Preserving and Adding Value to Scientific Data: The Cybercartographic Atlas of Antarctica

Session 10
Adding value to data
Wednesday 23 November
***Ensuring Long-term Preservation and Adding Value to Scientific and Technical data* (PV2005)**
The Royal Society, Edinburgh

D. R. Fraser Taylor, Tracey P. Lauriault, Peter L. Pulsifer
Geomatics and Cartographic Research Centre
Dept. of Geography and Environmental Studies
Carleton University
Ottawa (ON) Canada

Carleton UNIVERSITY

Geomatics and Cartographic Research Centre

Cybercartography: Theory and Practice

1. What is Cybercartography?
2. Cybercartographic Atlas of Antarctica (CAA)
3. InterPares 2 Project (IP2)
4. Archiving the Cybercartographic Atlas of Antarctic Challenges
5. Final Remarks

1. What is Cybercartography?

1.a) What is Cybercartography?

Maps and Mapping are taking on new functions in the Information Era

- The map as an artifact
  - New multimedia and multisensory products on-line
- The map as an organizing principle
  - Conceptually and geographically link information sources in an integrated framework
  - Spatial Data Infrastructures
  - Multimedia links add new context to improve understanding
- The map as a metaphor
  - The ‘Cybercartographic Atlas’ as a metaphor for spatially located information of all kinds
  - Multiple representations to challenge fixed ideas
  - Maps involving art and imagination not just ‘real’ locations

1.b) “Cyber”

The “Cyber” in cybercartography refers to both practice and theory. Delivery in cyberspace but also second order cybernetics and integral theory as theoretical underpinnings

1.c) Definition - Cybercartography

First Introduced at the 1997 ICA Conference

The organization, presentation, analysis and communication of spatially-referenced information on a wide variety of topics of interest and use to society in interactive, dynamic, multidisciplinary, multisensory formats with the use of multimedia and multimodal interfaces.

D. R. Fraser Taylor, 1997,
keynote address entitled "Maps and Mapping in the Information Era" ICC Sweden

1.d) The Major Elements of Cybercartography

1. **Multisensory / multimodal** – *Incorporating vision, sound, touch and eventually smell and taste*
2. **Multimedia**
3. **Interactive** – *Engaging the user in new ways (games or eudutainment)*
4. **Topical** – *Applied to a wide range of topics of interest to society*
5. **Integrated** – *Part of an information / analytical package*
6. **Multidisciplinary** – *Teams of individuals from many disciplines (English, Music, Psychology, Cognitive Science, Geography, International Trade)*
7. **Collaborative** – *Involving new research partnerships (academia, government, industry, NGO)*

2. Cybercartographic Atlas of Antarctica

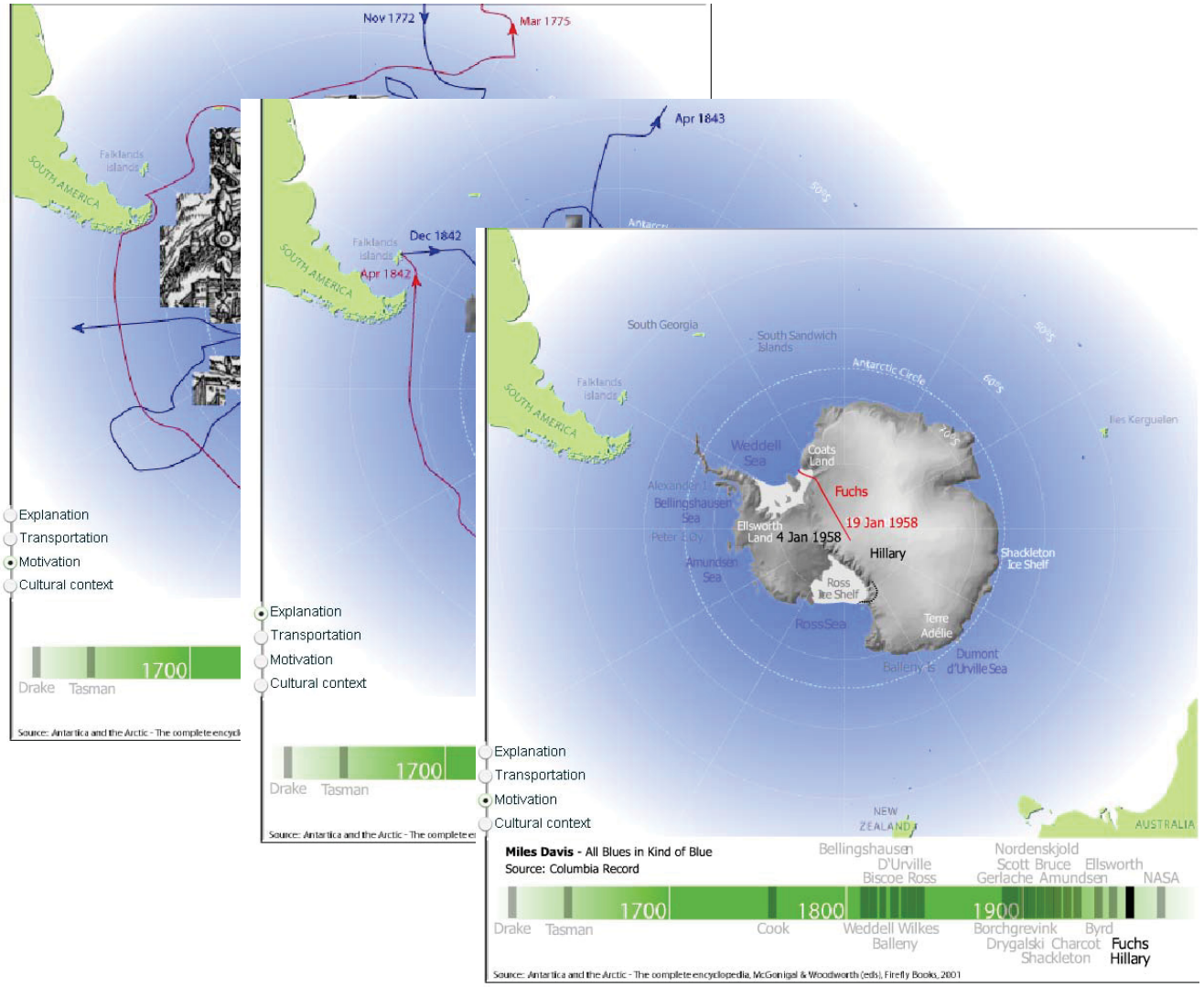
The Cybercartographic Atlas of Antarctica

2. a) the Cybercartographic Atlas of Antarctica

- Address environmental issues
- Provide environment for Scientific collaboration
- Design atlases for informational and educational purposes
- Combine multiple / remote geolocated databases ‘on the fly’
- Develop the structure of an evolutionary atlas
- Provide an authoring toolkit

The Cybercartographic Atlas of Antarctica

2. b) Cybercartographic Atlas of Antarctica

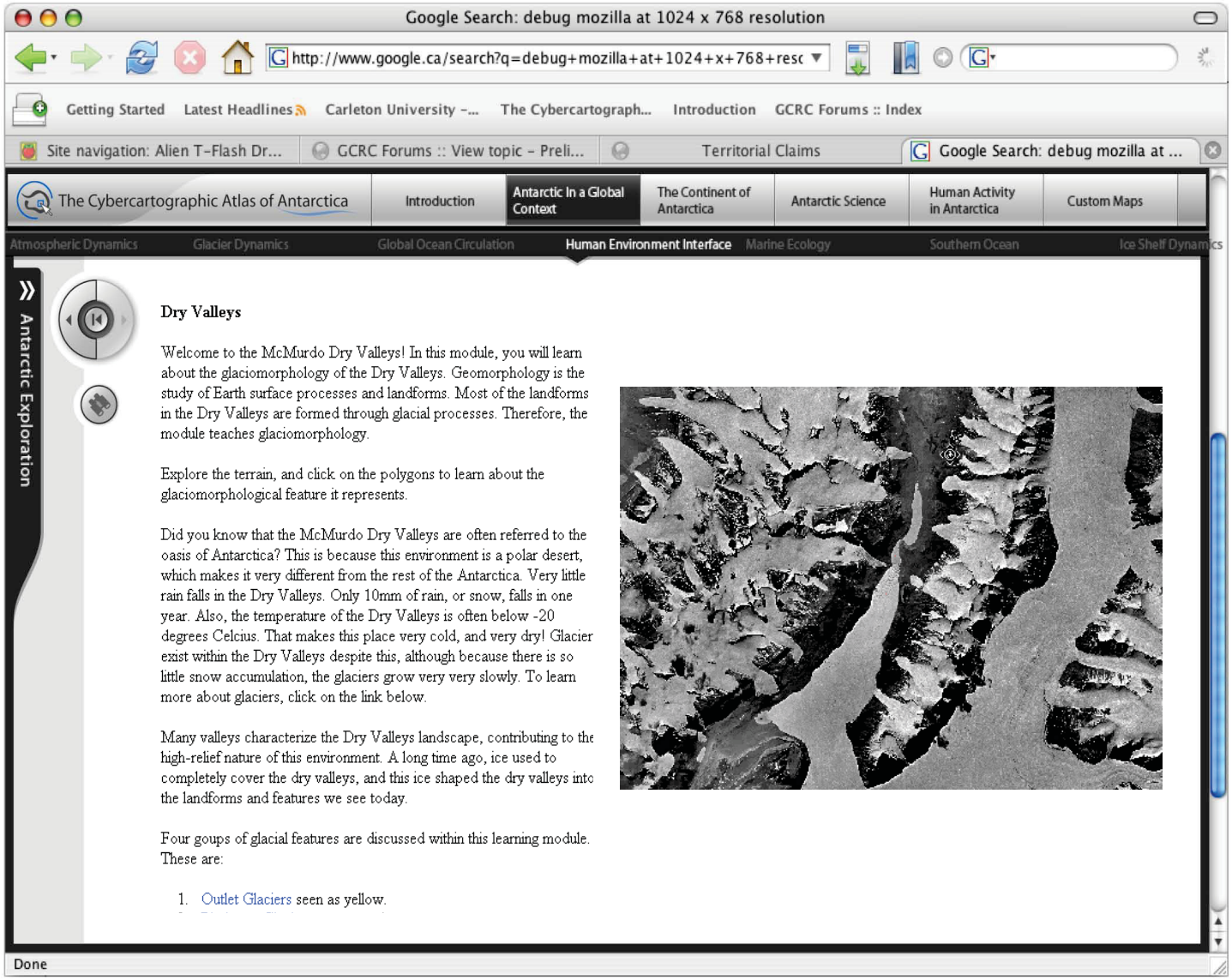


The Cybercartographic Atlas of Antarctica

Exploration & History

S. Caquard

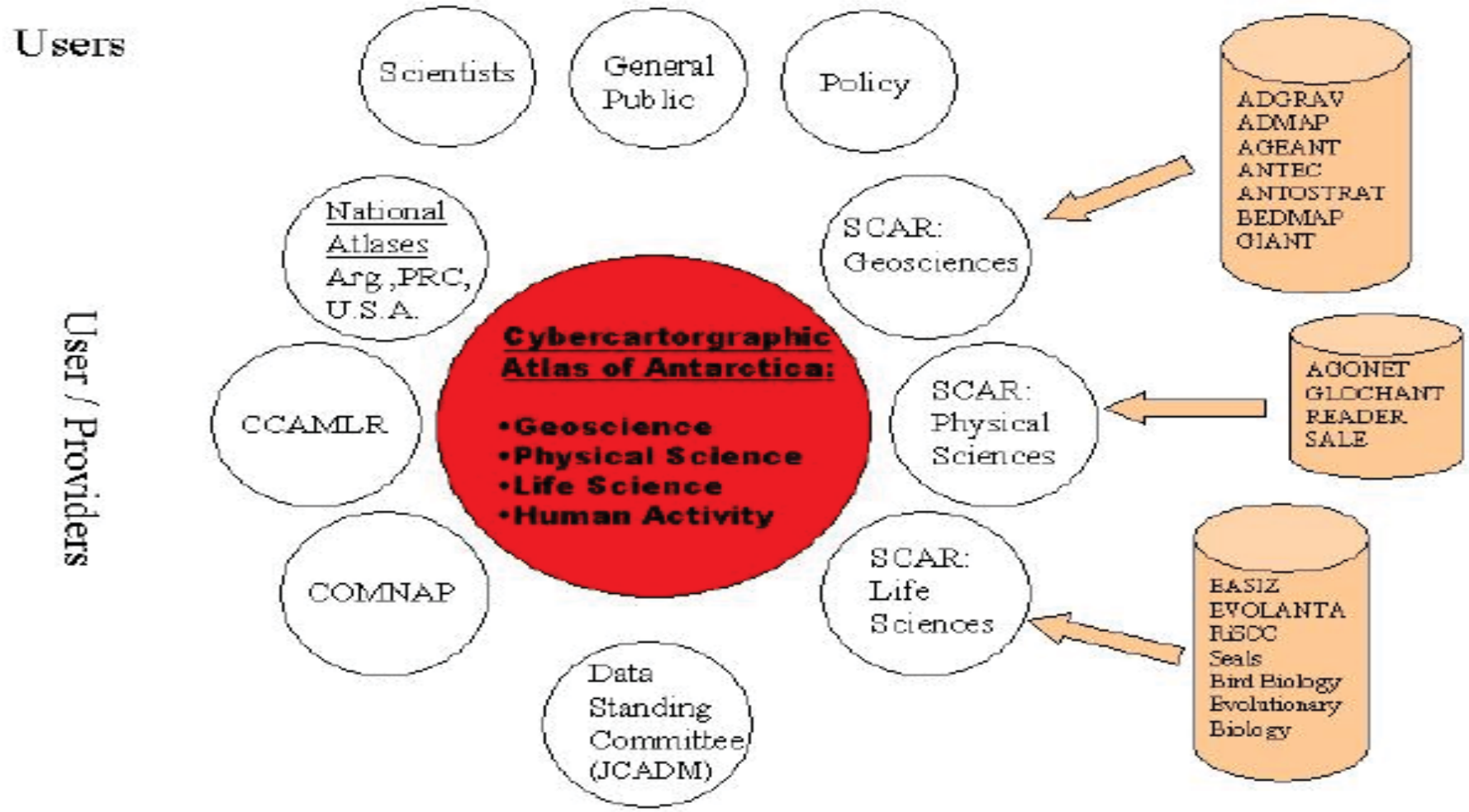
2. c) Cybercartographic Atlas of Antarctica



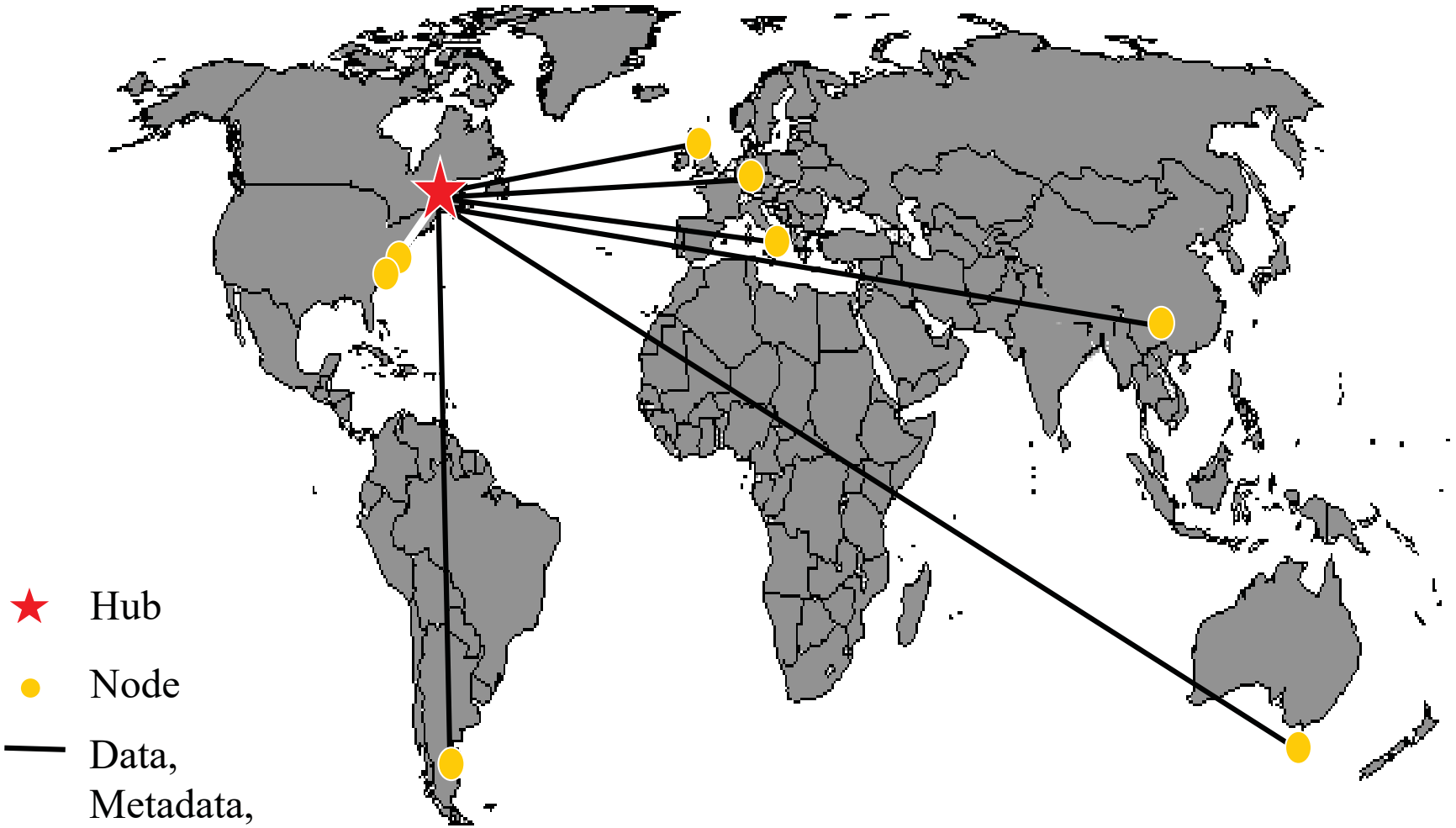
The Cybercartographic Atlas of Antarctica

Interactive 3D Visualization of Terrain: *Birgit Woods*

2. d) Remote Data and Partner agencies



2. e) Interoperability



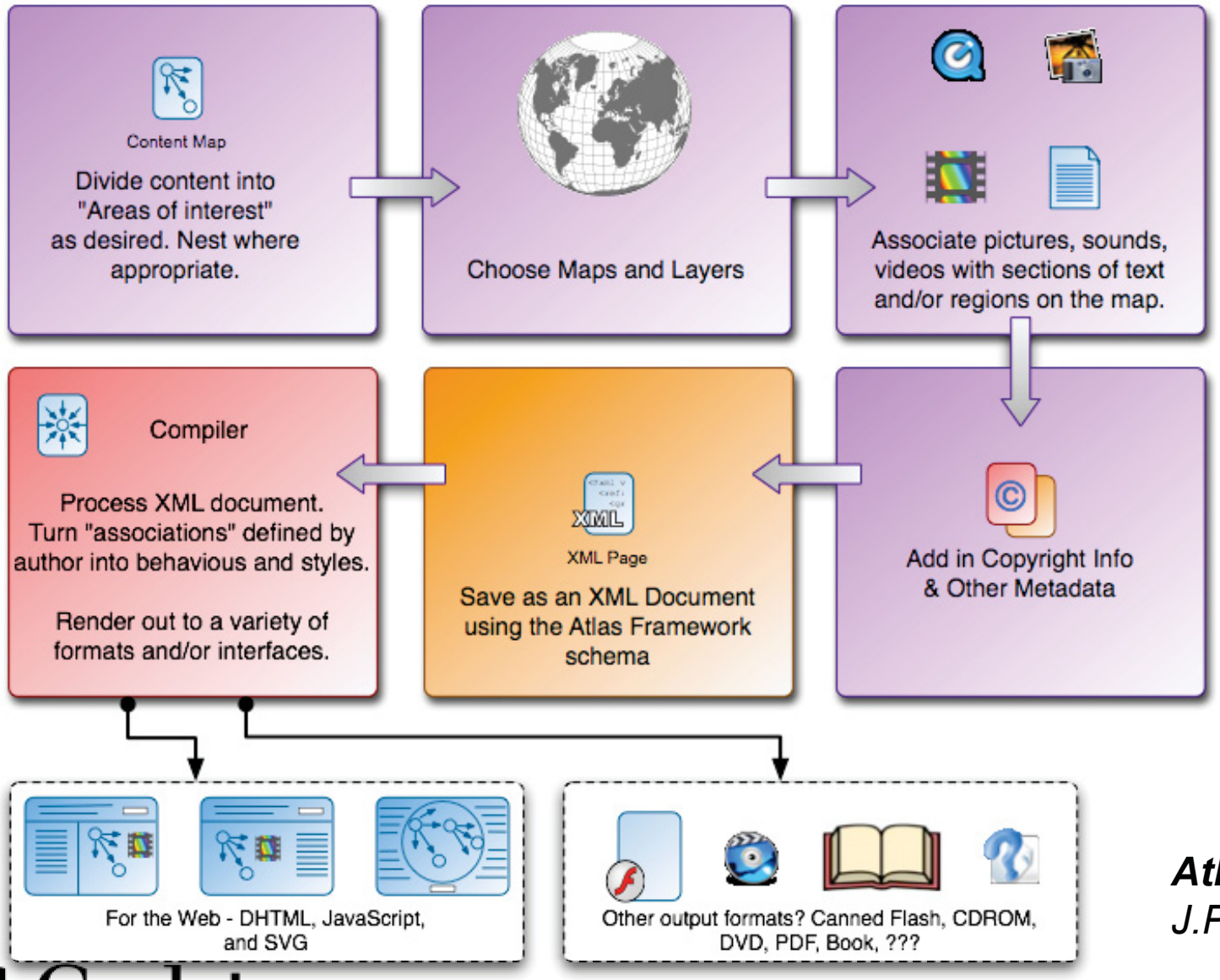
Pulsifer © 2003

2. f) Technological developments

Technical Approach:

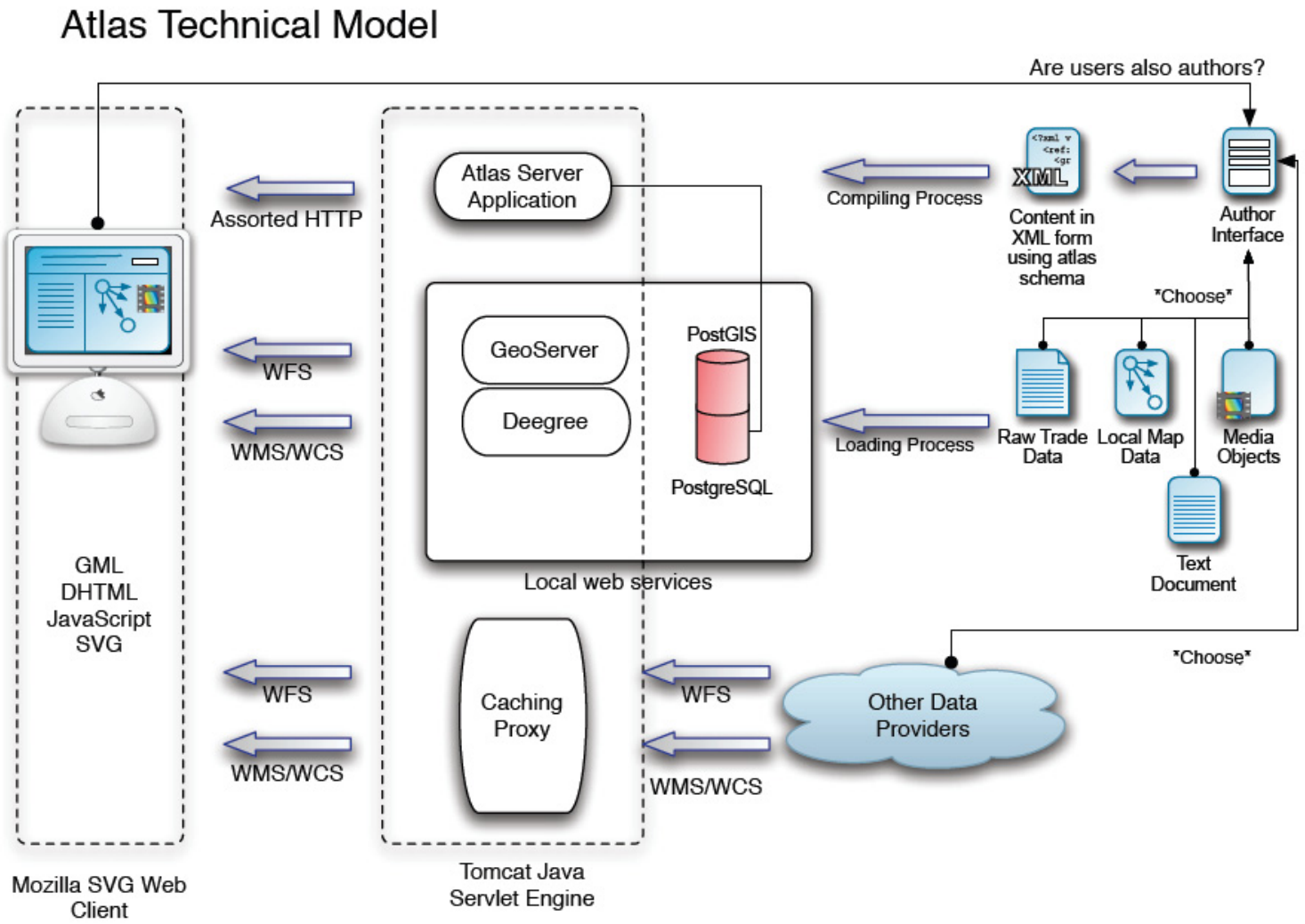
- Reduce the complexity of deploying an on-line atlas
- Access data via Open GIS Consortium (OGC) Standards
- Use of Open Source software (Geoserver, PostGIS, Apache…)
- Conceal data complexity from the users and authors
- Provide a web-based author toolkit
- Access atlas via a web portal

2. g) Technological developments



Atlas Model Flow:
J.P. Fiset, Amos Hayes

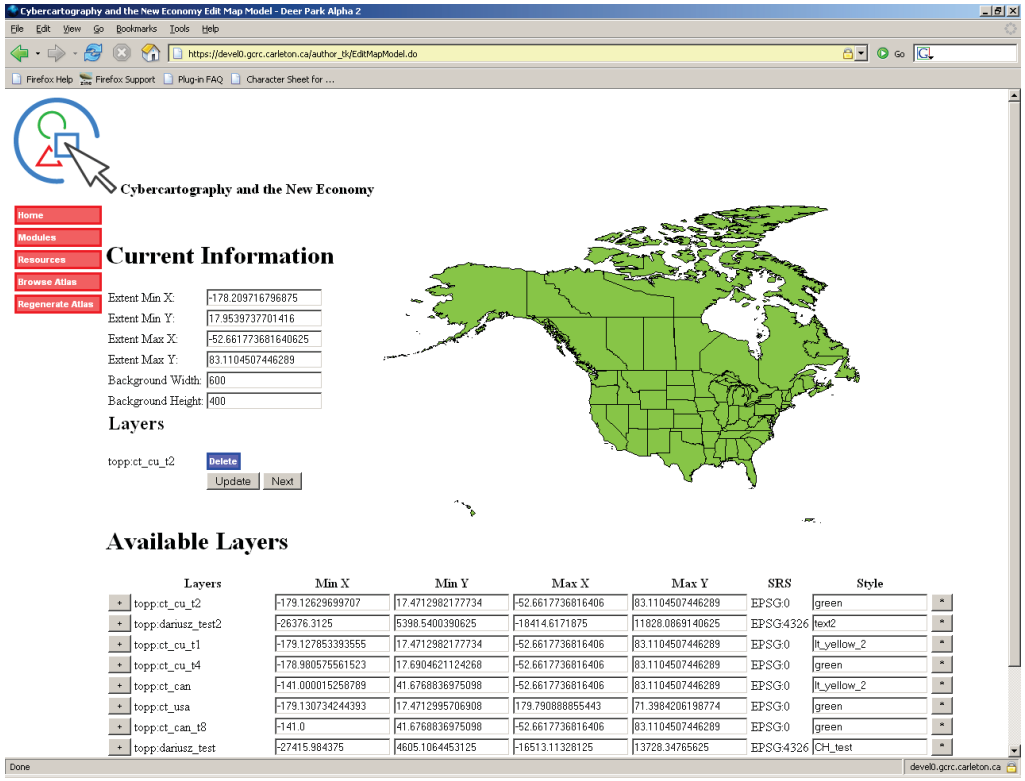
2. h) Technological developments



©2005 Carleton University - Geomatics and Cartographic Research Centre - J.P. Fiset, Peter Pulsifer, Amos Hayes

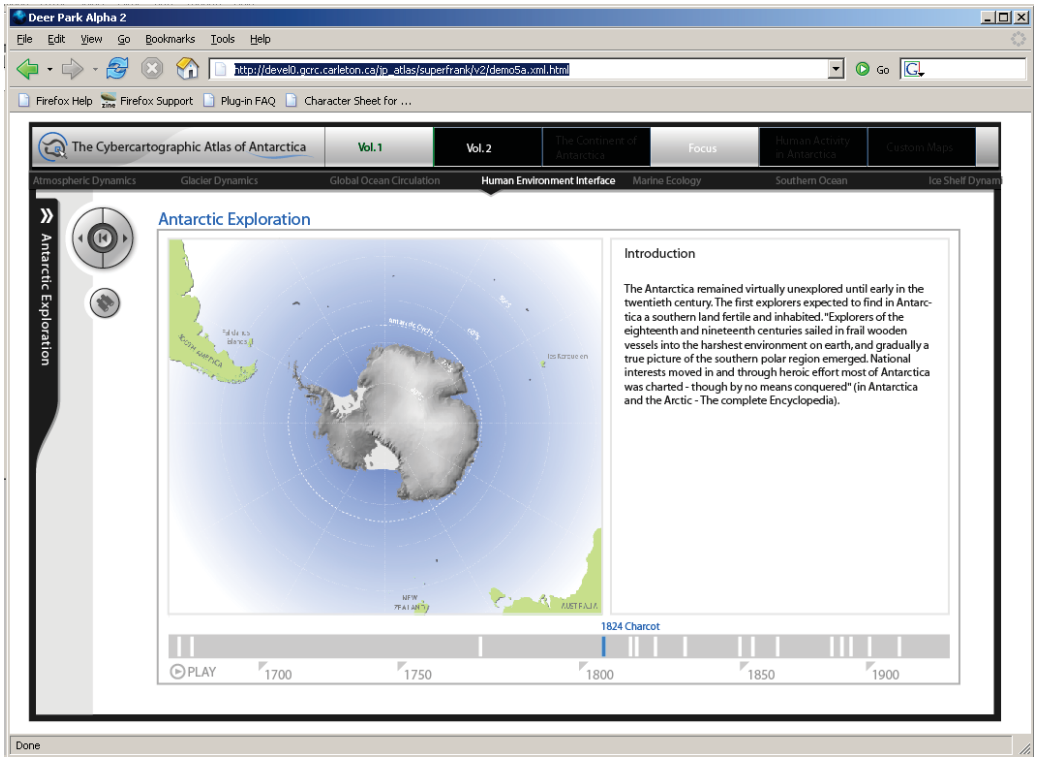
2. i) Technological developments

Provide a web-based author toolkit to allow scientists to enter their own data without knowledge of spatial technologies



- Easy to enter text, multimedia, metadata
- Select GIS data via “point and click”
- Translate cartographer’s and human factor specialist’s requirements
- Single look and feel across atlas based on templates

2. j) Technological developments



- Maps are generated dynamically from databases
- Remote databases are proxied via the atlas provider
- Aggregation of modules into a comprehensive on-line atlas
- Maps, text and multimedia react to user's exploration
- Any SVG-enabled web browser is sufficient (Firefox, IE + ASV)

3. InterPares 2 Project

3. a) InterPARES II objectives

Focus on records produced in complex digital environments in the course of artistic, scientific and e-government activities

IP2 will address:

- Issues of reliability and accuracy in addition to issues of authenticity,
- Life-cycle approach
- Records produced in new digital environments, experiential, dynamic, and interactive

International Research on Permanent Authentic Records in Electronic Systems InterPares 2

3. b) InterPARES II objectives

Objectives: to develop a theoretical understanding of the records generated by interactive, dynamic, and experiential systems, of their process of creation, and of their present potential use in the artistic, scientific and government sectors

	Focus 1 Artistic activities		**Focus 2** Scientific activities		**Focus 3** Governmental activities	
Domain 1 Records Creation & Maintenance	WG 1.1	Correlation of findings across disciplines	WG 2.1	Correlation of findings across disciplines	WG 3.1	Correlation of findings across disciplines
Domain 2 The nature of the record's authenticity, accuracy and reliability	WG 1.2		WG 2.2		WG 3.2	
Domain 3 Methods of appraisal & preservation	WG 1.3		WG 2.3.		WG 3.3	
Terminology						
Policy						
Description						

3. c) InterPARES II Case Study CS06

Domain 1, Focus 2, Working Group 2.1 Records Creation & Maintenance of Scientific Case Study

Antarctica is often referred to as the ‘Continent of Science’ where exploration is for research and where treaties create and environment conducive to collaboration for international scientific study and not exploitation.

3. d) Related IP2 Studies

- Scientific Data Portal Research
  - Practices in Scientific Data
- Archival Standards Benchmark study and Metadata Registry (UCLA & Monash)
  - ISO19115 with Archiving Standard is being registered and analyzed
- Antarctic Treaty Searchable Database Case Study
- Persistent Archives (GRID – San Diego Super Computing)

4. Archiving the Cybercartographic Atlas of Antarctica: The Challenges

4. a) Archiving - Cybercartographic Atlas of Antarctica

- Archiving a dynamic, multidimensional, multisensory, multimedia, multimodal and distributed Atlas?
- How do we make the available for future generations?
- Who pays for data preservation, storing, and archiving on collaborative projects?
- Who will store the Atlases?
- Recovering costs in a distributed virtual Internet project?
- Is there a neglect to capture adequate documentary evidence of the occurrence of these dynamic transactions?
- What are the best multimedia metadata standards for photographs, film, video, web-cams, interactive maps, and animation?
- Does one archive the final CD-ROM product or is a periodic copy of the Internet version adequate?

4. b) Archiving Issues for Geospatial Data

- **Technological Obsolescence**
  - Open Source
- **Interoperability**
  - Open Geospatial Consortium
- **Proprietorship**
  - Data from SCAR
  - Creative Commons
  - Open Source
  - Multimedia objects still Proprietary
- **Data Refreshing**
  - Toolkit
  - Compiler
- **Data migration**
  - Xml
- **Data emulation**

Framework Based on *Bleakly, Denise R., (2002). Long-term Spatial Data Preservation and Archiving: What are the Issues?*

4. c) Archiving Issues for Geospatial Data

- **Storage capacity**
  - Data created and remotely accessed on the fly
- **Metadata w/the data**
  - Multimedia metadata
  - UCLA Archiving Benchmark Study
  - ISO 19115
- **Paper preservation of the data does not work as it is the interrelationships that matter**
- **Data archiving versus information preservation**
  - Data + Metadata + Context
- **Clearinghouses are libraries not archives**
  - The problem of archiving raw data from portals remaims
  - Test archiving with Carleton U Data Centre
- **Estimating costs**
  - Cost benefit analysis
  - Resources not included in award

Framework Based on *Bleakly, Denise R., (2002). Long-term Spatial Data Preservation and Archiving: What are the Issues?*

4. d) Profiling Metadata for Multimedia Information in a Geospatial Portal – MA Thesis, Y. Zhou

- **The ISO19115 and GML can be used jointly in describing collective level metadata information**
- **Limitation: the mediaType level metadata information is undefined yet**
- **The metadata profile is defined flexibly**

- **A potential approach for developing metadata for georeferenced multimedia information in a geospatial portal**
  - Implementation issue
  - Efficient tools
- **A potential means for efficient data access in a geospatial portal**
  - The usefulness of metadata information visualization
  - To emphasize the user center design of metadata information visualization

4. e) Preliminary Case Study Results - IP2 23Q

1. What activities of the creator have you investigated?
2. Which of these activities generate the digital entities that are the objects of your case study?
3. For what purpose are the digital entities you have examined created?
4. What form do these digital entities take? (e.g. e-mail, CAD, database)
5. How are the digital entities created?
6. From what precise process(es) or procedures, or part thereof do the digital entities result?
7. To what other digital or non-digital entities are they connected in either a conceptual or technical way? Is such a connection documented or captured?
8. What are the documentary and technological processes or procedures that the creator follows to identify, retrieve and access the digital entities.
9. Are those processes and procedures documented? How? And in what form?
10. What measures does the creator take to ensure the reliability and authenticity of the digital entities and their documentation?

4. f) Preliminary Case Study Results - IP2 23Q

11. Does the creator think that the authenticity of his/her digital entities is assured and if so, why?
12. How does the creator use the digital entities under examination?
13. How are changes to the digital entities made and recorded?
14. Do external users have access to the digital entities in question? If so, how? And what kind of uses do they make of the entities?
15. Are there specific job competencies (or responsibilities) with respect to the creation, maintenance, and/or use of the digital entities? If yes, what are they?
16. Are the access rights (to objects and/or systems) connected to the job competence of the responsible person? If yes, what are they?
17. Among its digital entities, which ones does the creator consider to be records and why?
18. Does the creator keep the digital entities that are currently being examined? That is, are these digital entities part of a recordkeeping system? If so, what are its features?

4. g) Preliminary Case Study Results - IP2 23Q

19. How does the creator maintain its digital entities through technological change?

20. To what extent do policies, procedures, and standards currently control records creation, maintenance, preservation and use in the context of the creator's activity? Do these policies, procedures, and standards need to be modified or augmented?

21. What legal, moral (e.g. control over artistic expression) or ethical obligations, concerns or issues exist regarding the creation, maintenance, preservation and use of the records in the context of the creator's activity?

22. What descriptive or other metadata schema or standards are currently being used in the creation, maintenance, use and preservation of the recordkeeping system or environment being studied?

23. What is the source of these descriptive or other metadata schema or standards (institutional convention, professional body, international standard, individual practice, etc.?).

4. h) New Mapping Frontiers

- Spatially referenced data have always been integral to map creation and the abstracted rendering of these data have traditionally been in the hands of cartographers.

- The paper map was the final product or record that was then catalogued and preserved. Generally data used to create the map were lost and not included as part of the complete record set.

4. i) New Mapping Frontiers

- The introduction of GIS has revolutionized production and preservation and helped add value, but preservation issues have been virtually ignored and the value of the map as knowledge integration tool is not fully exploited

- The Cybercartographic Atlas of Antarctica, and the new paradigm of cybercartography, attempts to increase the value added to scientific knowledge on Antarctica and to explicitly address preservation issues

5. Final Remarks

5. a) The Knowledge Commons is Fragile

Fragments of paper maps and fragments of digital maps

"In archival terms the last quarter of the 20th century has some similarities to the dark ages. Only fragments or written descriptions of the digital maps produced exist. The originals have disappeared or can no longer be accessed."

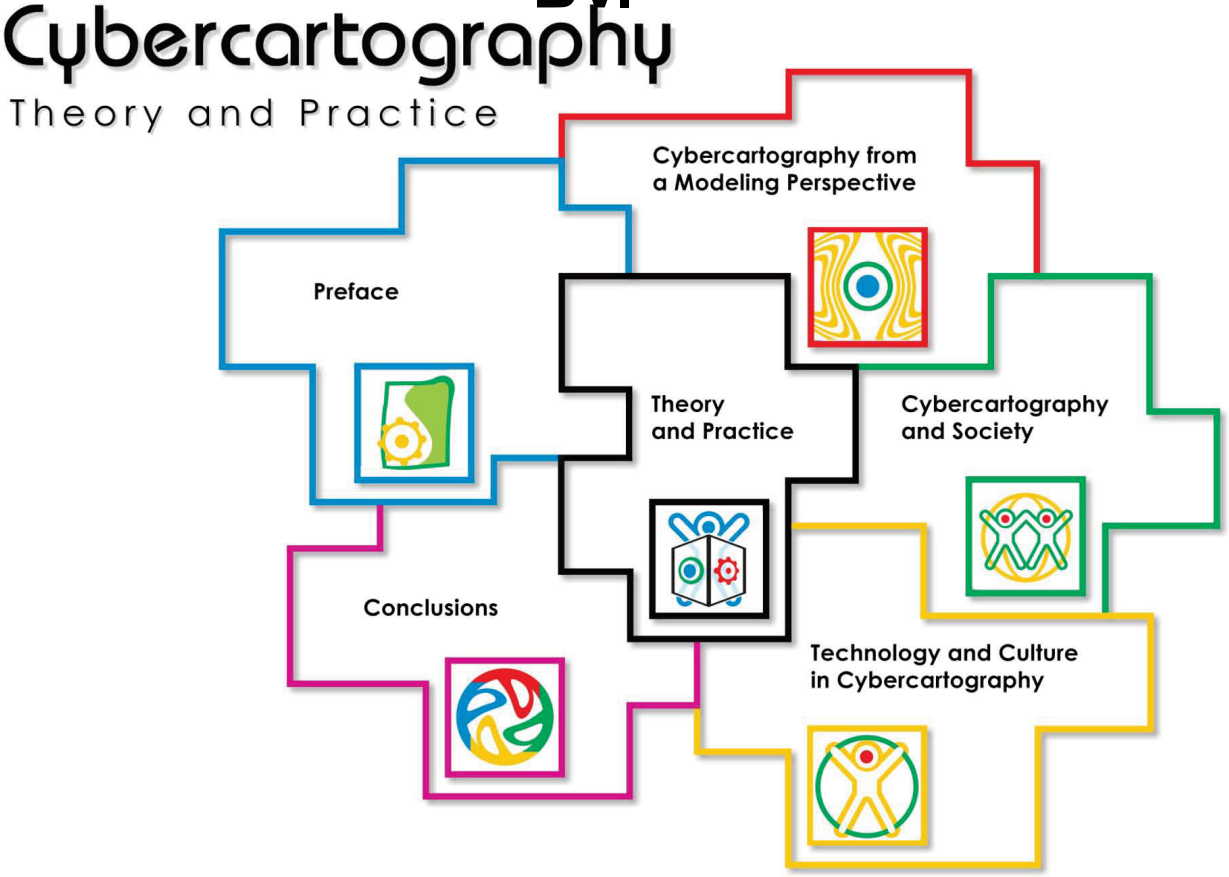
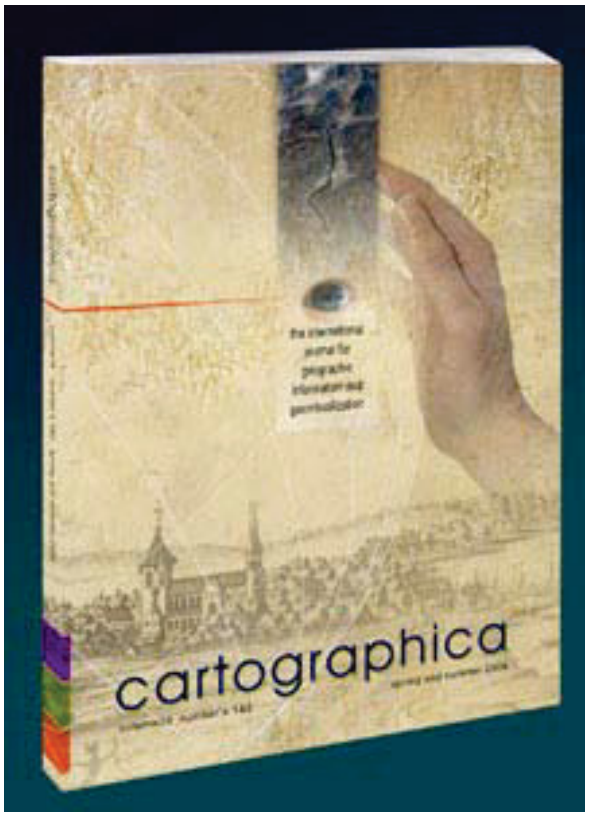
Taylor

5. b) Conclusion

Just as the map was central to the age of exploration the cybermap is central to the information age

If you would like to learn more!

New Book in Press, Elsevier BV.



Special Issue on Cybercartography