

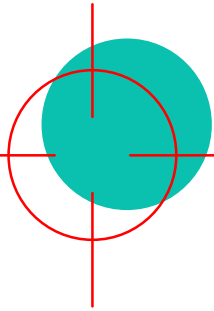
Academia: Challenges and Opportunities in the Age of Cyberscience

IPSA 2000, Quebec, August 1–5
Internet Conference (June 12) „Macro and Micro Societal Change Resulting from the Development of Internet“

Dr. Michael NENTWICH
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Assessment
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Sciences

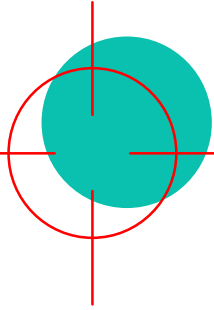
A-1030 Vienna, Strohgasse 45/3
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<http://www.oeaw.ac.at/ita>





Overview

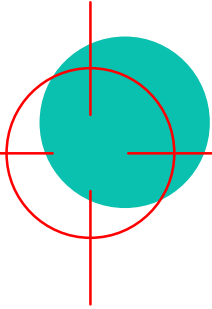
- What is Cyberscience?
- Three main aspects
 - Digital knowledge representation
 - Liberation from spatial limitations
 - New roles, new challenges
- Conclusions



‘Cyberscience’ is defined ...

... as all scholarly activities in the ‘information and communications space’ – formed by the computer and in particular IC technologies
(as opposed to ‘traditional’ science which does not use networked computers)





Types of scholarly activities

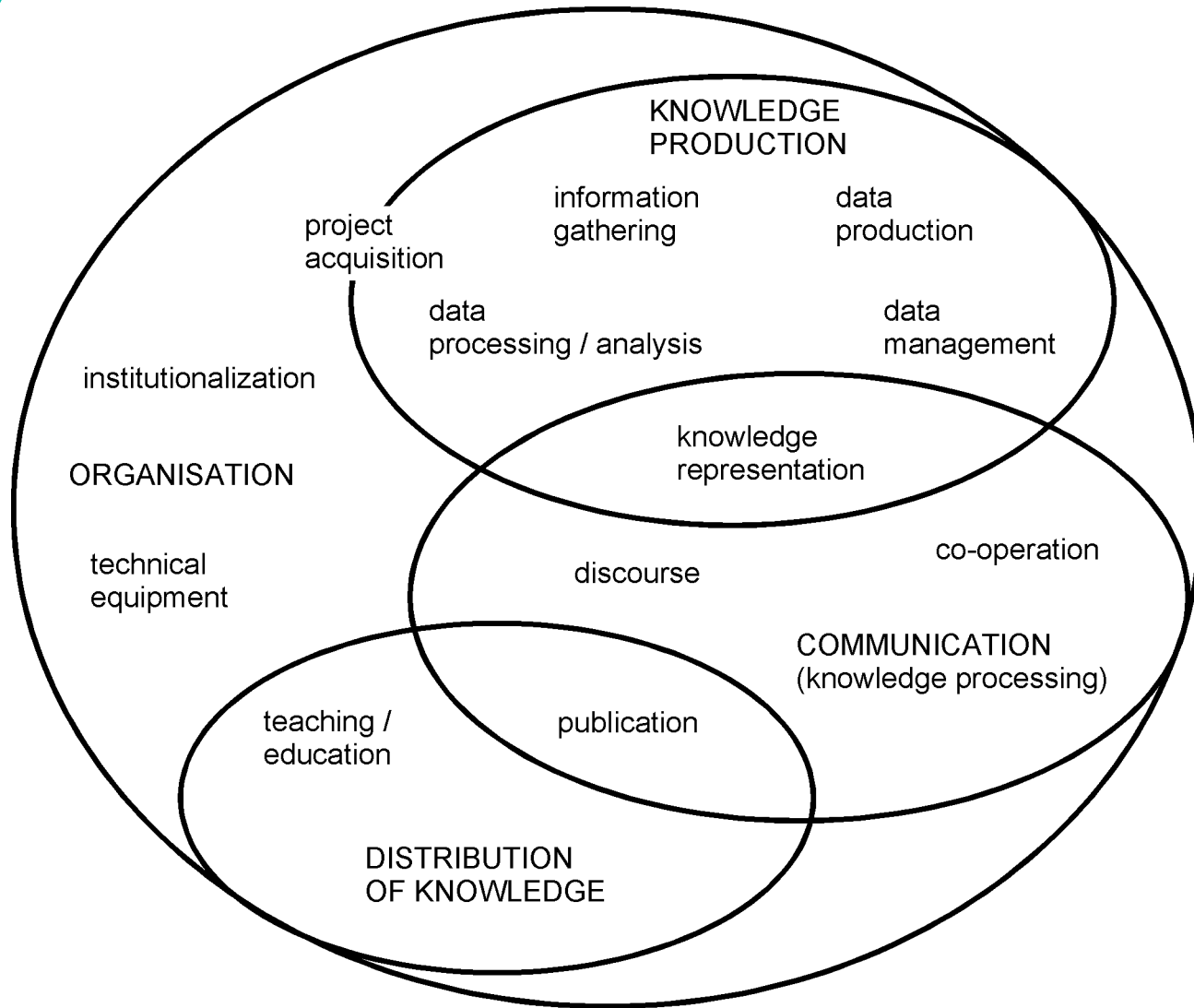
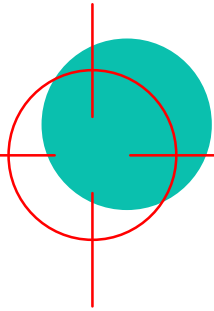


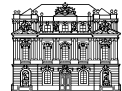
Table 1: Changes in academia on the path to cyberscience

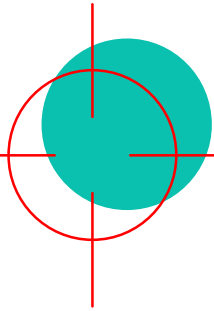
| | | technical-organisational transformation | | | |
|--|------------------------------|--|---|--|--|
| | | “traditional” science | → | | cyberscience |
| organisation | institutionalisation | traditional institute; guest researchers | | telework | virtual institute |
| | technical equipment | typewriter; telephone; library | stand-alone PC; fax | internet connection | multimedia PC; access to data networks |
| | project acquisition | face-to-face/by letter/ telephone negotiations | | E-mail exchange | electronic procurement |
| knowledge production | information gathering | libraries; personal conversations | offline databases | online datab.; link collec- tions; discussion lists | digital libraries ; knowbots |
| | data production | interviews; experiments | electron. text analysis | internet surveys | simulation/modelling; virtual reality |
| | data management | slip boxes; lists | hypertextual slip boxes databases | | networked slip boxes; decentral databases |
| | data-processing /analysis | „with paper and pencil“ | electron. data-processing expert systems | | artificial intelligence |
| | knowledge representation | linear texts | electron. text-processing databases | multimedia; hypertexts | hypertext-da tabases |
| communication (knowledge processing) | co-operation | letters; telephone; personal meetings | exchange of electron. manuscripts | E-mail; decentral assembly of databases; software sharing | groupware |
| | discourse | conferences; seminars; conversations (pers./tel.) | | E-mail; discussion lists; skywriting | online conferences; internet chatting |
| | publication | print media | submission of electron. manuscripts | parallel publication in WWW; Epreprints | pure E-publications; „net of knowledge“ |
| distribution | teaching/education | traditional teaching (seminars, lectures) | correspondence courses | multimedia manuals | virtual university |



Two Hypotheses

1. Several framework conditions and virtually all forms of scholarly activity are affected by the increased use of ICT.
2. The changes are not only of a qualitative nature (e.g. speed of communication), but there is also the potential of qualitative changes in the scholarly system (structures, roles, maybe also content).





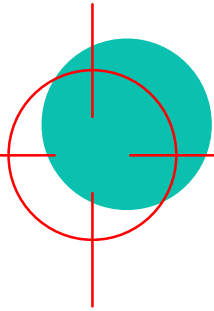
Digital knowledge representation

yesterday: linear texts

today: interlinked linear texts
(online publications with cross-links)

tomorrow: hypertexts

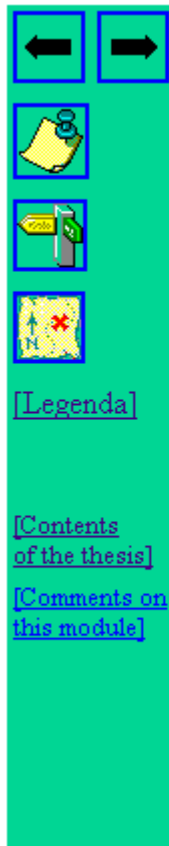
the day after
tomorrow: interlinked hypertext databases



Innovative examples

- Amsterdam physicists' group (Harmsze, Kircz)
<http://www.science.uva.nl/projects/commphys>
 - fully fledged schema for revolutionizing the way physicists may present their research to colleagues
- Diskurs (Nentwich)
<http://www.oeaw.ac.at/ita/ebene5/mn/diskurs.htm>
 - experimental hypertext authoring software

Sample page of physics article



RESULTS=A08-m4

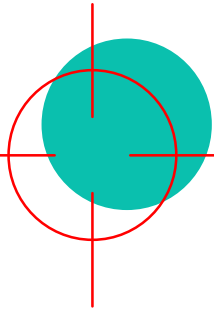
The differential cross sections of charge-transfer collisions between Na atoms and I atoms have been measured in the eV range, using an atomic beam set-up [1]. The differential cross section have also been calculated semiclassically [2].

This module contains two main components: raw data [3] and graphically presented, treated results [4], that have been generated in experiments [5] and calculations [6]. In particular we have results for:

- measured differential cross sections of $\text{Na} + \text{I} \rightarrow \text{Na}^+ + \text{I}^-$, 13-85 eV [7]
- measured rainbow structures 13-63 eV [8]

This module also contains a copy of 'theoretical data and results' obtained as intermediary results in the course of the interpretation [9]

- Treated results potential, and raw data and treated results deflection function $\text{Na} + \text{I}$, 13.1 eV [10]
- raw data and treated results of the calculated differential cross section $\text{Na} + \text{I}$, 13.1 eV [11]
- theoretical rainbow structure 13-63 eV [12]



Sample page of DISKURS project

Scientific Hypertexts

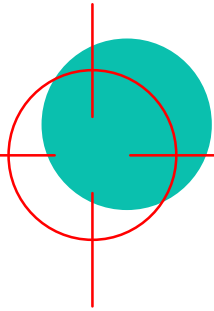
This project – which is in itself a hypertext – discusses the potential of the hypertext 'technology' in academia. The text is organised as follows (although the following is not suggesting a reading order – since hypertexts may, by definition, be read not only in one sequence but by many 'paths'):

- What exactly is a [hypertext](#)?
 - possible [scenarios](#)
- What are the potential [benefits and shortcomings](#) of hypertexts in academic writing?
- What are the [factors](#) influencing whether or not the future of academic writing lays with hypertexts or not?

Paths: [Long path](#); [Front page](#)

Modules linking to here: [Index](#); [Knowledge Representation](#);

Project "Scientific Hypertexts", started by Michael Nentwich on 24-Nov-99 09:56

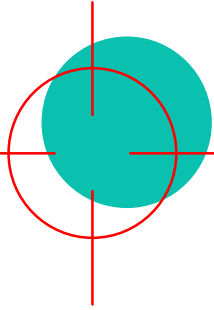


Will it happen?

crucial factors:

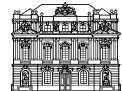
- technical issues
 - screen technology, network reliability
- organisational issues
 - incentive structure, access, archiving
- subject-related issues
 - disciplinary differences, type of paper

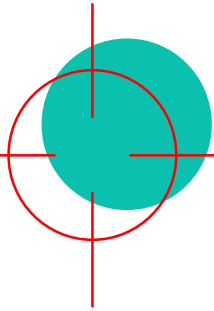
→ a matter of time?



Liberation from spatial limitations

- Remote access to digital resources
(digital libraries, online databases etc.)
- Multichannel online conferencing (sic!)
(video, audio, simultaneous access to documents etc.)
- Groupware
(shared workspace, version controlling etc.)
- Collaboratories
(virtual institutes, virtual laboratories)

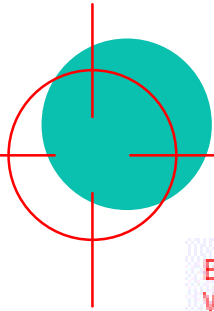




Innovative examples

- OpenTheory project (Meretz)
<http://www.opentheory.org/>
 - collaborative production of texts
- GOLLA (Gräf)
<http://infosoc.uni-koeln.de/golla/>
 - common archive of references and abstracts





Sample page of OpenTheory

Betal VO.4, 05.05.2000
Was'n neu? [Lies mich!](#)

Klick: [ToDo- und
Ideenskizze Fehler-Liste](#)

Click: [Development](#) Visits:
2403

Sponsored by
[Syrius](#)

open theory

Projektmitglied? → (Name = E-Mail) → [Hilfe](#) - Kein Mitglied? → [Anmelden...](#)

Maintainer: [Stefan Meretz](#), Version 1, 05.05.2000

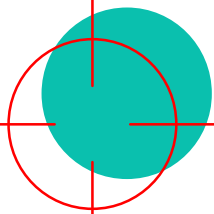
Status: Aktiv

To-do-Liste (ohne Priorität):

(2) Neue Wünsche hier eintragen:
↳ [Absatz kommentieren](#)

(2.1) Re: **To-do-Liste (ohne Priorität)**: 10.05.2000, 16:32, [Thomas Kalka](#): Eine Publisher-Funktion. Einen Knopf drücken, und das Projekt wird zu einem PDF-Dokument umgesetzt und gesendet.
↳ [Absatz kommentieren](#)

(2.1.1) Re: **Das leidige Thema: Formate**, 10.05.2000, 17:45, [Stefan Meretz](#): Finde ich prinzipiell gut, nur das PDF-Format passt mir nicht, denn es ist ein proprietäres Format und die Dokumente sind nicht



Sample page of GOLLA

Deutsche Gesellschaft für Online Forschung -DGOF-

Keywords

[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#)
[H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#)
[O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#)
[V](#) [W](#) [X](#) [Y](#) [Z](#) [\[\]](#)

Index

[hausverwaltungssoftware](#)
[HS Friedrichs SS98](#)
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[Noch zu lesen](#)
[Testkeyword](#)
[Usability](#)
[WAI](#)

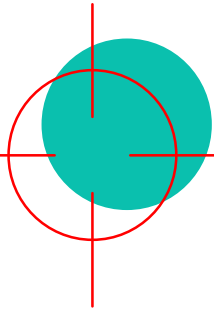
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Index [gast Suche nach "" mit 143 Treffer] Reihenfolge: [alpha](#) [x-chrono](#) [zugriffe](#) [rating](#) [item_id](#)

| Zugriffe | Autor(en) und Titel |
|----------|---|
| (347) | <u>Nielsen, Jakob;</u> Usability Engineering |
| (329) | <u>Gräf, Lorenz;</u> Locker verknüpft im Cyberspace. Einige Thesen zur Änderung sozialer Netzwerke durch die Nutzung des Internet |
| (324) | <u>Bosnjak, Michael; Bandilla, Wolfgang; Schneid, Michael; Lorch, Guido; Batinic, Bernad; Werner, Andreas; Stiegler, Angelika;</u> Online-Forschung im deutschsprachigen Raum - Erste Ergebnisse einer Umfrage unter Mitgliedern der 'German Internet Research' Mailingliste |
| (290) | <u>Dahlén, Martin;</u> lg98-04-01 |



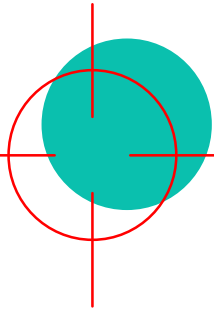


Will it happen?

crucial factors:

- technical issues
 - screen technology, network reliability
- organisational issues
 - incentive structure, coffee room effect
- subject-related issues
 - disciplinary fit

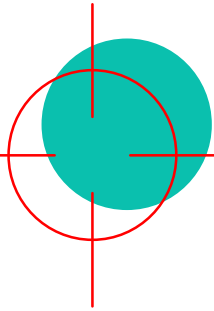
→ again a matter of time?



New demands, new roles

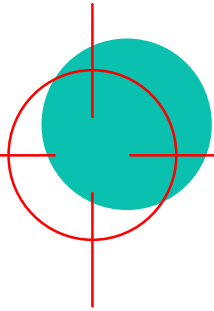
e.g.:

- outsourcing of information gathering
 - technological: ‚knowbots‘, XML
 - ‚cybrarians‘ and other ‚information brokers‘
- the role of researchers in the publication process
 - digital ‚mimeos‘ vs. commercial publishers
 - outsourcing of layout & marketing to authors
 - role of research libraries and university presses



Conclusions

- Computer-mediated communication has proven to have an enormous potential to change important parameters of scholarly work
- need for further research, e.g.:
 - to explain the differences between disciplines
 - to assess the likely consequences for the content of the research
 - to give advice for further action to politics and academic associations (e.g. training, infrastructure)



More about the project 'Cyberscience'

Project homepage:

<http://www.oeaw.ac.at/ita/ebene4/e2-2a17.htm>

(includes papers in English and German for download and further links)

On the future of knowledge representation, see in particular my paper to the APSA 2000 Annual Meeting, Washington D.C.:

http://193.170.91.145/Knowledge_Representation_DSK.htm

