

"New Frontiers – GIS, Life, the Universe and Everything



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Cybercartography and the New Economy Project

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Morning Plenary, Ottawa, May 30,
2003





Project Funding

- Social Sciences and Humanities Research Council of Canada (SSHRC)
 - Innovation on the New Economy: Research Alliance Program Stream
(http://www.sshrc.ca/web/apply/program_descriptions/ine/alliances_e.asp)
 - Awarded a 4 year grant to support research in cybercartographic theory and methodology:
 - Project implementation began 01/2003



The Geomatics and Cartographic Research Centre

■ Research focus:

The application of cartography and geospatial analysis to an increased understanding of societies and economies in a national and international context



Cybercartography

Reflects the Changing Nature of Cartography:

“the organization, presentation, analysis and communication of spatially-referenced information on a wide variety of topics of interest and use to society in an interactive, dynamic, multimedia, multisensory and multidisciplinary format”

Taylor

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Aims and Objectives

- Multidisciplinary research team will develop a new, foundational paradigm for cybercartography
- Contribute to an improved understanding of how individuals organize, navigate and interact with computer-based information



Cybercartographic Products

■ Atlas Goals:

- Create two innovative products and methodologies to compliment discovering, utilizing, **presenting and distributing existing information and data** for
 - The Cybercartographic Atlas of Antarctica
 - The Atlas of Canada's Trade with the World
- The intended users are scientists, decision makers and the general public



7 Elements of Cybercartography

Cybercartography:

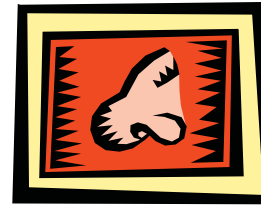
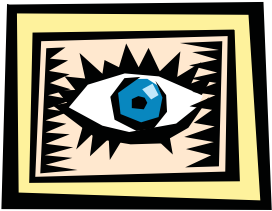
1. Is multisensory using vision, hearing, touch and eventually smell and taste;
2. Uses multimedia formats and new telecommunications technologies such as the World Wide Web;
3. Is highly interactive and engages the user in new ways;
4. Is applied to a wide range of topics of interest to society, not only to location finding and the physical environment;



Elements cntd.

5. Is not a stand alone product like the traditional map but part of an information/analytical package;
6. Is compiled by teams of individuals from different disciplines;
7. Involves new research partnerships among academia, government, civil society and the private sector.

1. Multisensory



Responsive Workbench

Source: <http://www-graphics.stanford.edu/projects/RWB/>

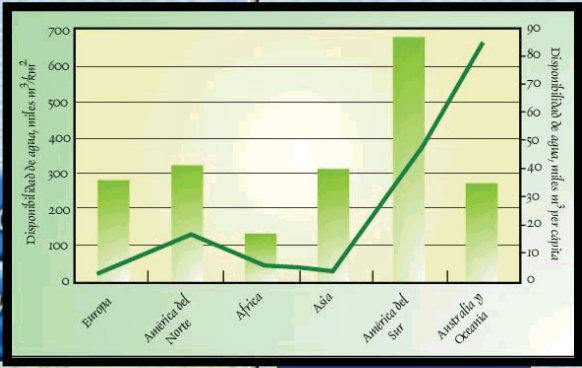


Libra Nose

M. Romano, A. Scarpa, S. Sinopoli
Technobiochip scarl, Marciana (LI), Italy
http://www.technobiochip.com/tb_en.htm

2. Multimedia

- Acerc...
- El Agua y...
- Oferta Ambiental
- Población y Cultura
- Usos e Impactos
- Horizontes
- En América



Graphics

Atlas Cibernético

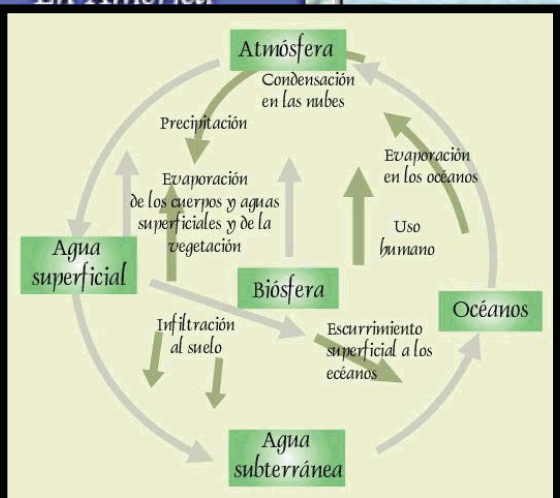
El Agua en América

Video

Flujos en el ciclo global del agua

	Volumen (km³ por año)	Rango de estimaciones (km³)
Evaporación terrestre	71,000	65,000 - 73,000
Precipitación en tierra	111,000	99,000 - 119,000
Evaporación de los océanos	425,000	385,000 - 505,000
Precipitación en los océanos	385,000	320,000 - 450,000
Escorrentía de tierra a los océanos	39,700	33,500 - 47,000
Ríos	27,000	27,000 - 45,000
Escorrentía subterránea directa	12,000	0 - 12,000
Escorrentía de glaciares (hielo y agua)	2,500	1,700 - 4,500
Transferencia neta de humedad de la atmósfera de los océanos a la terrestre	39,700	No disponible

Tables



Visualizations

Animations



3. *Interactive*

- “Cartography that engages the users in new ways”
- Edutainment – pleasurable activities that entertain and educate at the same time

Interactive - Infotainment

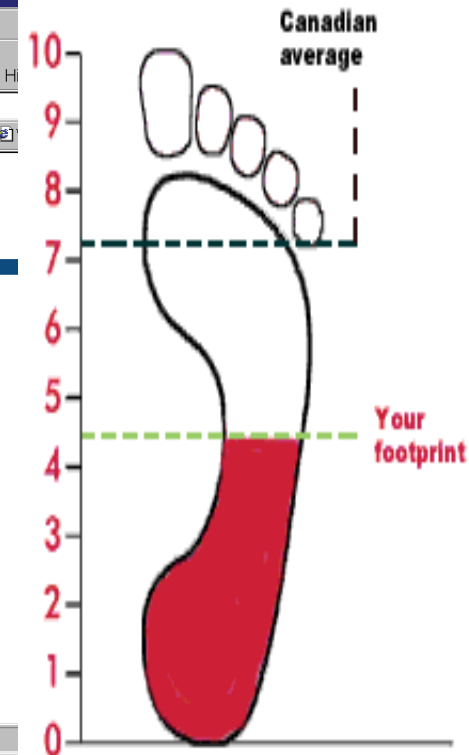
City Lifestyle Explorer - Microsoft Internet Explorer
 Address: http://ceroi.net/cle/

On-line Ecological Footprint Calculator - Microsoft Internet Explorer
 Address: http://apps.city.toronto.on.ca/servlet/footprint.s_fp_waste

City Lifestyle Explorer
 Chosen lifestyle: [Icons for various lifestyle choices]

On-line Ecological Footprint Calculator
 1) Estimate your household's yearly purchases/ use of services on the following items:

Item	Cost
a) clothing and shoes	\$ 1443.01
b) paper products (i.e. books, magazines, newspaper, writing paper)	\$ 472.29
c) plastic products (i.e. garbage bags, cups, toys, beverage containers)	\$ 80.94
d) medicine	\$ 166.89
e) hygienic products/ toiletries/ personal items/ diapers	\$ 289.43
f) telephone	\$ 804.32
g) entertainment (movies, concerts, restaurants, etc.)	\$ 1017.0

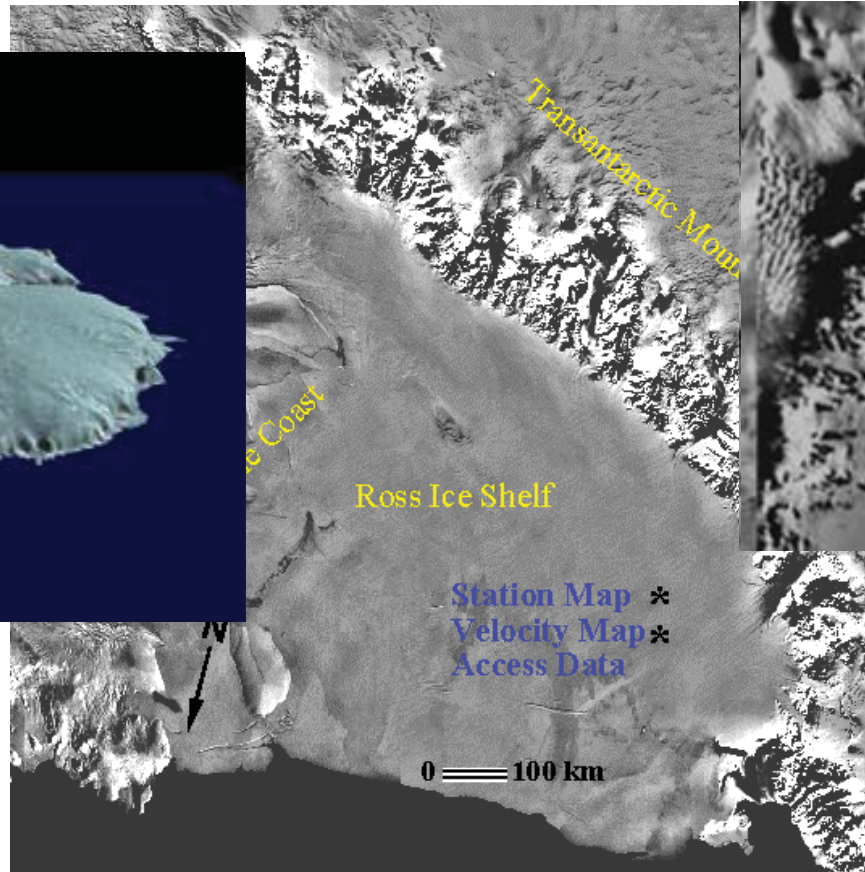


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4. *Applied to a wide range of topics*

Society and Environment

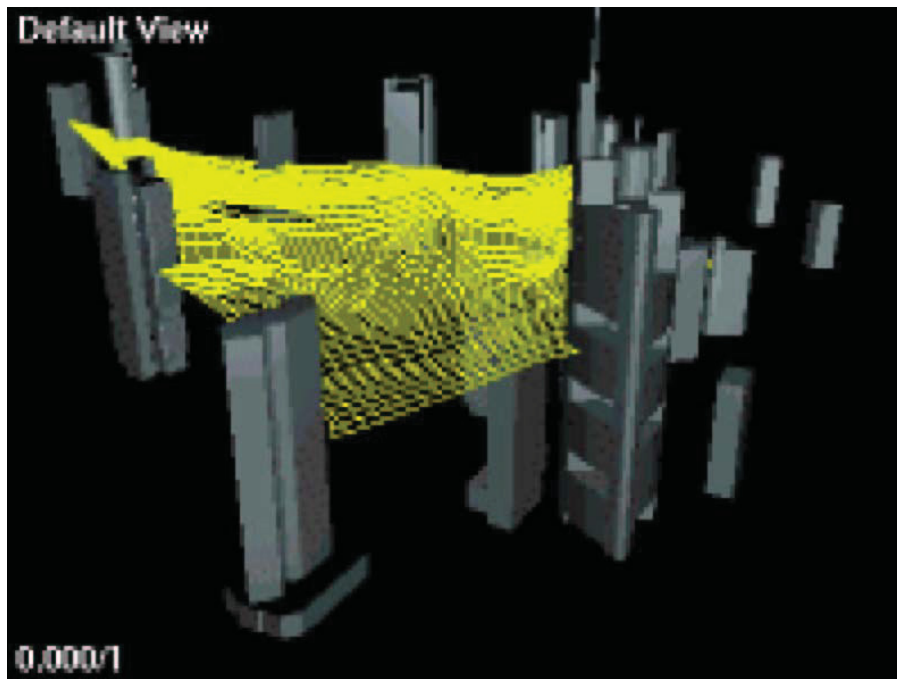


*Image credits: NASA - Goddard
Space Flight Center Scientific
Visualization Studio/NSIDC*

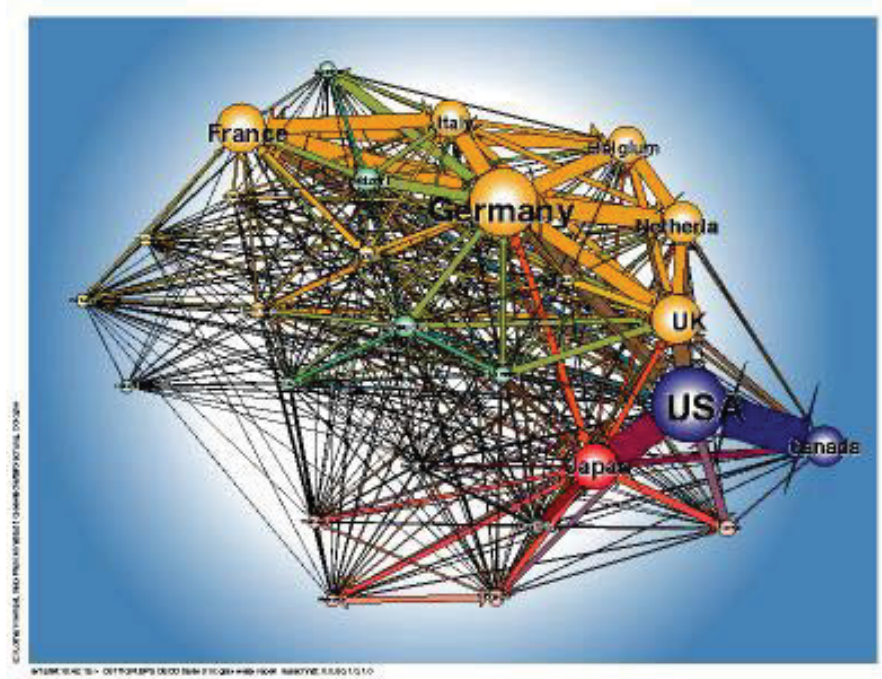
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4. Topics Contd.

Society and Economy



Money Transfers Between Banks
Image from Presentation, Cartwright, W., 2002
Image creator is unknown



Structures of World Trade
Image Source:
<http://www.mpi-fg-koeln.mpg.de/~lk/netvis/trade/>



5. Information/analytical package

- Cybercartography uses new and developing communication networks and distributed information systems
- Research areas include multi users within flight simulation & measures of situational awareness for distributed users
- Cybercartography is a theoretical construct and not a product.
- Unlike GIS software, you cannot buy a cybercartographic system.



6. *Multi-disciplinary teams*

- Network of people (as opposed to just computers)
- Collaborative - Integrative - Cross-domain
 - Cartography
 - Geography, Cognition
 - Literary and language studies
 - International trade
 - Film studies, Music
 - Psychology
- Information community
 - Application, urban planners, surveying, economists
 - Data providers, producers, user communities, scientists, general public, policy makers



6. Teams Contd.

Project Investigator:

- *D.R.F. Taylor*, Geography, Environmental Studies and NPSIA

Researchers in Internet Cartography

- *Dr. Michael Peterson*, Geography, University of Nebraska at Omaha
- *Dr. William Cartwright*, Geospatial Science, Royal Melbourne Institute of Technology University, Australia
- *Dr. George Gartner*, Cartography and Geo-Mediatechniques, Vienna University of Technology

Audio Tactile Mapping

- *Dr. Don Parkes*

International Trade

- *Dr. Michael Hart*, The Norman Paterson School of International Affairs (NPSIA)

Archiving

- *Wendy Watkins*, Carleton University
- *Dr. Luciana Duranti*, UBC, InterPares 2 Project Director

Human Factors Research

- *User Understanding – Dr. Gitte Lindgaard, & Dr. Richard Dillon* Psychology – Human Oriented Technology
- *Navigation & Situational Awareness Dr. Christopher Herdman*, Psychology Flight Simulation Models
- *Dr. Jo-Anne Lefevre*, Cognitive Psychology
- *Dr. Robert McCann*, Human-Automation Integration Branch, NASA Ames Research Center, California

Navigation and text Narrative

- *Hypertext Dr. Brian Greenspan*, English Language and Literature
- *Visual and Sonic, Dr. Paul Theberge*, Canada Research Chair in Music and Technology, *Dr. Laura Marks* in Film Studies

Olfaction and Teleolfaction

- DR. Fabrizio Davide



7. *New research partnerships*

Involves new partnerships among research centres, national mapping agencies, private sector, NGOs and educational institutions

- Canadian Committee for Antarctic Research (CCAR)
- Canadian National Institute for the Blind Library (CBIBL)
- Foreign Affairs and International Trade (DFAIT)
- Geomatics Industry Association of Canada (GIAC)
- International Cartographic Association (ICA) Commission on Maps and the Internet
- ICA on Mountain Cartography
- GeoAccess Division, Natural Resources Canada (NRCan)
- Orbital Media Group
- Scientific Committee for Antarctic Research (SCAR)
- Group of Experts on Geospatial Information Geography Division, Statistics Canada (StatCan)
- Telecom Italia
- S.p.A.
- InterPares II

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Users

■ General public

- Learn from theme specific synthesis of data on Antarctica and Trade

■ Policy makers

- Integrate and analyze GI to support policy decisions

■ Scientists

- Integrate and analyze GI using scientific visualization to support information discovery and knowledge generation



Moving to a Research Environment

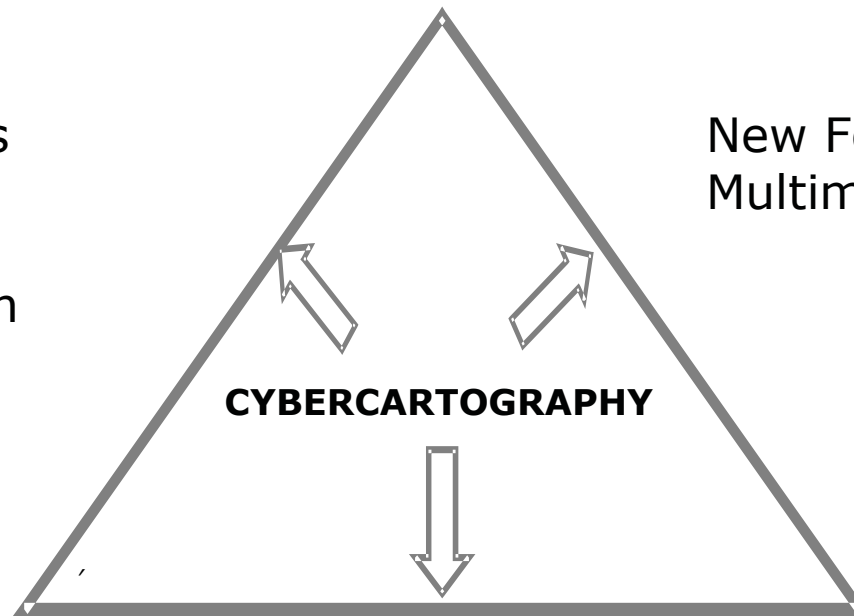
- The previous elements are based on observations of the practice of cartography
- A theoretical framework was formulated to better understand these developments



Developments in Modern Cartography

New Forms of Analysis
and Cognition
Data exploration,
Computer Visualization

New Forms of Multisensory and
Multimedia Communication



New Computer and Telecommunications Technologies
GPS, GIS

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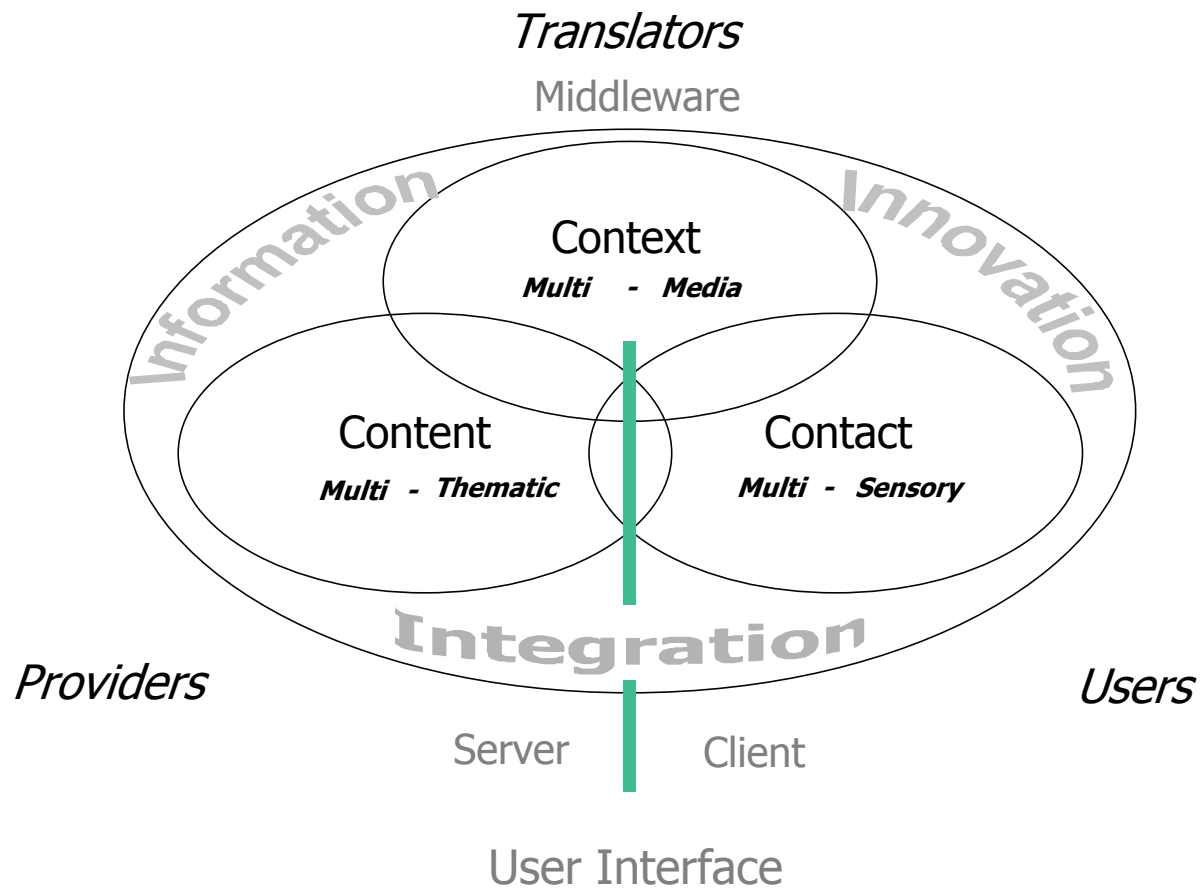


*The Social Sciences and the
New Information Economy*

- Transition from hardware and software to “brainware”
- Knowledge integration is key



Cybercartographic Integrated Research Framework





Archiving

- 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*



Domesday Project

- The BBC Domesday Project was created in 1986 and used the BBC Acorn Micro computer and proprietary BBC Software.
- It sold as a complete system, including hardware, software, and data for £5000
- It aimed to mirror the original Domesday survey by William the Conqueror 900 years before and consisted of two disks.
 - One containing official maps, statistics, etc. and the
 - Second a community disk including contributions from schools
- It was an innovative and comprehensive survey of British life in 1988
- The ground-breaking Domesday project has become unreadable and the wealth of its contents are potentially lost forever.



Canada Land Inventory

■ Canada Land Inventory (CLI)

- 1963, 1st GIS project in North America
- IBM mainframe in PL/1 computer language
- 3500 maps available from the system
- 1994 Program review and CLI is archived
- Data but not hardware were restored
- Magnetic tapes were damaged and only some files were retrievable
- Data translators used to move data into modern GIS
- 16 step data conversion process with many experts and at a high cost
- Some not all data were converted and made available on GeoGratis (<http://geogratis.cgdi.gc.ca/>)



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

Geospatial Data Archiving Issues

- **Technological Obsolescence**
 - fast product development cycle
 - Lack of backward compatibility(ArcView 8.1 and 3.0)
- **Interoperability**
 - between software, hardware,
 - peripherals
 - and file types
- **Proprietaryship**
 - Impedes preservation
 - Information is in the private sector
- **Data Refreshing**
 - Moving from one medium to a newer medium
 - Risk of losing functionality

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Archiving issues contd.

- Data migration
 - From one hardware software configuration to another
 - From one generation computer to another
 - Moves software and operating systems
- Data emulation
 - One software tool to make software act as if it were something else
 - Long term viability is unknown
- Storage capacity
- Metadata w/the data
- Paper preservation of the data does not work as it is the interrelationships that matter



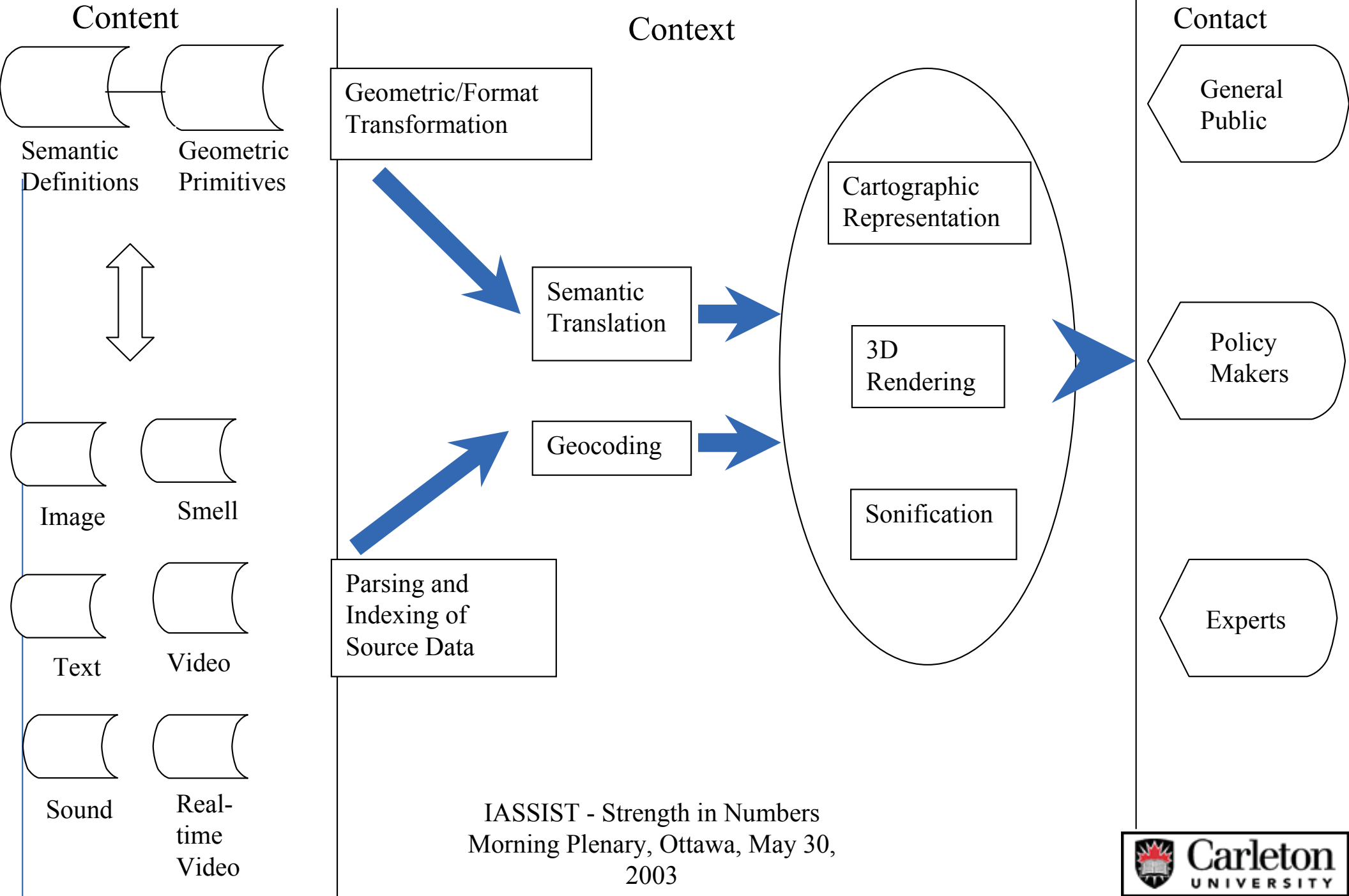
Issues contd.


- Data archiving versus information preservation
 - Data are more powerful if kept in their context
 - Refreshing and copying to new media removes the context and the objects may be archived but not preserved (*I.e., context is lost*)
- Clearinghouses are libraries not archives
 - Provides distributed access to data but does not store them nor archive them
 - National Satellite Land Remote Sensing Data Archive is a clearinghouse and an archive
 - GeoConnections Access Portal is a clearinghouse
- Estimating costs
 - May cause some to destroy their data to make way for new data



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.
- Cybercartography as a new paradigm has positioned data on par with the final map and related information objects as a result geospatial data and their attributes have become records in and of themselves.





Cybercartography Archiving questions?

- How does one archive a dynamic, multidimensional, multisensory, multimedia, multimodal and distributed Atlas?
- The Atlas will become an important scientific digital knowledge asset on environment and society how do we make sure it is available for future generations?
- Who pays for data preservation, storing, and archiving particularly in an international inter-organizational project of this kind ?

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Questions cntd.

- Who will store the Atlases? Archives of Canada? Natural Resources Canada? Scientific Committee on Antarctica?
- How can archiving costs be recovered in a distributed virtual Internet project?
- As cartography moves into a distributed Internet environment and enters into information exchanges based on more dynamic web presentation, is there a neglect to capture adequate documentary evidence of the occurrence of these transactions?
- Geospatial data require metadata, as do multimedia, dynamic and experiential information objects. What are the best 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?

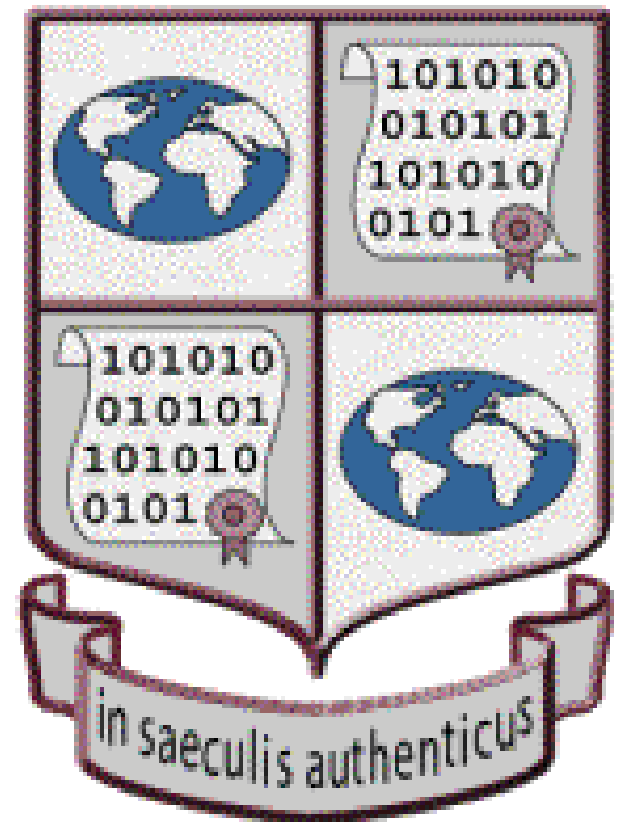
InterPares 2

IP2 will address:

- issues of reliability and accuracy in addition to issues of authenticity,
- these issues exist throughout the records' life-cycle
- records produced in new digital environments, experiential, dynamic, and interactive,
- records resulting from artistic, scientific and government activities

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*International Research
on
Permanent Authentic
Records in Electronic
Systems*






InterPares 2

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						

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Cybercartographic Atlas of Antarctica IP2 Case Study

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 an environment conducive to collaboration for international scientific study and not exploitation.



Geospatial Data Archiving Initiatives

- Canada Ground Systems Operations Section (GSOS)
 - http://dweb.ccrs.nrcan.gc.ca/ccrs/db/Staffdir/orgchart/tmpGSOS_e.cfm?SectionID=8
- National Land Remote Sensing Archive
 - <http://ceos.cnes.fr:8100/cdrom-00b2/ceos1/policy/policy5.htm>
- FGDC Managing Historical Geospatial Data Records
 - <http://www.fgdc.gov/nara/hdwgfsht.html>
- CODATA (2002). Frontiers of Scientific and Technical Data Archiving Scientific Data. Science Specialty Session Abstracts.
 - <http://www.codata.org/codata02/>
- GeoConnections, Canadian Geospatial Data Infrastructure (CGDI), Policy Advisory Node has commissioned “*A study On Policies For Archiving and Preserving Geospatial Data*”, David Brown, NAC



Conclusion

- We are only scratching the surface, and worse may be scratching where people do not itch. Are we like the French generals who built the Maginot line? Perfectly prepared for the last war!!