 2007: Vol. 315 no. 5813 pp. 772-773;

⁵ Solomon, S., et al. "Contributions of stratospheric water vapor to decadal changes in the rate of global warming." *Science* 327.5970 (2010): 1219-1223.

⁶ Anderson, J. G., et al. "UV dosage levels in summer: Increased risk of ozone loss from convectively injected water vapor." *Science* 337, 835.

⁷ Pan, L. L., et al. "Thunderstorms enhance tropospheric ozone by wrapping and shedding stratospheric air." *Geophys. Res. Lett.*, 41.22 (2014): 7785-7790.

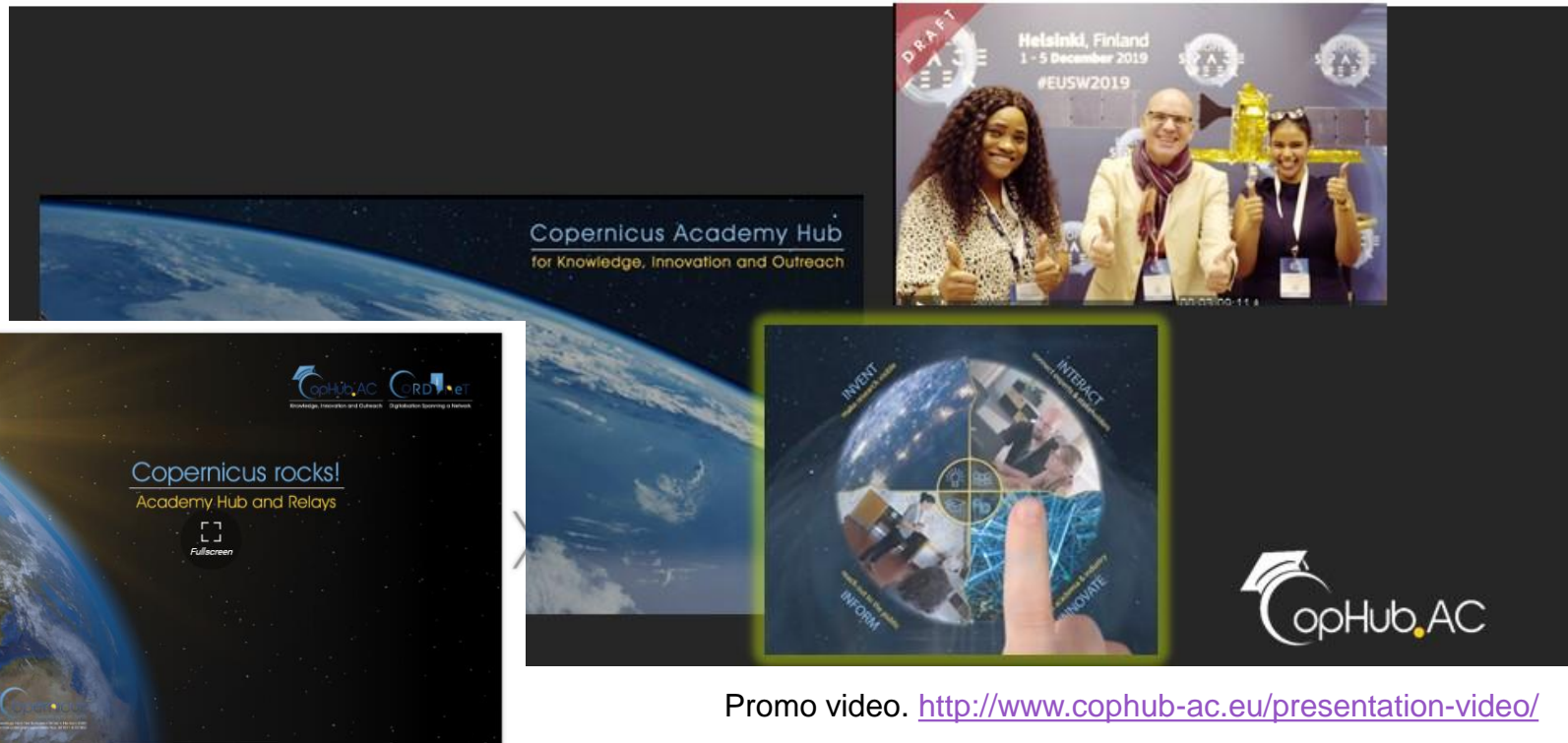
Writing – generic skills

- **3** Communicating
 - In **writing, presenting, talking**
 - Expressing thoughts (clearly, concisely, convincingly)
 - Style depending on **audience** (listeners, readers)
 - Depth and format depending on **type of communication** (paper, poster, presentation)
 - Scientific level depending on **dissemination level** (seminal paper for internal use vs. international peer-reviewed journal article)
 - Free of scientific ‘constraints’: **essay**
 - **Bi-directional** communication: workshops, polls, feedback

Mind the audience ... ☺



CopHub.AC VIDEO

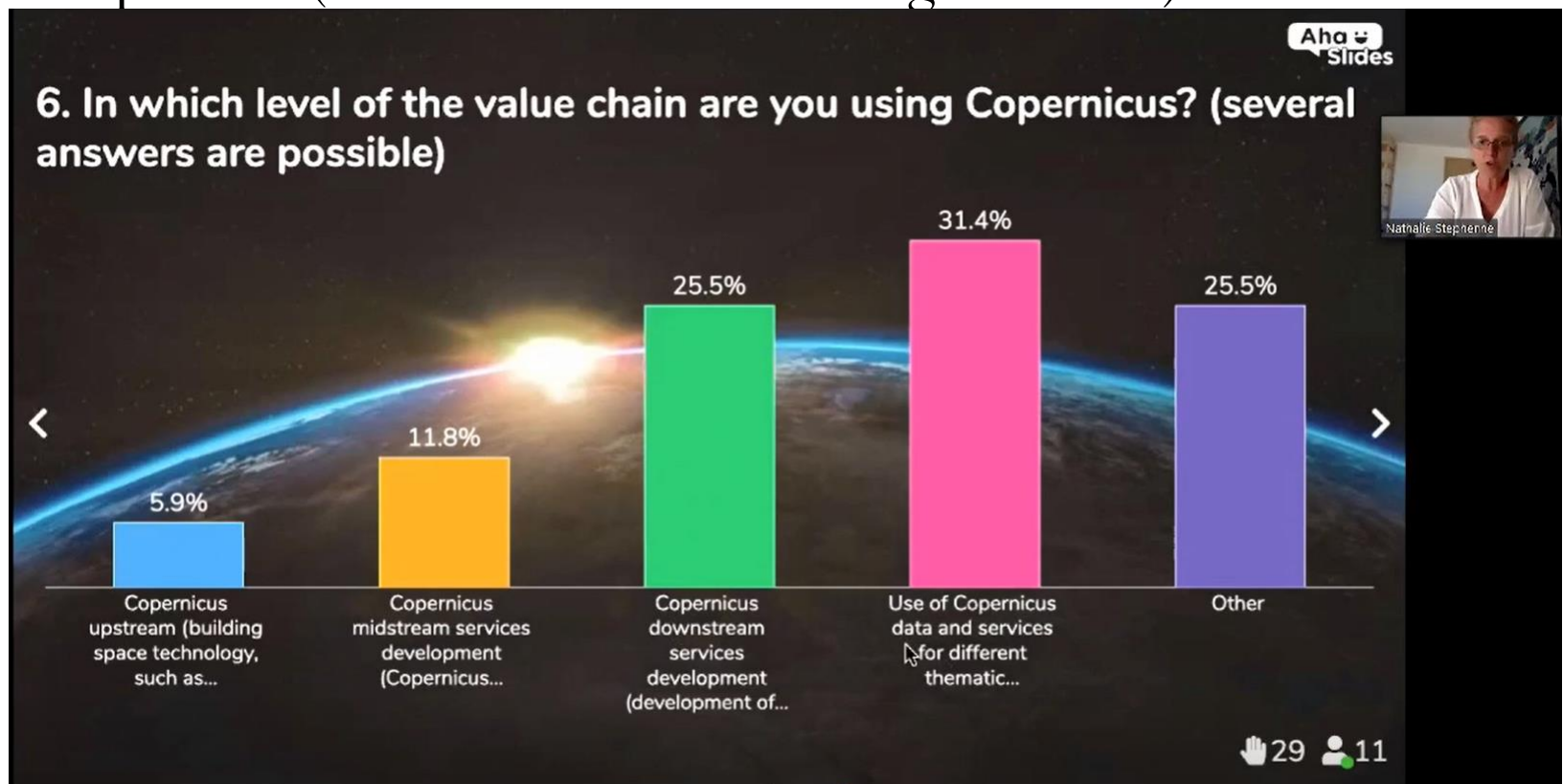


Promo video. <http://www.cophub-ac.eu/presentation-video/>

Brochure: <http://www.cophub-ac.eu/>

Engage the audience ...

- Communication to be effective, requires a bi-directional process (sender-receiver including feedback)

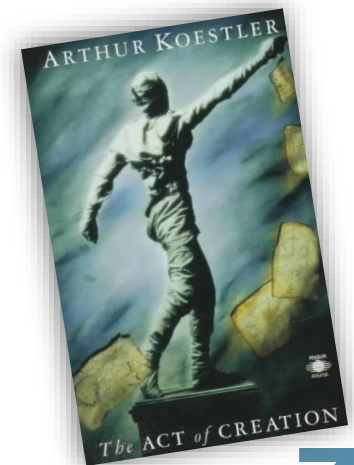


Hybrid Online Meetings



Writing – generic skills

- 4 Critical thinking and creativity
 - Do not simply repeat what others said (no progress), but judge, qualify, confirm, position, approve/disprove
 - Be open to new approaches, accommodate other thoughts and concepts
 - Science emerges from **new combinations, perspectives, viewpoints**
 - **‘Bi-sociative’** thinking (A Koestler *“The act of creation”*)



Writing – transferable skills

- **4** Critical thinking and creativity
 - ‘Artistic’ approach – unconventional combination

Sunflower artwork /
drone imagery for
Beethoven's 250 years
anniversary (near
Ammersee, Germany)



Writing to aid thinking

- **think** – **plan** – **write** – **revise** – ... – **submit**
- Applies to *all forms* of written texts, from notes over essays and theses to published papers (with increasing importance)



coreybradshaw.files.wordpress.com/2012/10/confused-signage.jpg

Scientific publication

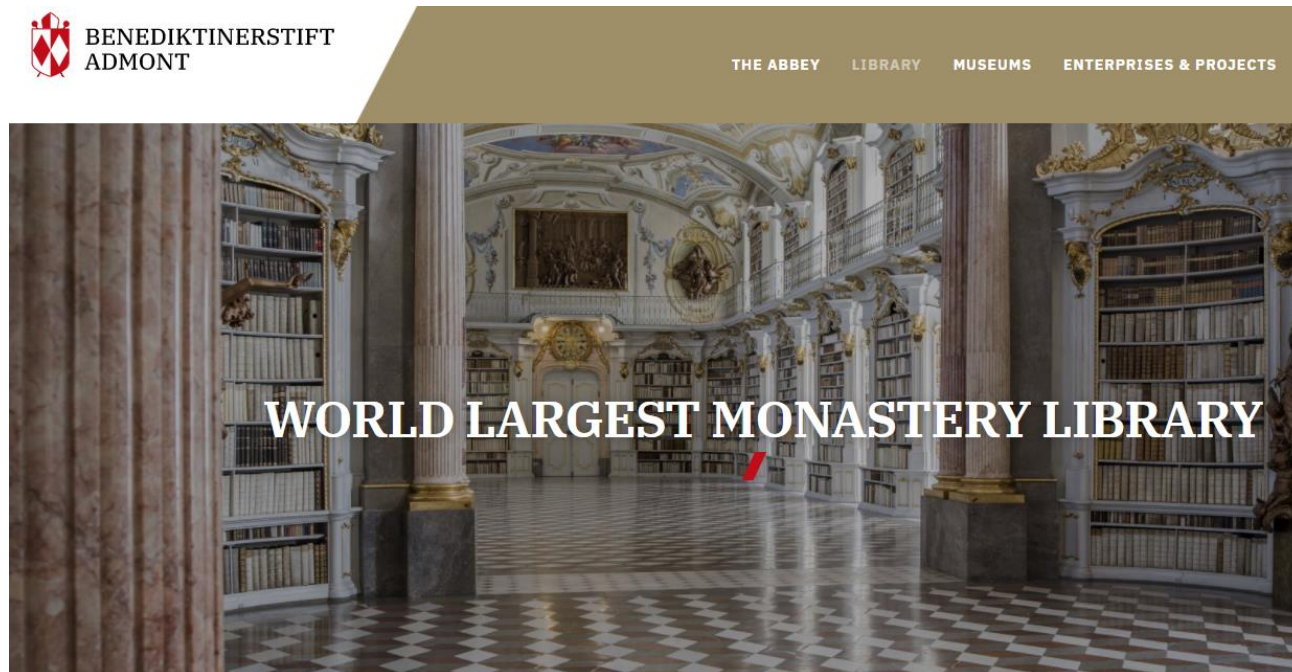
Theses (Seminal,
Bachelor, Master, PhD)

Free essay

Writing to aid thinking

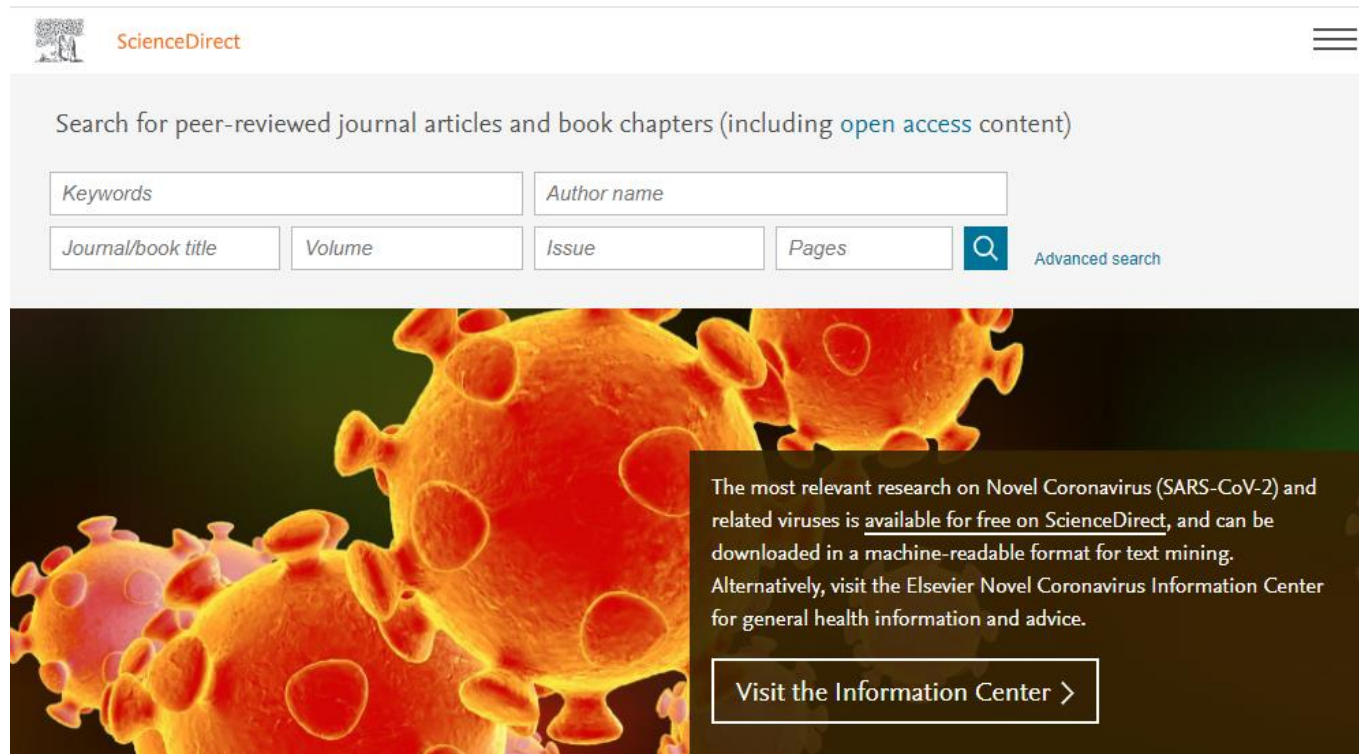
- Primary aim of scientific writing: **documenting**, **retrieving** and **accessing** knowledge
- *In the past*: physical repositories, huge libraries*

**still, one copy of your thesis is stored in the University's library ☺*



Writing to aid thinking

- Primary aim of scientific writing: **documenting**, **retrieving** and **accessing** knowledge
- *Today*: Internet (virtual repositories, collaborative platforms)



ScienceDirect is the world's leading source for scientific, technical, and medical research.

Collaborative platforms

- Concept goes beyond repository ... what is the rationale of collaborative platforms? **Jointly creating, archiving, curating, ... knowledge**
- Classical platform: Wikipedia



WIKIPEDIA
De freie Enzyklopädie

Hoamseitrn
ThemenPortal
Lezde Enderunga
Neie Artike

Gmoa

AutornKaffee
Stammdisch
Mir fehlt ein Wort
AutornPortal
Qualitätssicherung
Etz spendn!

Hoamseitrn **dischkrian** Lesn Quejtext oschaugn Gschicht oschaugn Su

Schon gewusst? **Bairisch** ist älter als Hochdeutsch!
→ Während die deutsche Schriftsprache im 15./16. Jh. entstanden ist, sind die ältesten **altbairischen** Texte aus dem 8. Jahrhundert.

Boarische Wikipedia **Austro-Bavarian Wikipedia**

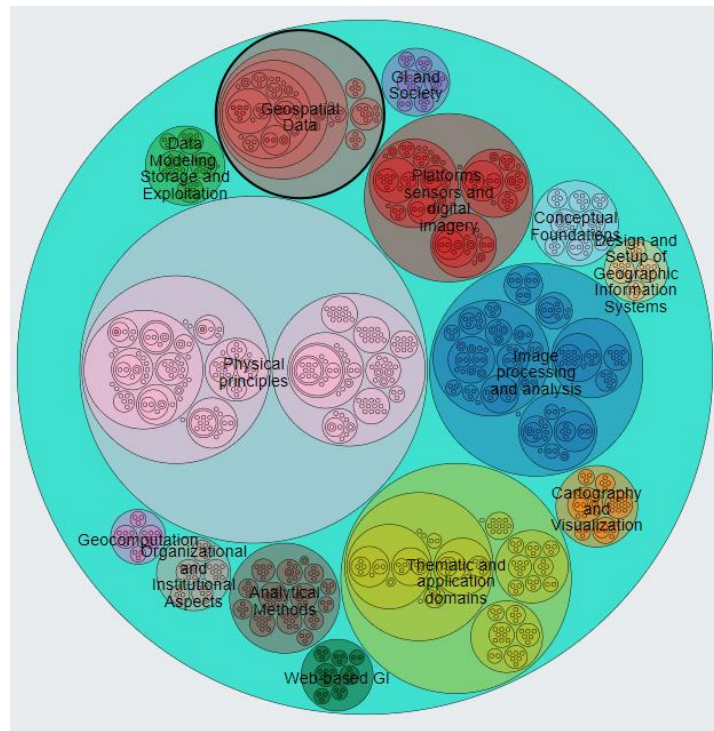
Welcome! Bienvenue! Servus! In da Bayrisch-Östereichischn Wikipedia mid **31.585** Artikln!

Des is de Wikipedia in **Boarische Sproch** (Austro-Bavarian language, Bairisch-Österreichische Sprache) und (Bayerisch), Österreich (Östereichisch), Südtirol usw.

Griaßde • Midmochtipps • FAQ in deitsch • Wia schreib i a guads Boarisch? • Boarische Schreibweis • zuafällign Artikl afruafa

Collaborative platforms

- Concept goes beyond repository ... what is the rationale of collaborative platforms? **Jointly creating, archiving, curating, ... knowledge**
- Living textbook: Body of Knowledge



<https://bok.eo4geo.eu/GIST/>

Collaborative platforms

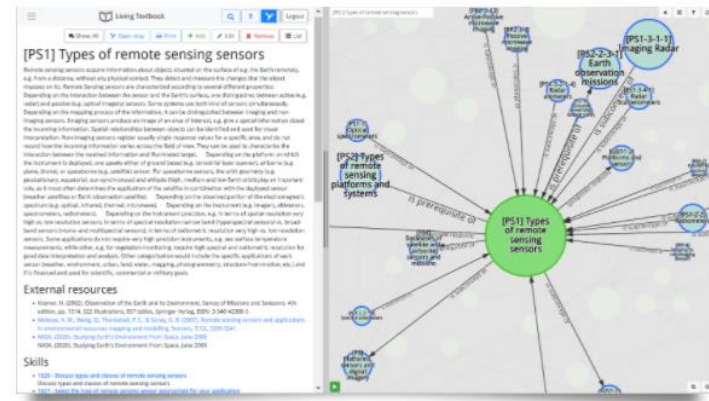
- Concept goes beyond repository ... what is the rationale of collaborative platforms? **Jointly creating, archiving, curating, ... knowledge**

- The **Living Textbook** (LTB) is used as the tool to create and maintain the EO4GEO Body of Knowledge (BoK). It allows users to create, edit and find concepts in the BoK.

The Living Textbook uses a concept map as a starting point and visualizes concepts and their relationships in one view, providing a convenient way to find connecting concepts and their descriptions. It provides an under-the-hood view of the BoK, also used by the contributing experts to develop and keep an overview of the BoK content.

In general, the Living Textbook is a tool that can be used to create a conceptual visualisation of a knowledge domain and share it amongst educators, researchers and anyone who would like to understand that domain. In some way it works as an advanced way of making a collaborative mind map. We call this a **Body of Knowledge**.

In the case of the EO4GEO project, we are visualising the domain of Geographic Information Science and Earth Observation. The tool is built in such a way that web applications can reuse the information via web interfaces. In this way, web application developers can create their own application on top of this information. EO4GEO uses the concepts, exported by the Living Textbook in its other tools such as the **Curriculum Design Tool** (CDT), the **Occupational Profile Tool** (OPT) and the **Job Offer Tool** (JOT).



The Living Textbook is used as the tool to develop the EO4GEO Body of Knowledge.

Shared writing / text editing

- Google Drive, Office 365, etc.

The image shows a Google Drive interface on the left and a Microsoft Word document on the right. The Google Drive interface includes a search bar, a sidebar with navigation options like 'Neu', 'Meine Ablage', and 'Speicherplatz', and a main area displaying a list of files and folders. The Microsoft Word document is open, showing a 'Start' tab and a 'Übersetzen in: Deutsch?' (Translate to: German?) popup. The popup contains the text 'Erstellen einer übersetzten Kopie des Dokuments mit Microsoft Translator.' and two buttons: 'Übersetzen' (Translate) and 'Nie aus: Englisch' (Never from: English).

Google Drive interface elements:

- Search bar: In Google Drive suchen
- Meine Ablage
- Schnellzugriff
- Files and folders: Seminar Analysis & Model..., Exploitation CopHub.AC, SE: GeoHumanitarian Acti..., Z_GIS Projects & SDGs
- Speicherplatz: 308,1 MB von 15 GB belegt

Microsoft Word interface elements:

- Start tab
- Übersetzen in: Deutsch?
- Übersetzen
- Nie aus: Englisch

Shared graphics and presentations

- Joint brainstorming (e.g. Lucidspark / Miro board)

The image shows a Miro board titled "Brainstorming Slumap". The board is divided into two main sections: "Ideas on Dissemination" and "General Comments (for all presentations)".

Ideas on Dissemination: This section contains a grid of sticky notes. At the top, there are five orange notes: "webinars", "blogs", "community workshops", "digital posters / comic books", and "social media". Below these, there are several other notes, including "Please pick one posted sticker and add your ideas!", "First idea", "Second idea", "My idea...", and "First idea".

General Comments (for all presentations): This section contains a grid of sticky notes with various questions and comments. Some of the notes include:

- "Is it possible to export the comments?"
- "Can we use VGI for labelling samples?"
- "General models might be a good option"
- "Look into the false positives and false negatives?"
- "Think about the definition of grids (using a standard - e.g. Worldpop!)"
- "Sabine Presentation"
- "Maxwell Presentation 1"
- "Nicholas Presentation"
- "Stefanos Presentation"
- "Angela Presentation"
- "Jon Presentation"
- "Monika Presentation"
- "Maxwell Presentation 2"

Shared code platforms

- GitHub, Jupyter notebooks, etc.

slangit20 ▾

Repositories New

Find a repository...

eo4geocourses/
PLUS_Practice-Image-Processing


eo4geocourses/
PLUS_OBIA-Introduction

slangit20/EO4GEO_Testbed

emissoni/EO4GEO_Testbed

slangit20/CourSL

slangit20/Patchy



Introduce yourself

The easiest way to introduce yourself on GitHub about you! You can start here:

slangit20 / README.md

- 1 - 🐼 Hi, I'm @slangit20
- 2 - 🗨️ I'm interested in ...
- 3 - 🎓 I'm currently learning ...
- 4 - 🤝 I'm looking to collaborate on ...
- 5 - 📧 How to reach me ...
- 6

Who has access

PRIVATE REPOSITORY

Only those with access to this repository can view it.

[Manage](#)

DIRECT ACCESS

1 has access to this repository. 1 invitation.


Manage access

[Invite a collaborator](#)

☐ Select all

Type ▾

filter:pending_invitations

☐  **LAGIS-BR**
Awaiting LAGIS-BR's response

Pending Invite 

24.4.2020

Diversity - Jupyter Notebook

Calculate Diversity Metrics

```
In [94]:  
import numpy as np  
import matplotlib.pyplot as plt  
import pandas as pd
```

Load attribute table dbh_clip1 (or dbh_clip2)

```
In [95]:  
divdf = pd.read_csv('dbh_clip2.csv')
```

```
In [96]:  
divdf.head()
```

```
Out[96]:
```

	BTNT	ID	AREA	PERIMETER	TOPO
0	WN	1	3873.181	278.915	W
1	WN	2	8389.118	412.414	W
2	WN	3	65937.602	1623.179	W
3	WN	4	9066.240	413.267	W
4	WN	5	308.209	76.786	W

```
In [97]:  
len(divdf)
```

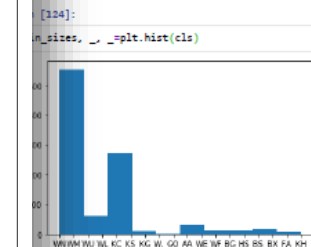
```
Out[97]:  
979
```

(define class field)

```
In [140]:  
cls = divdf.TOPO
```

histogram class (TOPO or BTNT)

slangit20@slangit20:~/Documents/EO4GEO_Testbed/Diversity (jupyter)



Assignment 2

- **Scientific** essay
 - (See description in BlackBoard)
 - See also Intro
- Contains a **research question** and (at least one) figure
- Structured and support assumptions
- Read and consider “*The Science of Scientific Writing*”

AMERICAN Scientist

FEATURE ARTICLE

The Science of Scientific Writing

If the reader is to grasp what the writer means, the writer must understand what the reader needs

George Gopen, Judith Swan

This article was originally published in the November-December 1990 issue of American Scientist.