



Geog 126: Maps in Science and Society

A history of Multimedia and
Web GIS

If only we'd known

“I think there may be a world market for five computers in the world”

Thomas Watson Chairman IBM 1943

“There is no reason for individuals to have a computer in their home”

Ken Olson CEO DEC 1977

“640,000 bytes of memory ought to be enough for anybody”

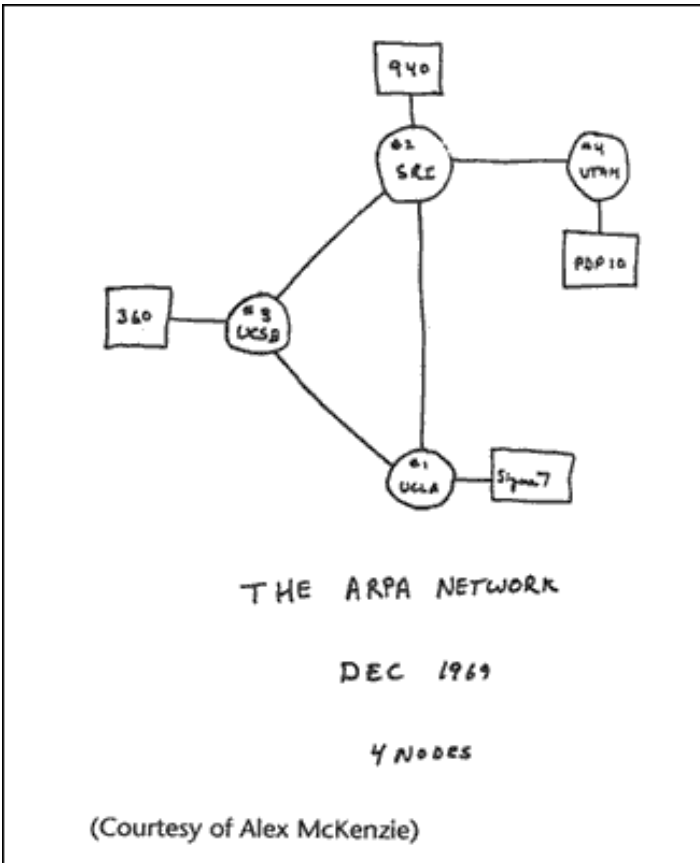
Bill Gates Microsoft 1981

“The Internet? We are not interested in it.”

Bill Gates Microsoft 1993

Early Internet History

- J.C.R. Licklider of MIT, then DARPA, first proposed a global network of computers in 1962
- Leonard Kleinrock of MIT and later UCLA developed the theory of packet switching
- Lawrence Roberts of MIT connected a Massachusetts computer with a California computer in 1965 over dial-up telephone lines
- Kleinrock's packet switching theory was confirmed.
- Roberts moved over to DARPA in 1966 and developed his plan for ARPANET



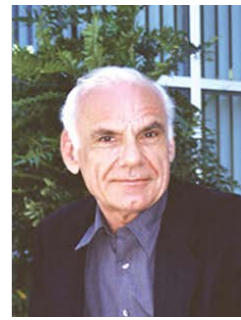
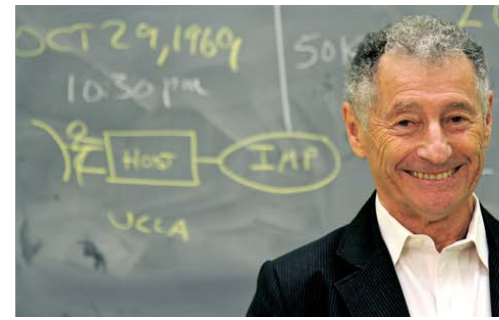
Leonard Kleinrock demonstrates how the first Internet communication was made with the help of an Interface Message Processor machine at his office at the UCLA Computer Science Department in Los Angeles

IBM 360

Model 20 had 4096 bytes of core memory, eight 16-bit registers

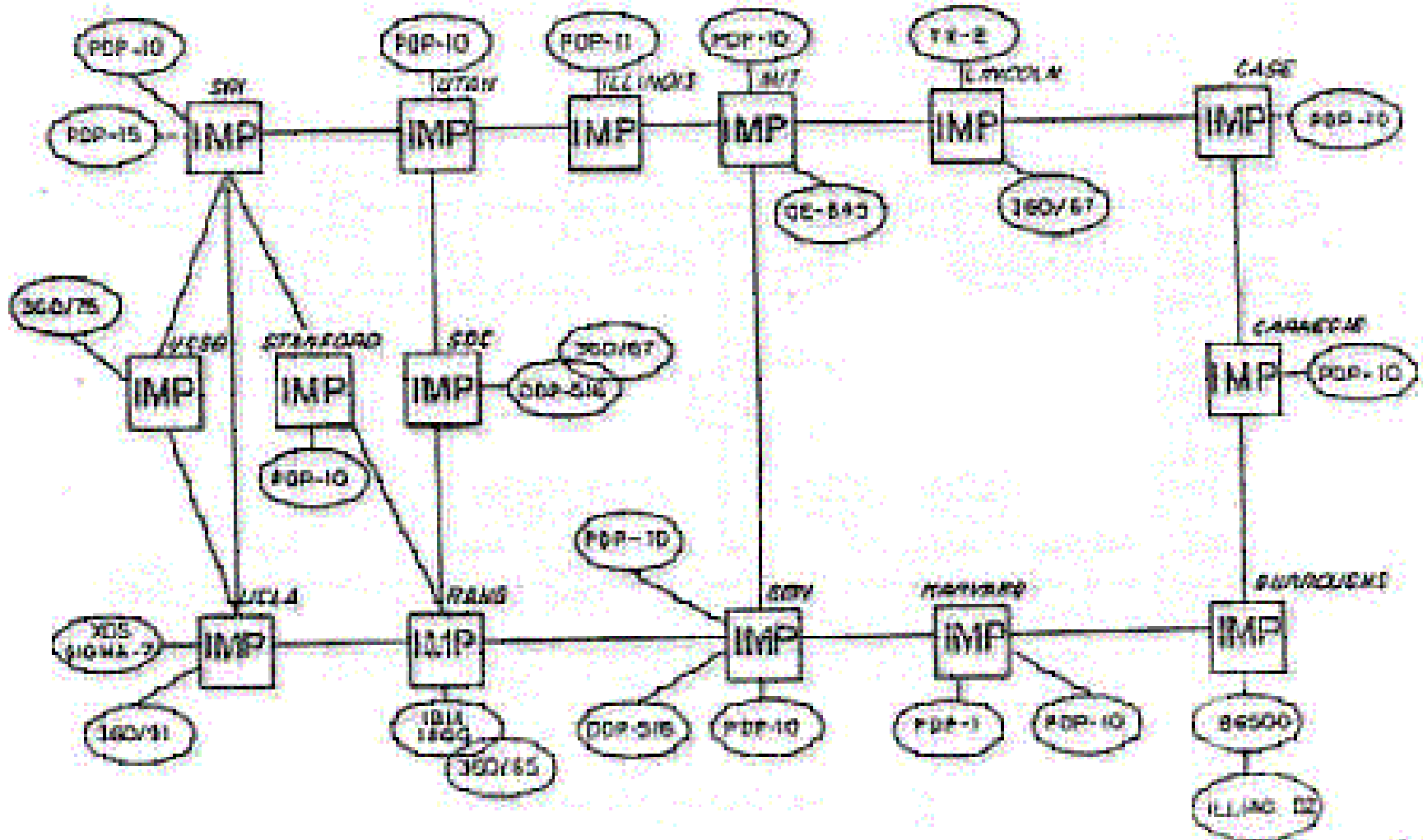


Simple beginnings



- ARPANET, was brought online in 1969
- Initially connected four major computers at universities in the southwestern US (UCLA, Stanford Research Institute, UCSB, and the University of Utah)
- 1970, MIT, Harvard, BBN, and Systems Development Corp in Santa Monica, Cal. were added.
- 1971, Stanford, MIT's Lincoln Labs, Carnegie-Mellon, and Case-Western Reserve U were added. Also, NASA/Ames, Mitre, Burroughs, RAND, and the U of Illinois plugged in.
- First message: Charlie Kline at UCLA sent the first packets on ARPANet as he tried to connect to Stanford Research Institute on Oct 29, 1969
- The system crashed as he reached the G in LOGIN!

The doubling begins



Important landmarks

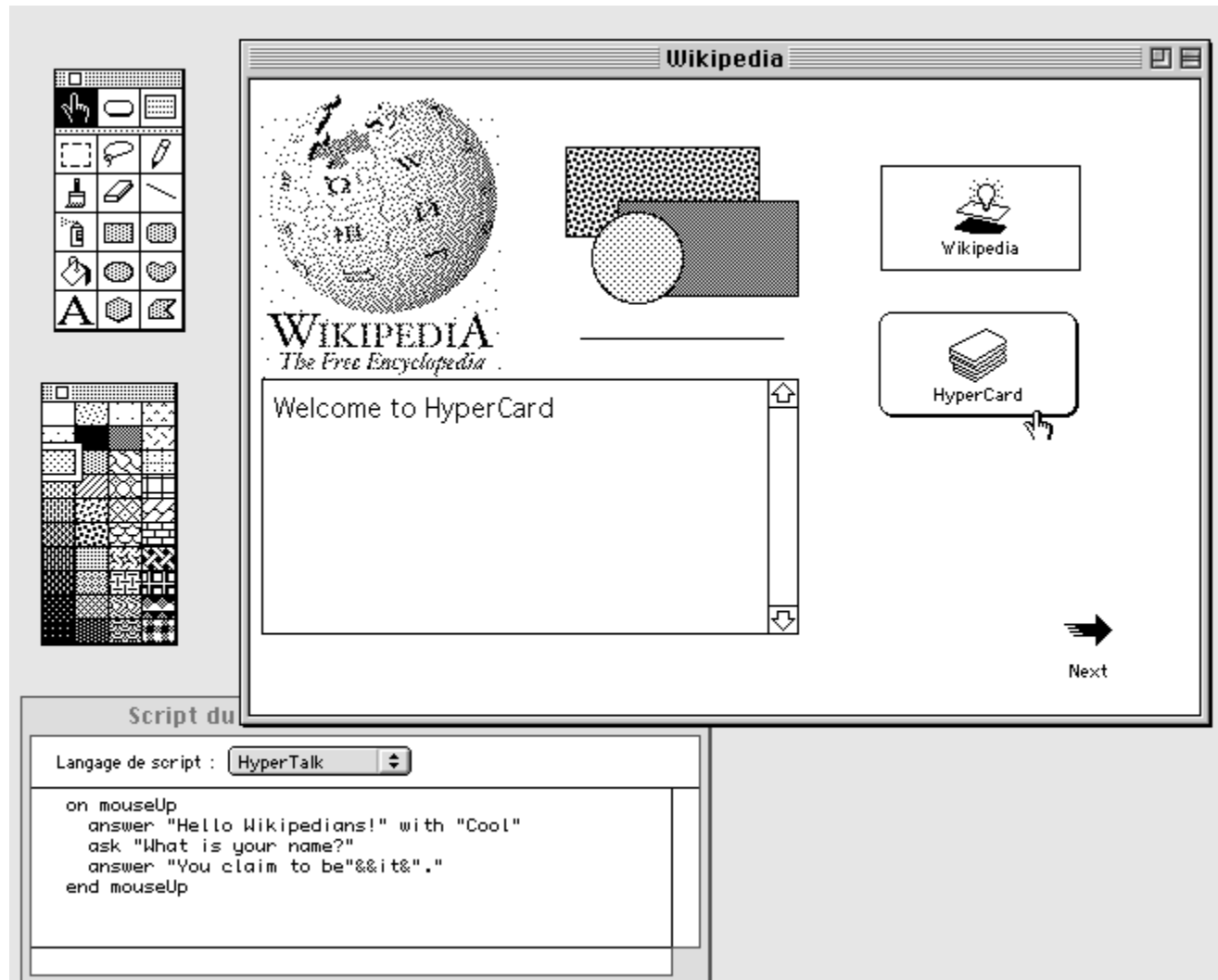


- E-mail 1972 (Ray Tomlinson of BBN selects @)
- Telnet, ftp 1972-3
- Ethernet 1974, outgrowth of Bob Metcalfe's Harvard dissertation on "Packet Networks."
 - The dissertation was initially rejected by the University for not being analytical enough
- Frederick G. Kilgour of the Ohio College Library Center (now OCLC, Inc.) led networking of Ohio libraries during the '60s and '70s.
- TCP/IP develops 1970s onward
- BITNET connected IBM mainframes around the educational community and the world to provide mail services beginning in 1981 (includes listserves)
- 1986, the National Science Foundation funded NSFNet
- 1989 Archie, WAIS

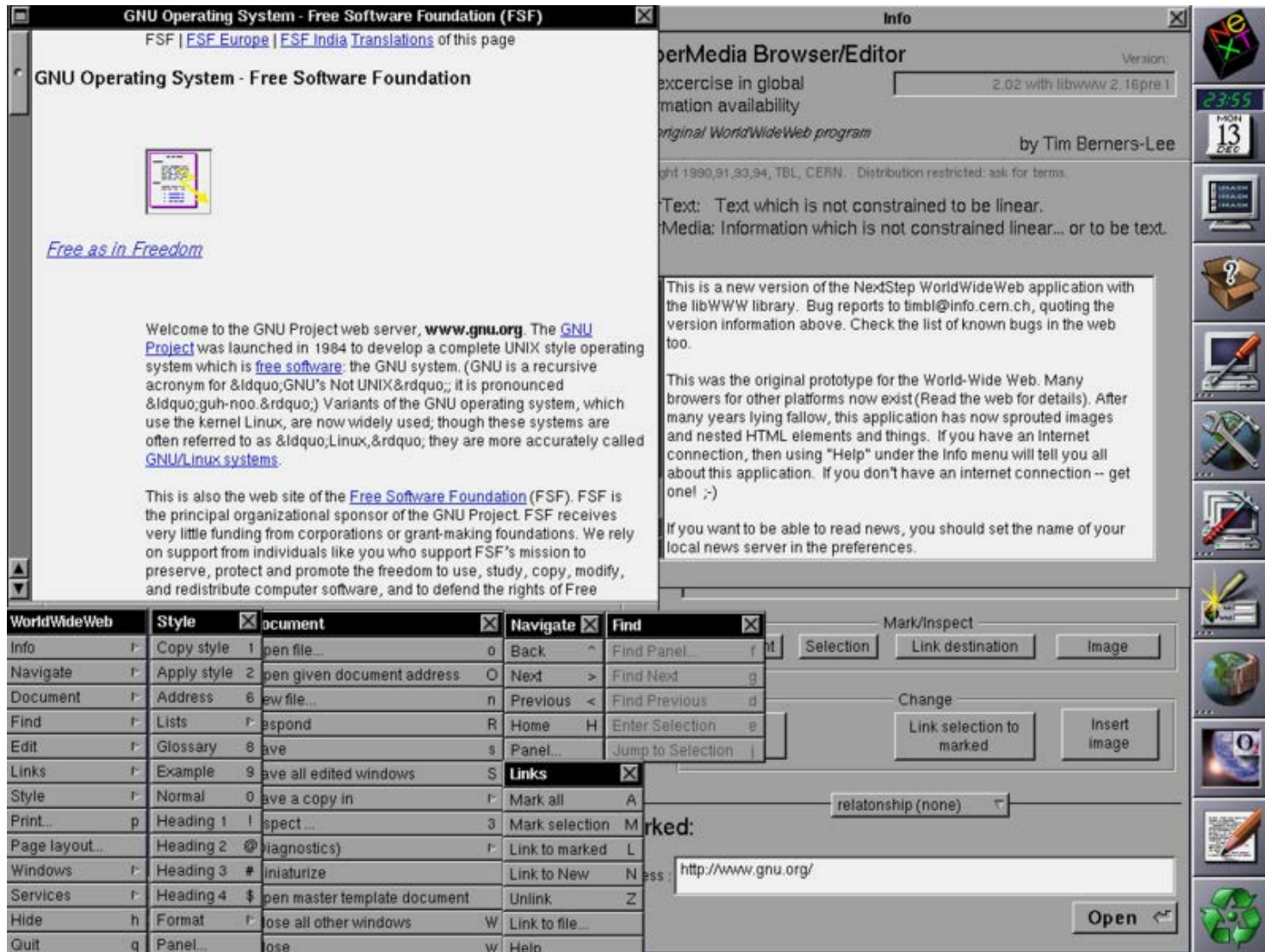
Web landmarks

- **Gopher** (distributed document search and retrieval network protocol)
 - Used hyperlinking features
 - Replaced by HTTP protocol
- Later tools built upon HTTP: e.g. Mosaic, Mozilla
- Mosaic was developed at the National Center for Supercomputing Applications (NCSA) beginning in late 1992. NCSA released the browser in 1993, and officially discontinued development and support on January 7, 1997

Apple's Hypercard "Stacks"

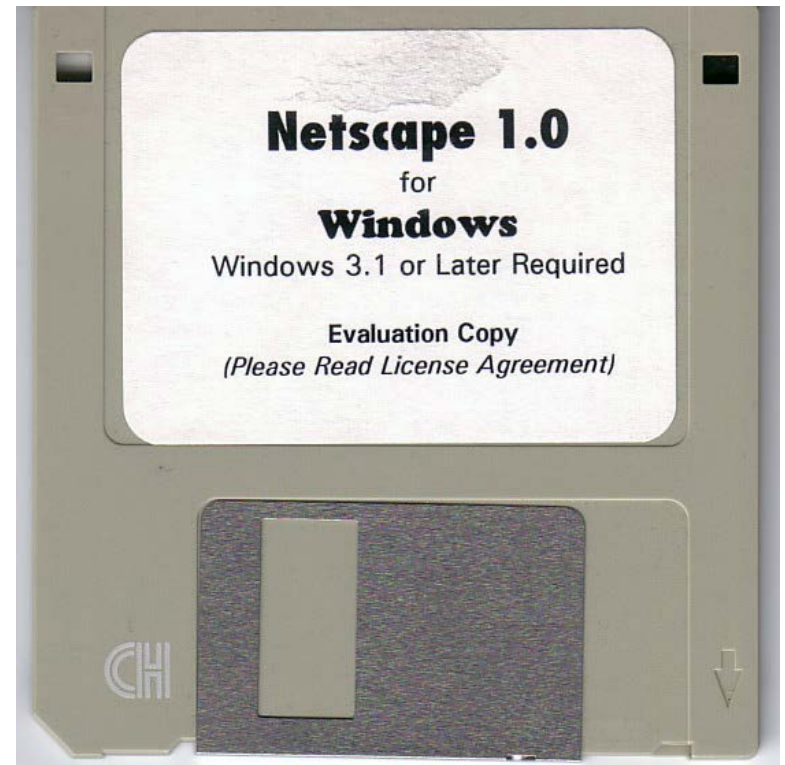
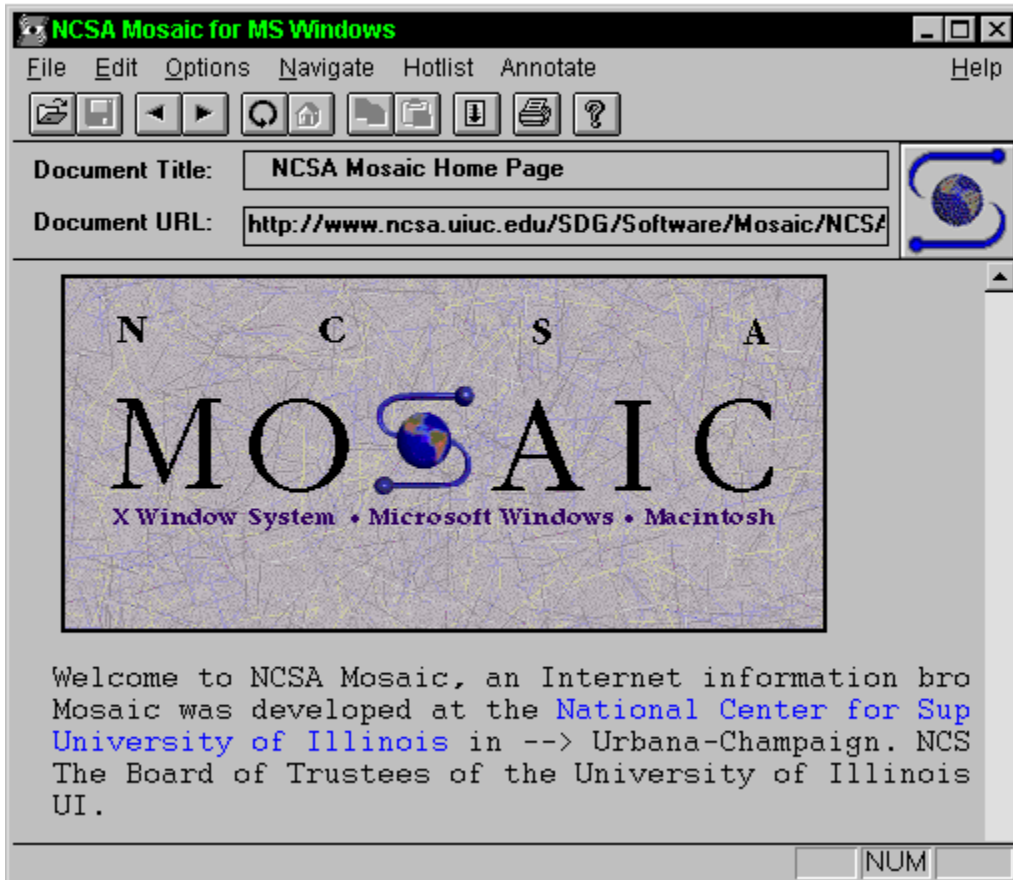


WorldWideWeb for NeXT (1991)



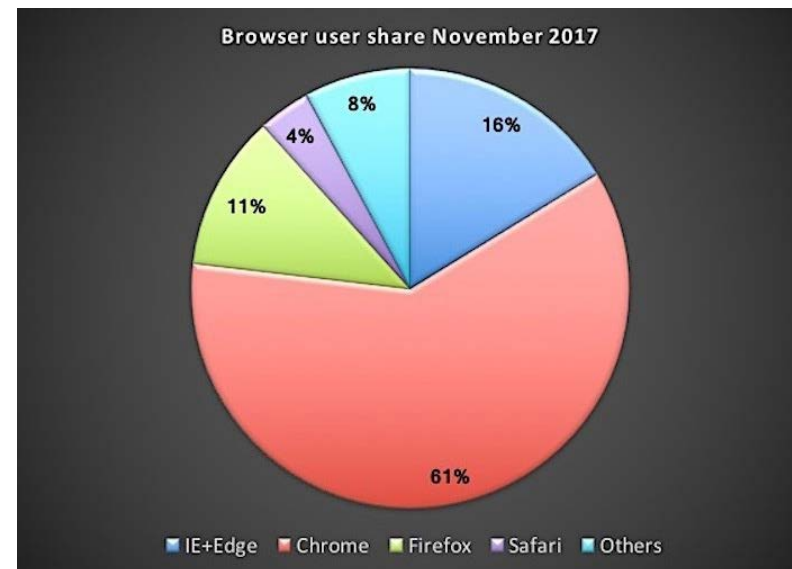
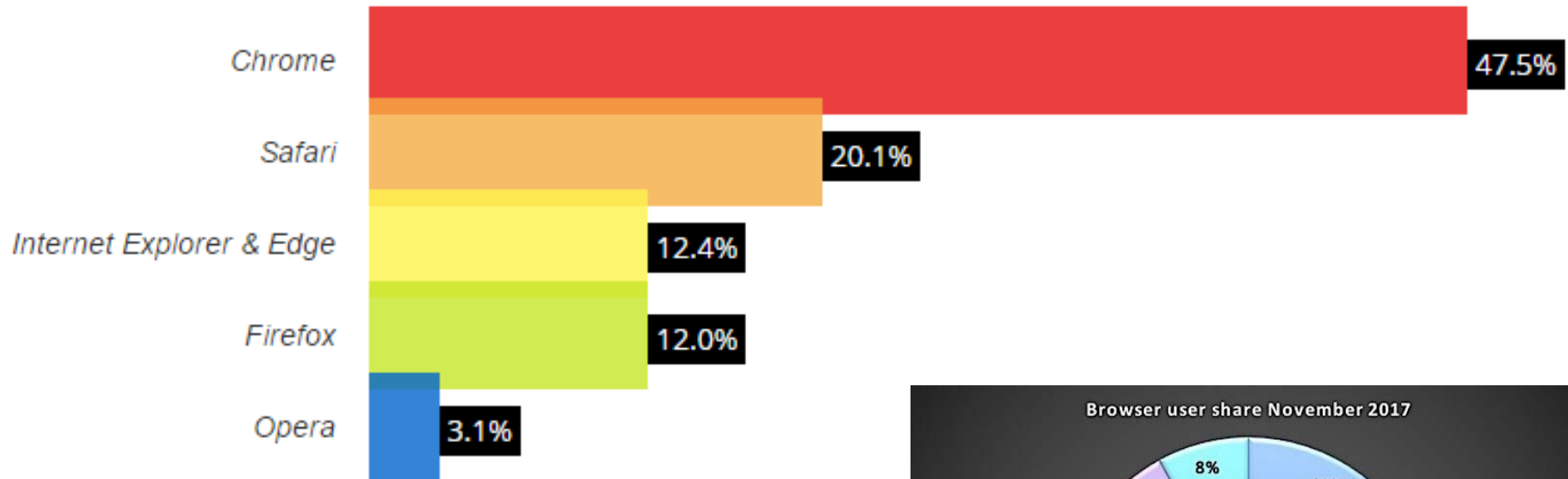
Arrival of the Browsers

From Computer Desktop Encyclopedia
Reproduced with permission.
© 2004 National Center for Supercomputing Applications



Browsers galore

2016 market share



Web cartography would have been impossible without...

- The Internet
- Precise positioning
- Mobile computing
- Wireless communications
- Standards
- Open Source software

The first GNSS: GPS



Mobile computing



Wireless



The screenshot shows a web browser window displaying an interactive map of UCSB. The browser's address bar shows "COX.net for Santa Ba...", "GauchoSpace", "Google Calendar", "CNN.com - Breaking N...", "BBC - Homepage", and "Geography BBS". The UCSB logo is visible in the top right corner of the page. A legend is open in the center, listing various building features and their symbols, including "Automatic door", "Accessible building entrance", "Inaccessible building entrance", "Accessible room entrance", "Inaccessible room entrance", "Stairwell", "Elevator", "Ramp", "Service road", "Men's restroom", "Women's restroom", "Unisex restroom", "Building", "Housing", "IV Food", and "Wireless" (Poor to Good). A "Floor" dropdown menu is open on the right, showing levels from 1 to 8 and a "Default" option. The map shows buildings like "University Center (UCen)", "Santa Rosa Hall", "Anacapa Hall", "Brodia Hall", "Robie Hall", "Life Science", and "Engineering II". The bottom of the browser window shows the Windows taskbar with the "start" button and several open applications: "C:\Documents and Se...", "L:\Geography126", "CAMapSociety2012.ppt", and "UCSB Interactive Ca...". The system clock shows "2:45 PM".

Standards

The screenshot shows the Open Geospatial Consortium (OGC) website in a Firefox browser. The browser's address bar displays "www.opengeospatial.org". The website header features the OGC logo and the tagline "Making location count." Below the header is a navigation menu with items: Home, Standards, Programs, Participate, OGC Blog, Events, About OGC, and Member Login. A search box is located to the right of the menu.

The main content area is titled "Geospatial and location standards for:" and lists various application areas on the left:

- Aviation
- Built Environment & 3D
- Business Intelligence
- Defense & Intelligence
- Emergency Response & Disaster Management
- Geosciences & Environment
- Government & Spatial Data Infrastructure
- Mobile Internet & Location Services
- Sensor Webs

In the center, a diagram illustrates the OGC standards framework. It is structured as follows:

- Open** (Central Node)
 - Where** (Left Branch)
 - Spatial Policy** (Icon: factory)
 - Interoperability** (Icon: cube)
 - Share** (Icon: globe)
 - Points of Interest** (Right Branch)
 - Geoweb** (Icon: mobile phone)
 - Geosemantics** (Icon: book)
- Open Data** (Bottom Branch)
 - Situational Awareness** (Icon: tower)
 - Real Time** (Icon: clock)

Surrounding these central nodes are various specific standards and concepts:

- Analysis**: Earth Observation, Navigation, BIM, Proximity
- Location**: Crowdsourcing, CAD, Open Source, GIS, Global, Place
- Time**: Monitoring, Location, Hydrology, Sensor Web, Linked Data
- Information Integration**: Open Data, Shared Understanding, Geoweb
- Geosynchronization**: Information Integration, Time, Planning, 5DI, Geosemantics
- Data Quality**: Weather, Alerts, Visualization, Real Time
- Climate**: GPS, Indoor/Outdoor, Metadata

Open Source Software



The screenshot shows the homepage of the Quantum GIS project. At the top left is the Quantum GIS logo, a stylized green 'Q' with a leaf. To its right is the text 'Quantum GIS'. Further right is a search bar with the placeholder text 'Search...' and a magnifying glass icon. To the far right are three small flags representing the United Kingdom, Germany, and France. Below the header is a navigation bar with links for 'Wiki', 'Forum', 'Planet', 'Chat', 'Bugs', and 'Shop'. The main banner features a colorful illustration of a medieval cityscape. Overlaid on the right side of the banner is the text 'Quantum GIS Version 1.7.3 "Wrocław"'. Below the banner, on the left, is a 'Main Menu' section with a list of links: Home, About QGIS, Community, Documentation, Download, Commercial Support, Developer Meetings, User Meetings, Sponsorship, and Advanced Search. Below the menu is a 'Support QGIS!' section with a 'Donate' button. On the right, there is a 'Welcome to the Quantum GIS Project' section with a paragraph of text and a link to the release announcement. Below that is a 'Learn more about QGIS' section with another paragraph of text. At the bottom right is a large blue button that says 'Download Now Free!' with the Quantum GIS logo.

Quantum GIS
Version 1.7.3
"Wrocław"

Main Menu

- » [Home](#)
- » [About QGIS](#)
- » [Community](#)
- » [Documentation](#)
- » [Download](#)
- » [Commercial Support](#)
- » [Developer Meetings](#)
- » [User Meetings](#)
- » [Sponsorship](#)
- » [Advanced Search](#)

Support QGIS!

[Donate](#)

Welcome to the Quantum GIS Project

Quantum GIS (QGIS) is a user friendly Open Source Geographic Information System (GIS) licensed under the GNU General Public License. QGIS is an official project of the [Open Source Geospatial Foundation \(OSGeo\)](#). It runs on Linux, Unix, Mac OSX, and Windows and supports numerous vector, raster, and database formats and functionalities.

Our latest release is QGIS 1.7.3 you can read the [release announcement here](#)

Learn more about QGIS

Quantum GIS provides a continuously growing number of capabilities provided by core functions and plugins. You can visualize, manage, edit, analyse data, and compose printable maps. Get a first impression with some [screenshots](#) and a more detailed [feature list](#).

Download Now Free!

Want to learn even more?

Isla Vista Wiki entry

Isla Vista, California - Wikipedia, the free encyclopedia - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://en.wikipedia.org/wiki/Isla_Vista,_California

Google ISI Web of Knowledge... NGS Online Review Sy... Login NPR : National Public ... COX.net for Santa Ba... UCSB Dept of Geogra... GauchoSpace

Isla Vista, California - Wikipedia, the ...

Random article

It may contain **original research** or **unverifiable claims**. Tagged since September 2009.

search

Go Search

interaction

- About Wikipedia
- Community portal
- Recent changes
- Contact Wikipedia
- Donate to Wikipedia
- Help

toolbox

- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link
- Cite this page

languages

- Deutsch
- Español
- Nederlands
- Norsk (bokmål)
- Português
- Volapük

Isla Vista is an **unincorporated community** in **Santa Barbara County, California, United States**. As of the 2000 census, it had a population of 18,344. The majority of residents are college students at nearby **UC Santa Barbara** or at **Santa Barbara City College**. The beach-side community is a **census-designated place** west of the **University of California, Santa Barbara**, on a flat plateau about 30 feet (9 m) in elevation, separated from the beach by a bluff. Many paths connect the town to the beach.

Isla Vista enjoys a **Mediterranean climate** and often has slightly less **precipitation** than either Santa Barbara or the adjacent community of Goleta. Isla Vista is located on a south-facing portion of the Santa Barbara County coast, between two small **peninsulas**, Coal Oil Point and Campus Point, in view of the **Channel Islands**. During **El Niño** years, precipitation in Isla Vista can be excessive and potentially dangerous. Some homes and apartments built on the south side of **Del Playa Drive**, most popular with students due to their direct ocean views, are in danger of collapse, since they are built on quickly-eroding bluffs thirty to sixty feet above the relentless Pacific Ocean. Recent erosion has exposed foundation supports in several of the properties closest to the university campus, UCSB.

As Isla Vista is on the south coast of Santa Barbara county, which has some of the highest housing prices in the United States, the student population shares densely packed housing with a working **Hispanic** population. Since Isla Vista has not been annexed by either **Goleta** or **Santa Barbara**, remaining unincorporated, only County funds are available for civic projects.

Isla Vista is home to a **student housing cooperative**, the **Santa Barbara Student Housing Coop**, as well as a food cooperative, the Isla Vista Food Co-op.

Contents [hide]

- Geography
- Isla Vista's history ^[2]^[3]^[4]
 - Early Days
 - World War II
 - The University

Isla Vista, California

— CDP —



Location in **Santa Barbara County** and the state of **California**

Coordinates: 34°24′53″N 119°51′38″W﻿ / ﻿34.41472°N 119.86056°W﻿ / 34.41472; -119.86056

Country	United States
State	California
County	Santa Barbara
Government	
 - N/A	
 - Senate	Tom McClintock (R)
 - Assembly	Pedro Nava (D)
 - U. S. Congress	Lois Capps (D)
Area	
 - Total	2.2 sq mi (5.7 km ²)
 - Land	2.1 sq mi (5.5 km ²)
 - Water	0.1 sq mi (0.2 km ²)
Elevation	46 ft (14 m)
Population (2000)	

start Search results for "isl... Isla Vista, California - ... Nero Express 2:03 PM

Geohack: 43 Geospatial info sources

GeoHack - Isla Vista, California - Mozilla Firefox


File Edit View History Bookmarks Tools Help

http://stable.toolserver.org/geohack/geohack.php?pagename=Isla_Vista,_California¶ms=34_24_53_N_119

Google ISI Web of Knowledge... NGS Online Review Sy... Login NPR : National Public ... COX.net for Santa Ba... UCSB Dept of Geogra... GauchoSpace

GeoHack - Isla Vista, California

GeoHack - Isla Vista, California



GeoHack

- Documentation
- Based on gis extension
- SVN (FishEye)

powered by WIKIMEDIA Toolserver

Views

- Template
- Discussion
- View source
- History

Languages

- Afrikaans
- العربية
- Aragonés
- Asturiano
- Azerbaijani
- Беларуская
- Беларуская (тарашкевіца)
- Български
- Català
- Češky

WGS84 34° 24' 53" N, 119° 51' 38" W
34.414722, -119.860556

UTM 11S 237085 3811852

Zoom 6 **Scale** ± 1:100000

Region [US-CA](#) **Type** city

Title [Isla Vista, California](#) (edit) | [report inaccuracies](#)

Contents [Global and Local services](#) · [Wikipedia articles](#) · [Photos](#) · [Other](#) · [Export](#)


View the location above by click a mapping link below:

Global services

Service	Map	Satellite	Other
ACME Mapper	Map	Satellite	Terrain , Mapnik
Ayna	Maps	Satellite	
Bing Maps	Map	Aerial	Bird's Eye
Blue Marble Navigator		Satellite	
ExploreOurPla.net		Daily	
Flash Earth		Satellite	
Fourmilab		Satellite	
GeaBios		Satellite	
GeoNames		Satellite	
GlobeXplorer		Satellite	
Google Earth		Open	w/ meta data

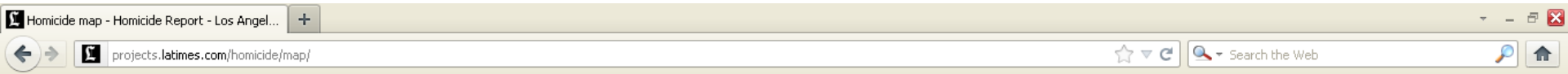
United States

Service	Map	Satellite	Other
ACME			Topo NEXRAD DOQ
GPS Visualizer		USGS Aerial	USGS Topo
MapQuest	Map	Labeled satellite	
MSN Maps USA	Map		
NASA/MSFC GOES		Satellite	
National Weather Service			Weather
TerraServer-USA		Aerial	Topo
TopoQuest			Topo
Trails.com			Topo



start Search results for "isl... GeoHack - Isla Vista, ... C:\Documents and Se... Microsoft PowerPoint ... 2:06 PM

Software Mash-Ups

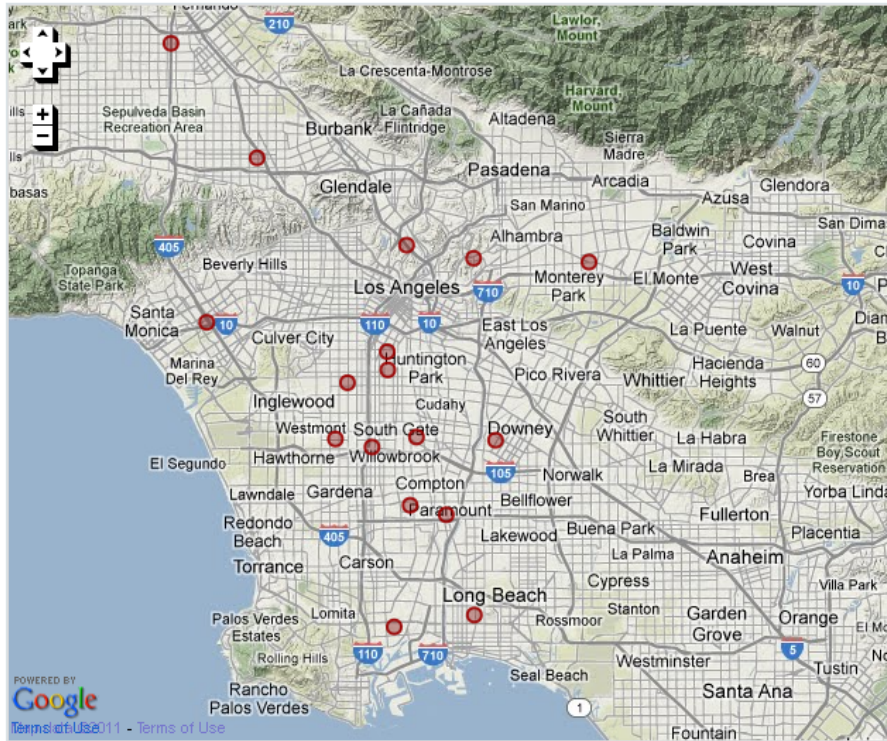


The Homicide Report

THE TIMES CHRONICLES L.A. COUNTY HOMICIDE VICTIMS

Showing 24 homicides from Jan. 1, 2012 to Jan. 15, 2012

Current view: 2012



Homicides are grouped based on number of homicides in an area. Click a group to zoom there.

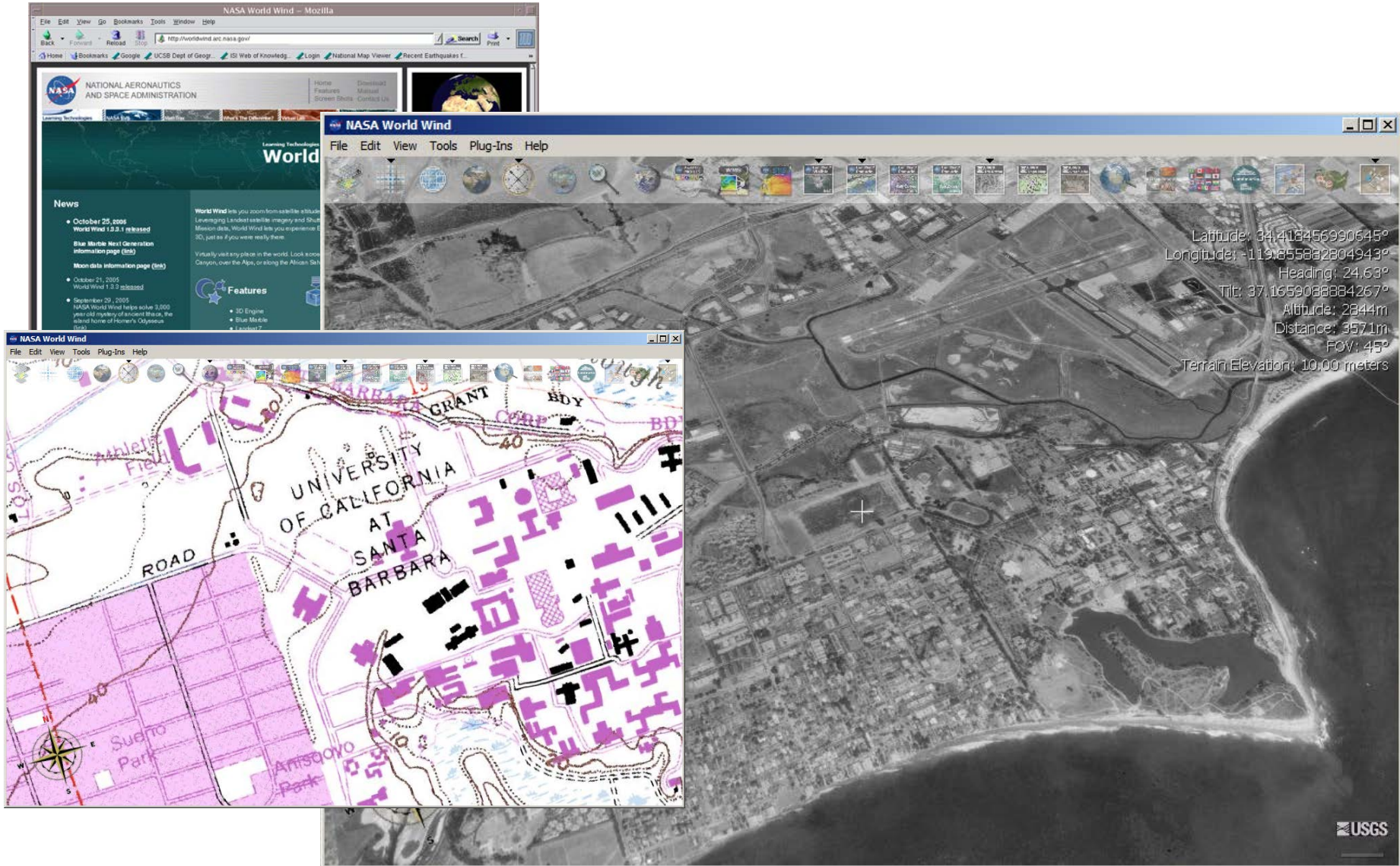
Name	Age	Date
Gerardo Fernandez	20	1/8/12
Hector Hernandez	42	1/8/12
Alberto Cruz	38	1/7/12
Juan Nunez	34	1/7/12
Mark Miles	48	1/6/12
Jeff Pouncil Jr.	19	1/5/12
Richard Hughes	38	1/5/12
Jane Doe #1	0	1/4/12
Jazmyne Eng	40	1/4/12
Calvin Milner	62	1/3/12
Asia Sonnier	23	1/3/12
David Morales Jr.	18	1/3/12
Jimmie Jackson Jr.	21	1/2/12

[View the complete list »](#)

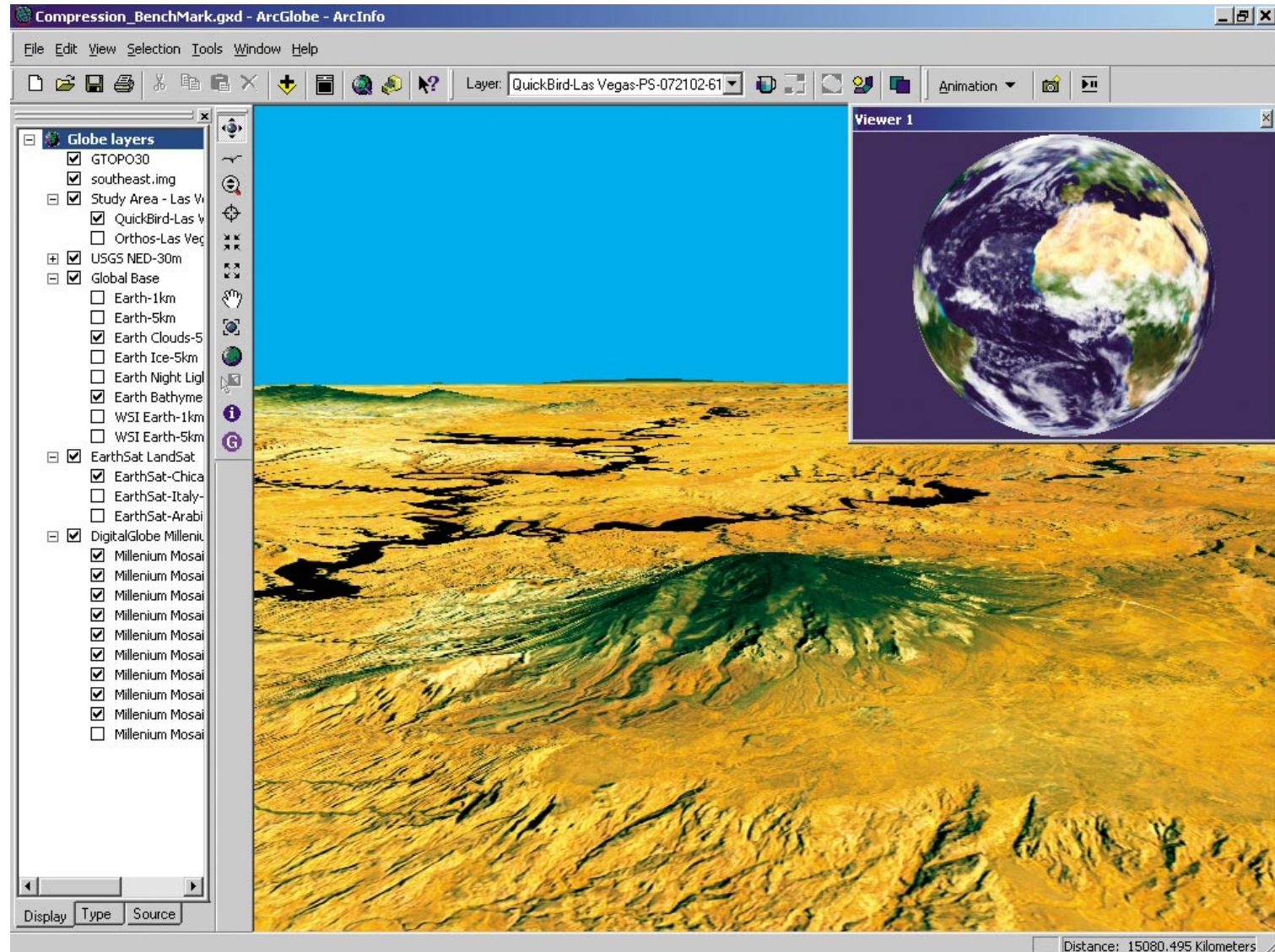
Enter the GeoBrowser

- Google Local 2004-5
- Data “Portals”
- Data “Clearinghouses”
- NSDI -> GSDI
- Vision of Digital Earth

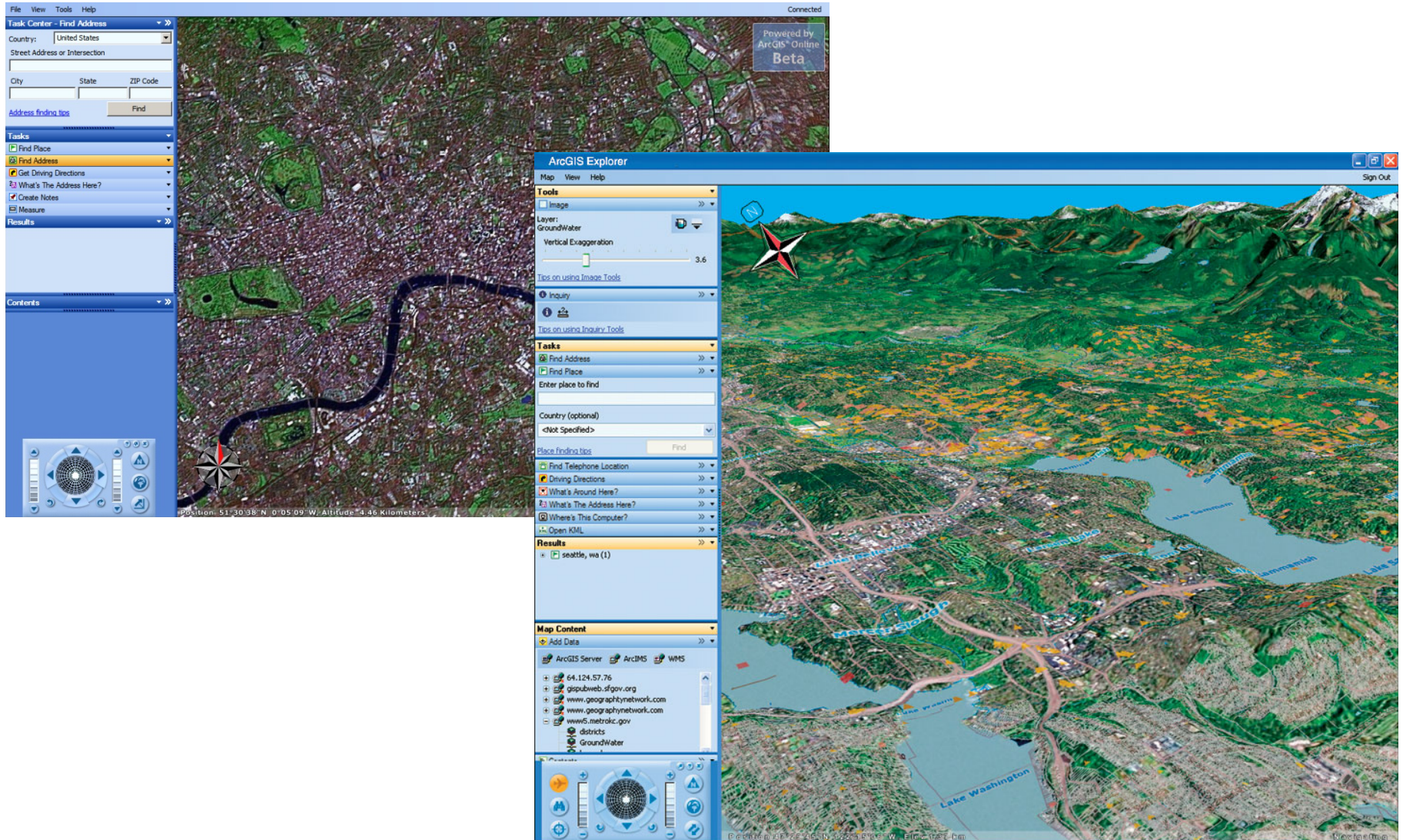
NASA World Wind



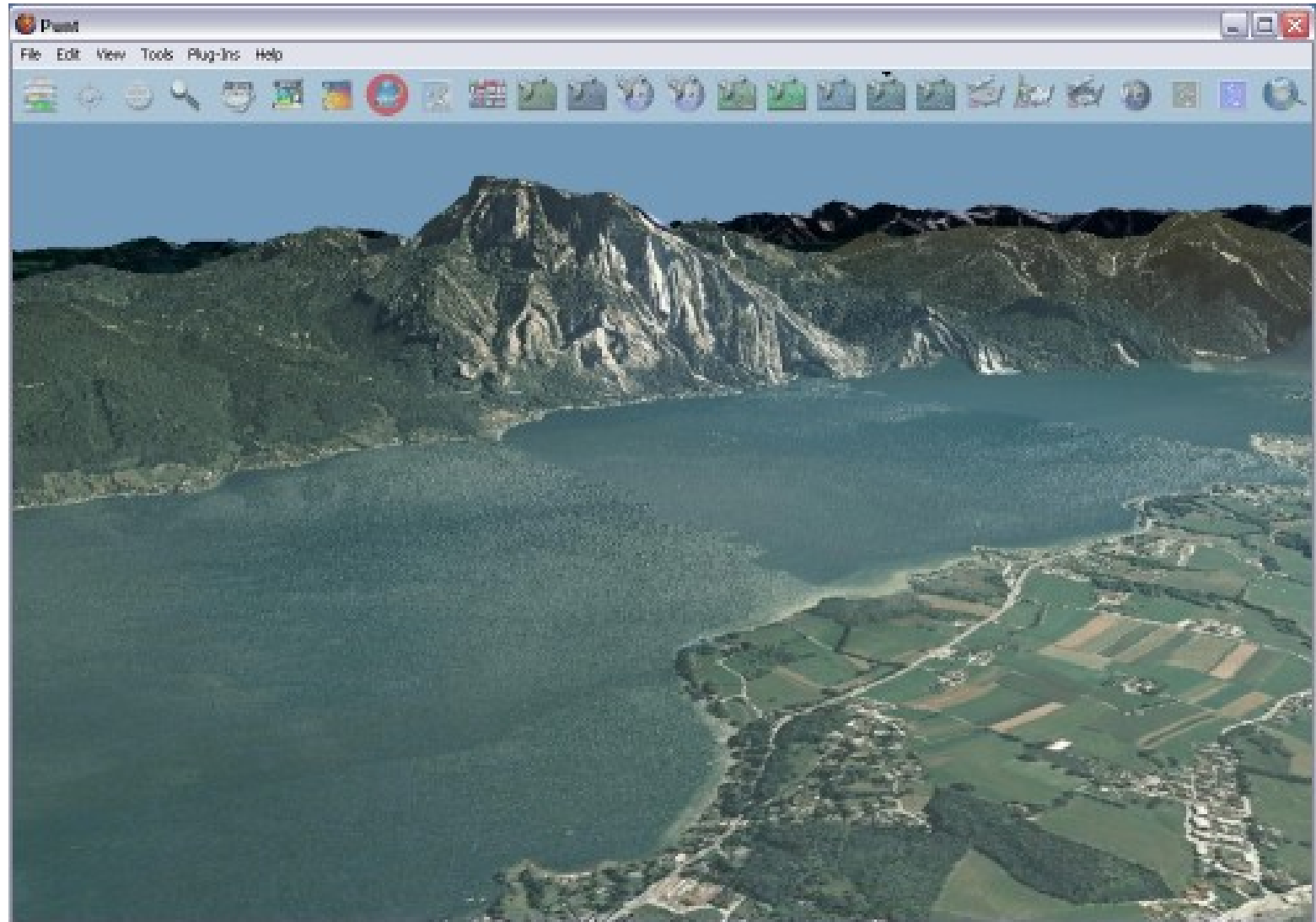
ArcGlobe: 3D Analyst Extension



ArcExplorer (Release Nov. 29th 2006)



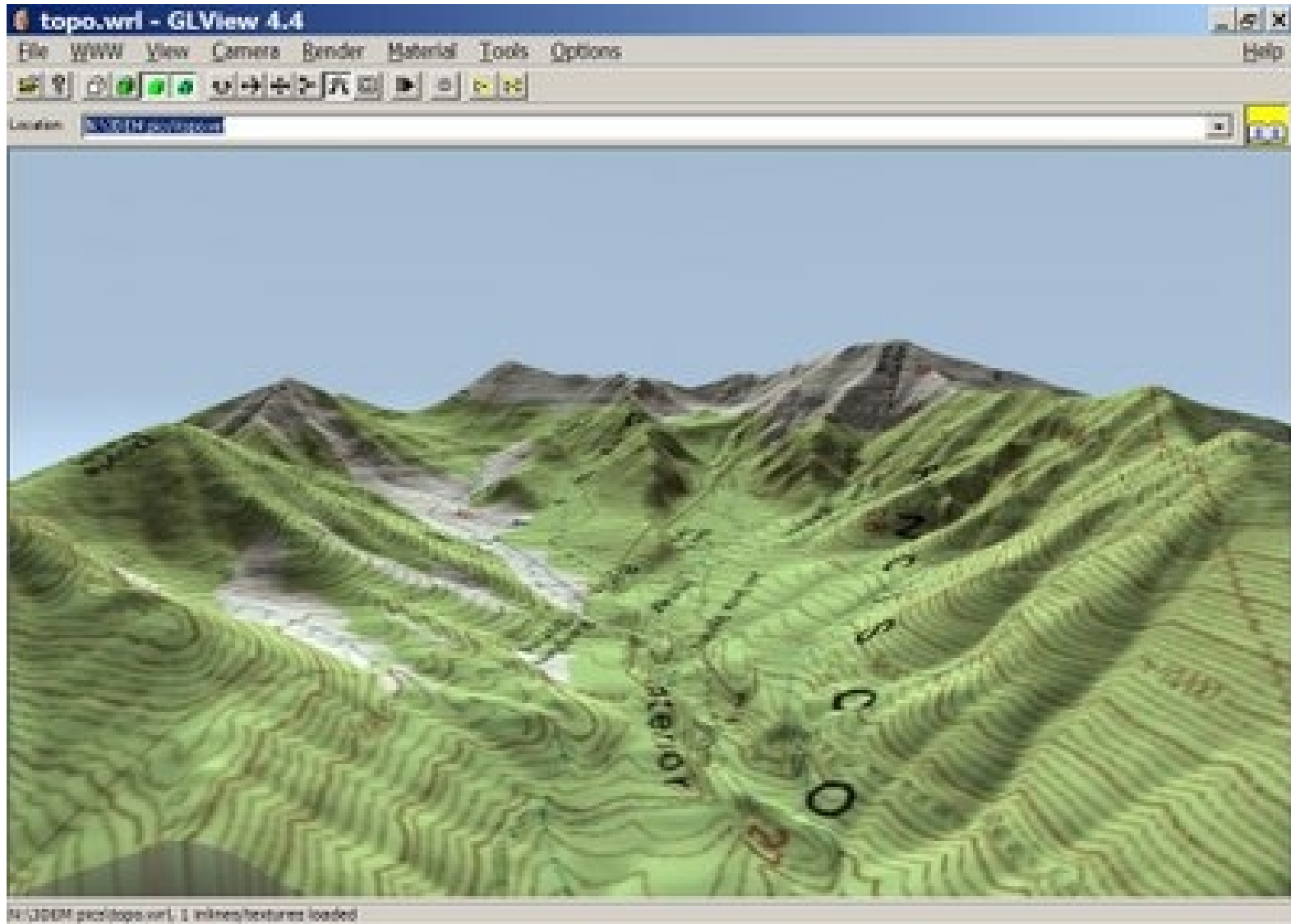
Punt Open Source Viewer



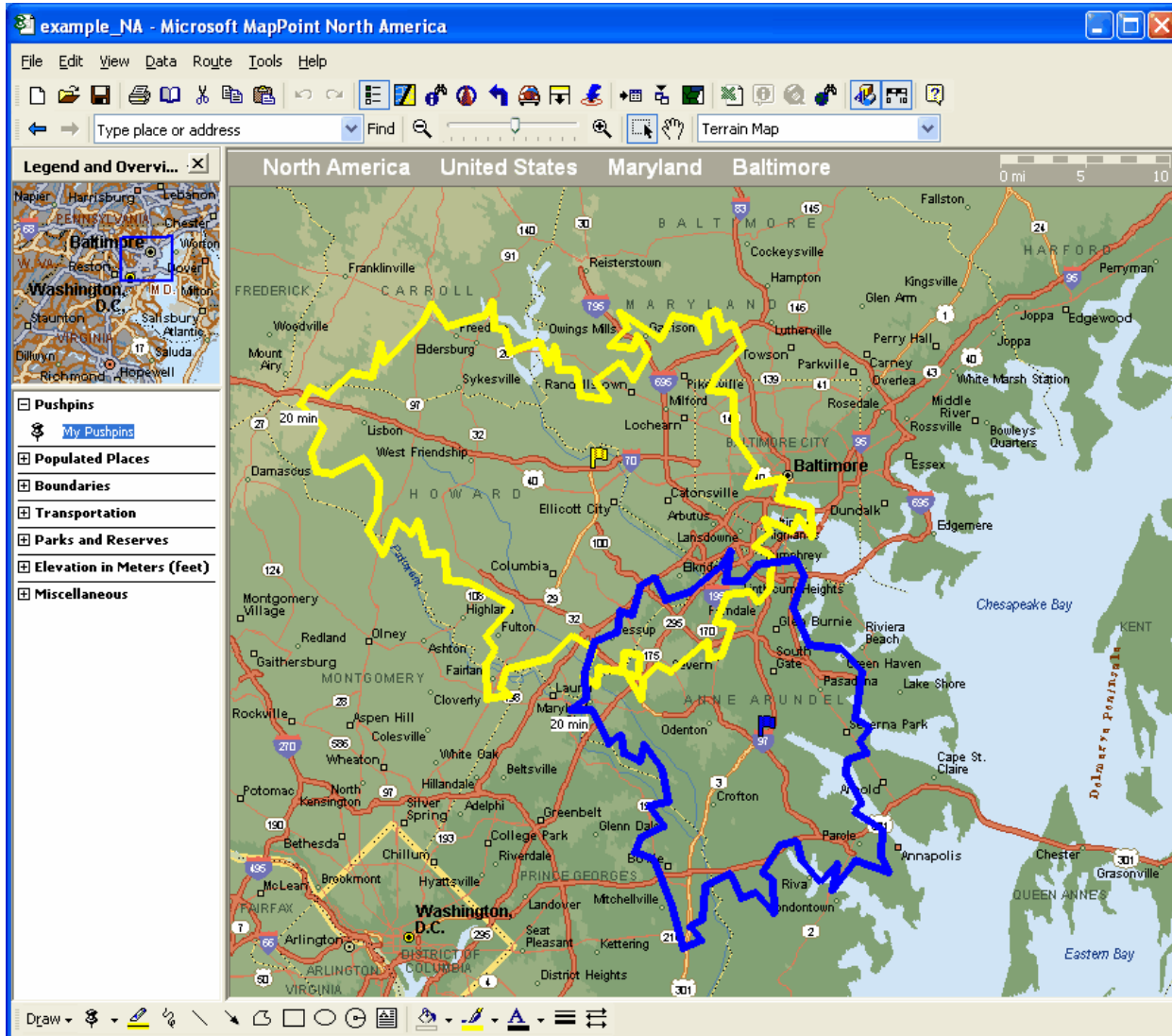
Microsoft: Virtual Earth

The screenshot displays the Microsoft Live Search interface in Microsoft Internet Explorer. The browser window title is "Live Search - Microsoft Internet Explorer". The address bar shows a URL: `http://maps.live.com/default.aspx?v=2&cp=44.023938~-99.71&style=h&vl=4&tilt=-89.875918865193&dir=0&alt=7689462.6842358`. The search bar contains the text "Search for a business or category" and "Enter city, address, or landmark". Below the search bar are tabs for "Businesses", "People", and "Maps". The main content area features a "Welcome" sidebar on the left with a "3D" button and a "Download now!" link. The central map area shows a 3D view of the United States with a "2D" button and a "3D" button. A compass and a "Microsoft Virtual Earth" logo are visible. The bottom of the page includes copyright information: "© 2006 Microsoft Corporation" and "© 2006 NAVTEQ". The taskbar at the bottom shows the Start button and several open applications: "Microsoft PowerPoint - [...]", "David Rumsey Historical ...", "GeoFusion, Inc. Homepa...", and "Live Search - Microso...". The system clock shows "2:19 PM".

VRML and GeoVRML



GML (XML) and SVG



Cooperative computing BOINC

- The Berkeley Open Infrastructure for Network Computing platform is currently the most popular volunteer-based distributed computing platform
- Over 1,280,000 participants
- Over 2,730,000 computers
- Over 910 TeraFLOPS (more than supercomputer Blue Gene)
- Over 12 Petabytes of free disk space
- SETI@home: 3.4 million years of computing time (January 2008)

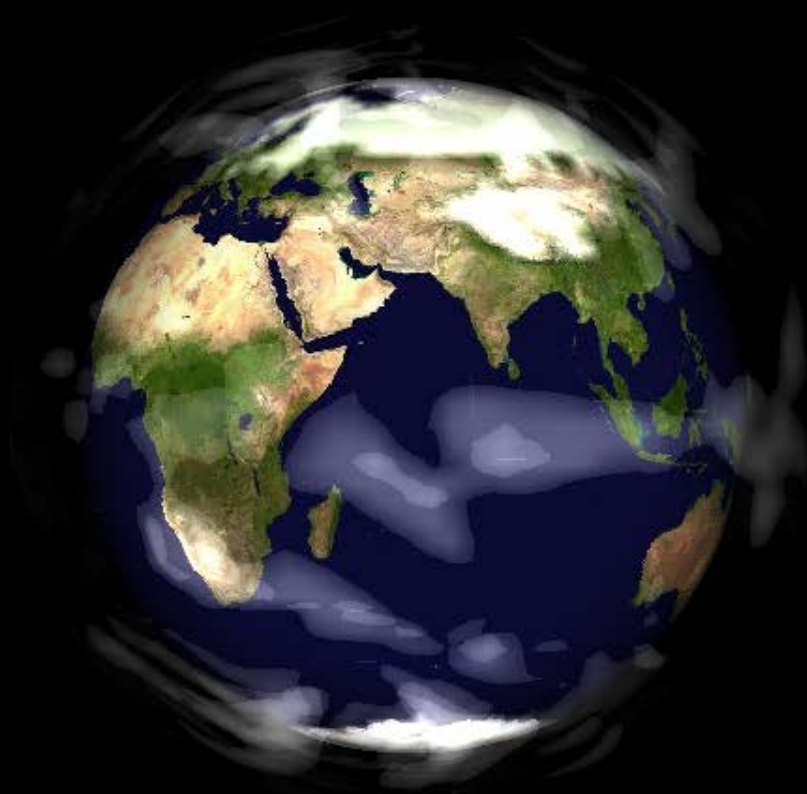
climateprediction.net

This globe shows your climate model running

Model date and time: 08/03/2044 13:00

Use keyboard keys to change view

- Use CTRL + key when in screensaver mode
- T - Temperature
- R - Rain & snow
- P - Pressure
- C - Clouds
- S - Stop/Start rotation
- G - Show/Hide grid
- H - Help & more options



Timestep
1121570 of 2073960



Hours of computing:
0825:02:25

An example: Google Earth

“We are like an iPod for Earth images.”

Michael T. Jones, Chief Technologist, Google Earth (Nov 2006)

Google Earth: A history

- Gore in the US Senate, 1985-1992. VP 1993-2001. Senate Select Committee on Intelligence
- Dayton Peace Agreement /Wright-Patterson Air Force Base, Ohio Dec 1995, ends war in Bosnia
- Google founded 1998
- Keyhole Earthviewer (2002) In-Q-tel funding
- Google buys Keyhole (Oct. 2004)
 - Google Maps/Local Feb. 8th 2005
 - Google Earth (June 2005)
 - Google Earth Community added (2005)
 - Partnership with National Geographic (2006)
- 100 million downloads: Version 4 (Nov. 2006)
- 1 Billion downloads: Version 6 (2011)
- API development ends 2015

Keyhole EarthViewer 3D



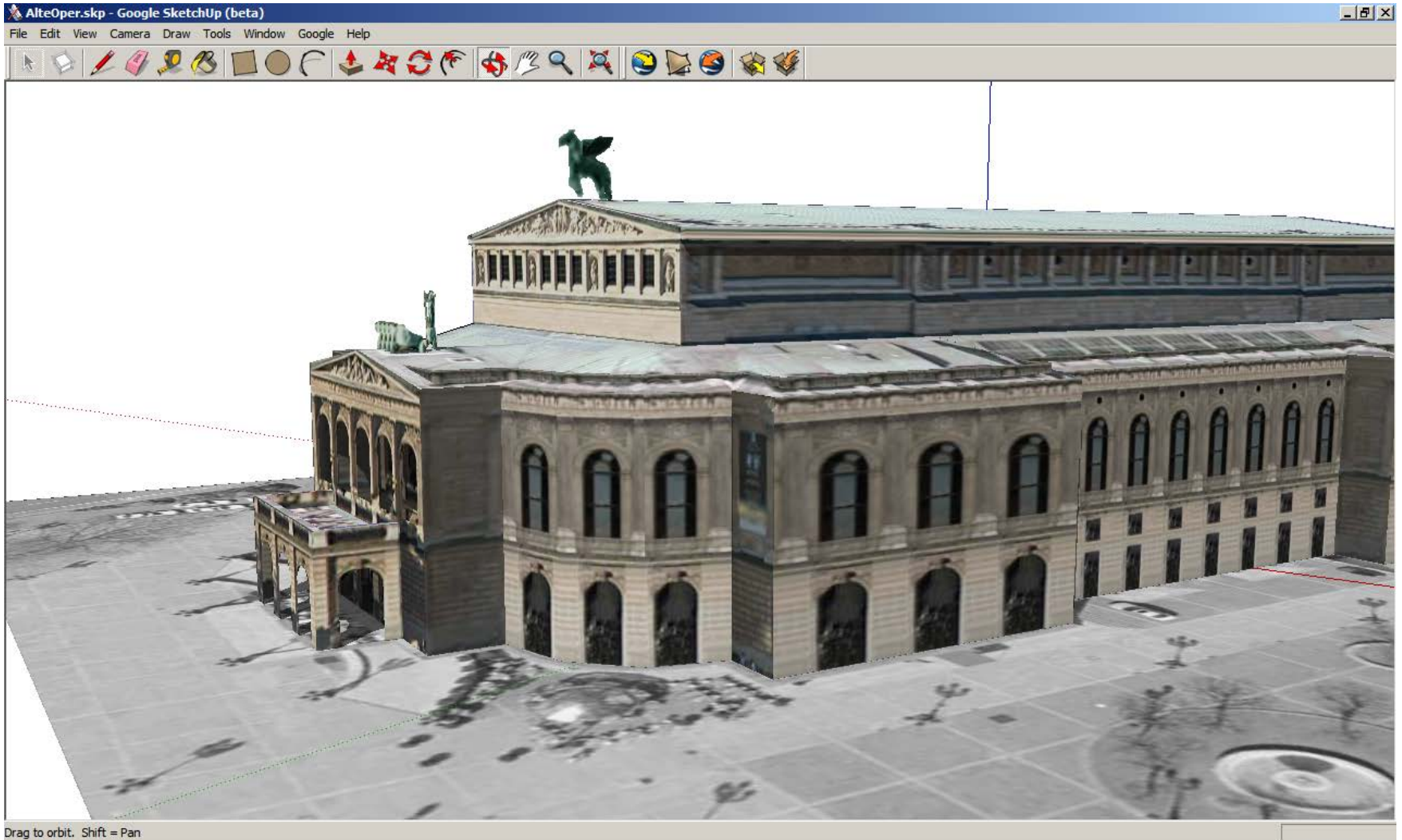
Google Earth Today

- Google Earth viewer 6
 - Timeline
 - Historical
 - Community Bulletin Board
- Google Earth Plus
- Google Earth Pro
- Google Earth Builder
- Google Earth Enterprise

Google Earth Mania



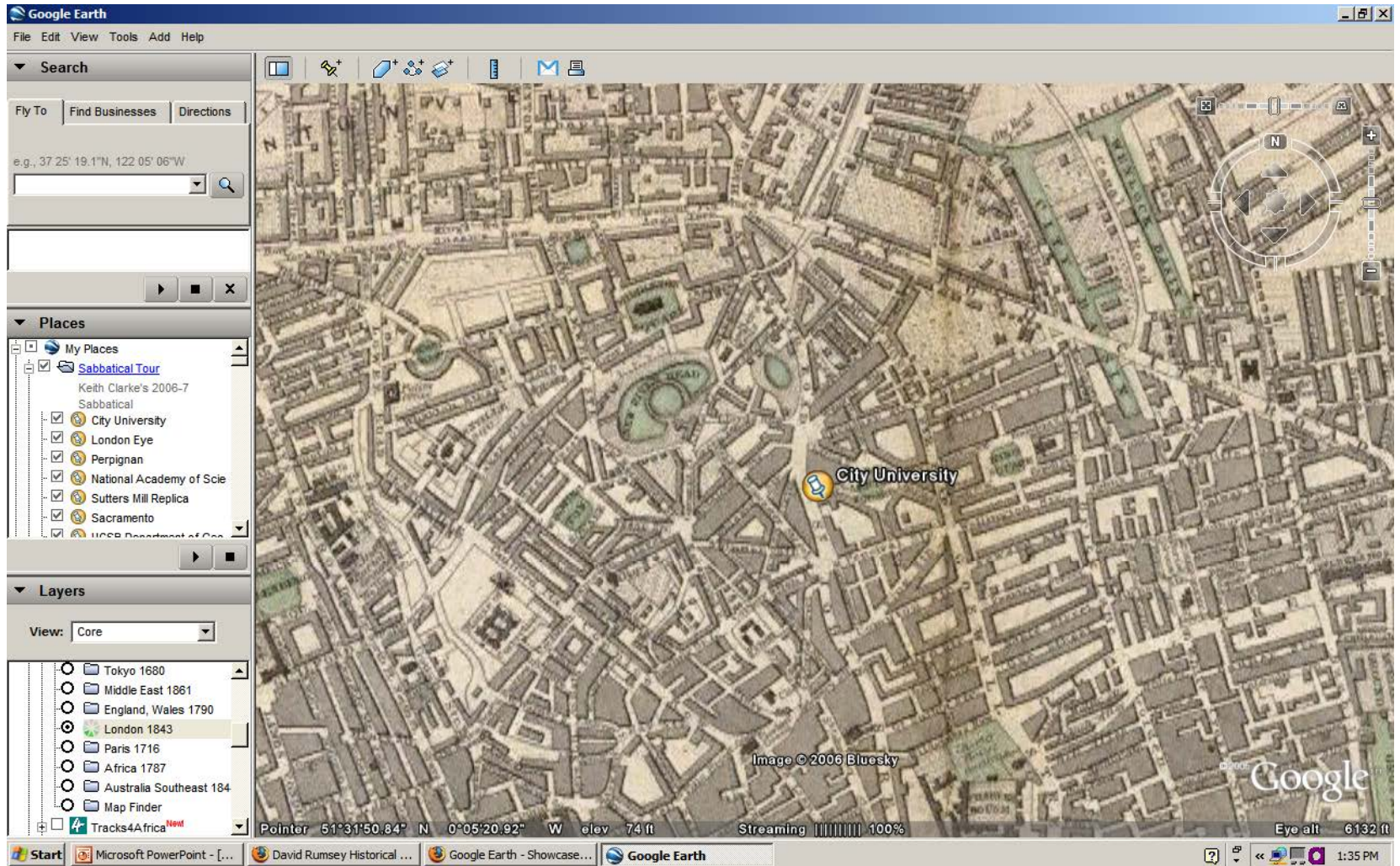
Google/Trimble SketchUp Model of the Alte Oper, Frankfurt



3D Warehouse



Multi-temporal: Rumsey Map Collection

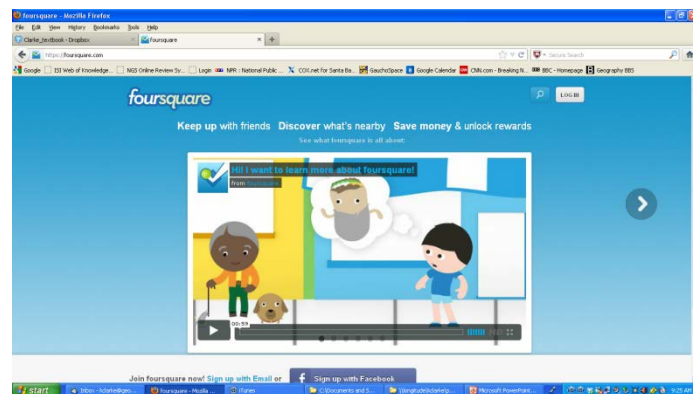
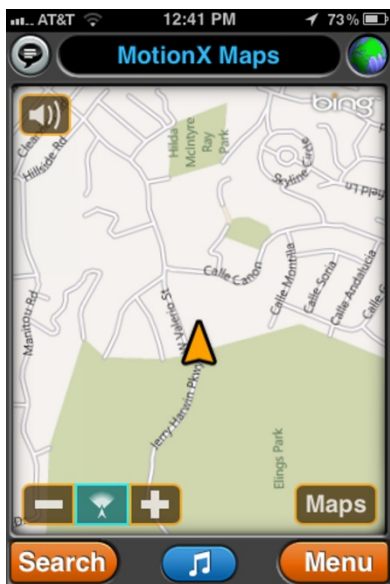


Basic KML

```
<?xml version="1.0" encoding="UTF-8"?>
  <kml
    xmlns="http://earth.google.com/kml/2.2">
    <Placemark>
      <name>Simple placemark</name>
      <description>Attached to the ground.
      Intelligently places itself at the height
      of the underlying terrain.</description>
      <Point>
        <coordinates>
          -122.0822035425683,37.42228990140251,0
        </coordinates>
      </Point>
    </Placemark>
  </kml>
```

Computer mapping

- Now ubiquitous e.g. GoogleMaps
- Supports mobile applications and LBS
- Birth of Location Enabled Social Networking



Computer mapping

- Classic paper “Automation and cartography” W. R. Tobler 1959

AUTOMATION AND CARTOGRAPHY*

WALDO R. TOBLER

AUTOMATION, it would seem, is here to stay. Advantages in speed and accuracy seem likely to make the use of computing machinery more common, despite the relatively high initial cost. In view of recent developments in automation and high-speed data processing, it is appropriate to ask, Do possibilities for automation exist in cartography? And if so, where can these possibilities be found? In order to answer these questions, the preparation of maps should be viewed as a complex data-processing system. Certain similarities then become apparent between data processing in general and cartographic processing in particular.

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THE GEOGRAPHICAL REVIEW



FIG. 7—Map of the United States drawn directly by machine from a deck of 343 punched cards. Plotting time, approximately 15 minutes. The map has been reduced, but not retouched. Bipolar oblique conic conformal projection (outline of original map from the American Geographical Society's Map of the Americas, 1:5,000,000). (Plotter courtesy the Benson-Lehner Corporation, Los Angeles.)

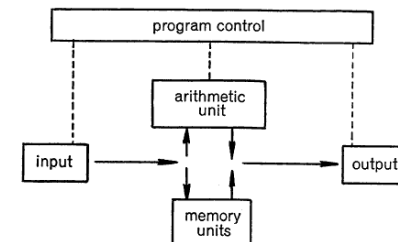
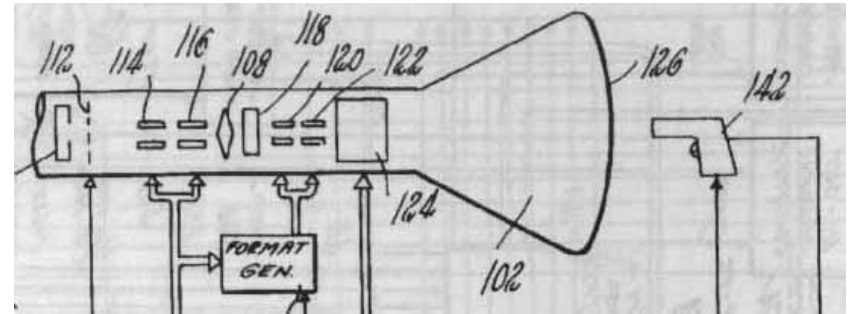


FIG. 2—The data-manipulation phase of a data-processing system.

THE MAP AS A COMPUTER INPUT

The conceptualization of a map as a data-storage medium leads directly to the concept of it as a computer input element (Fig. 4). Here two methods of use seem possible. In the simpler, data are extracted from a map, translated into some symbology that available machinery will accept, and then operated upon by the data-manipulation unit. Examples would include the

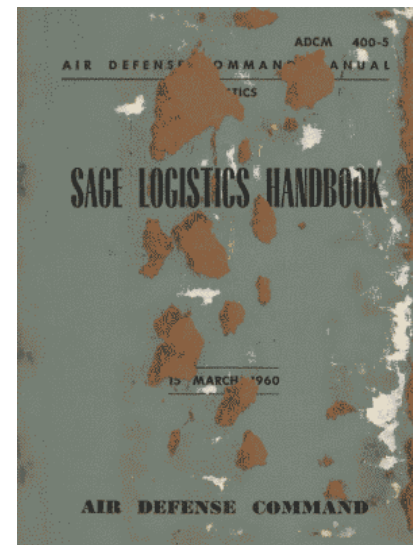
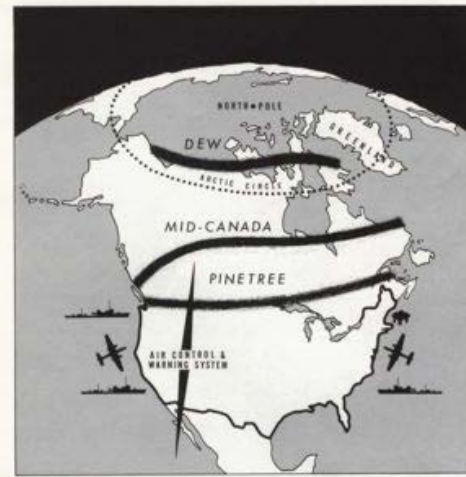
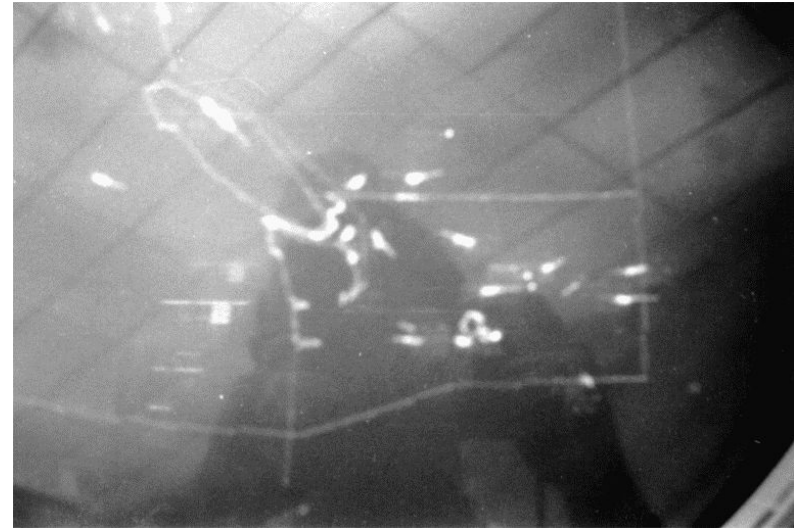
SAGE computing (distributed and IO)



**250 tons and 60,000 vacuum tubes
Operational 1963**



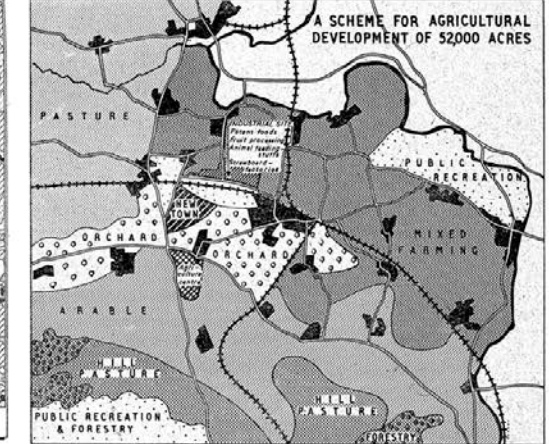
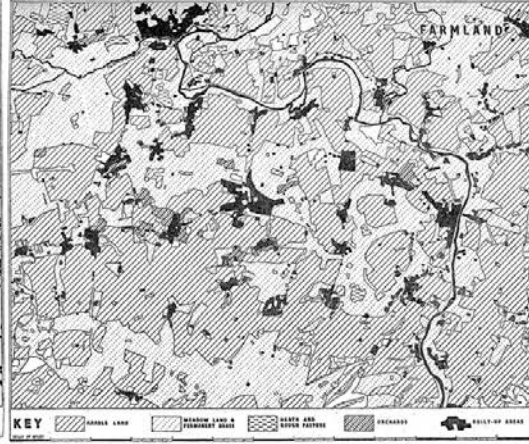
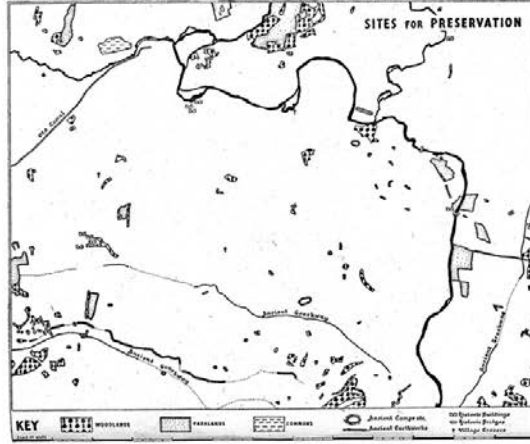
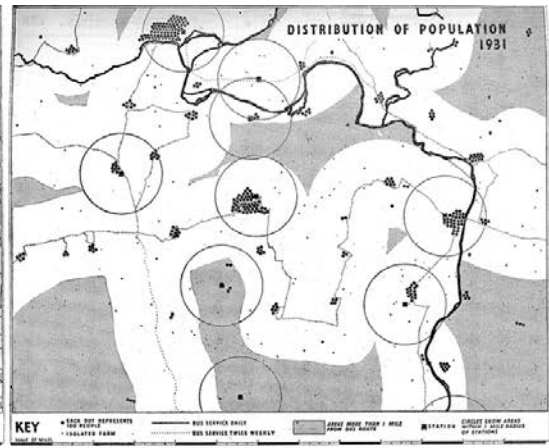
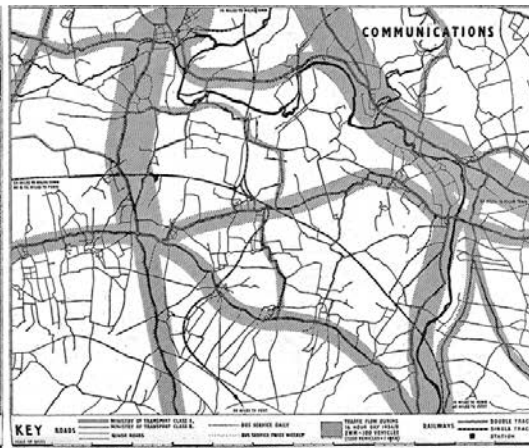
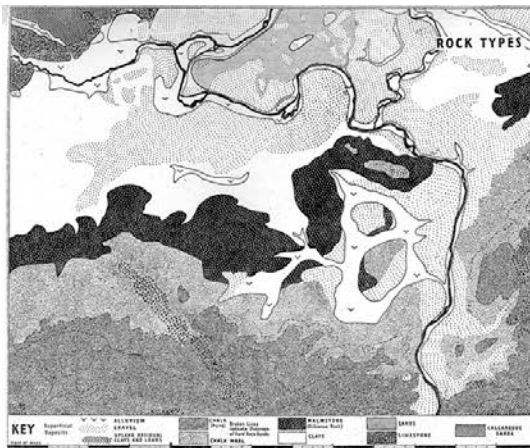
Automation and cartography



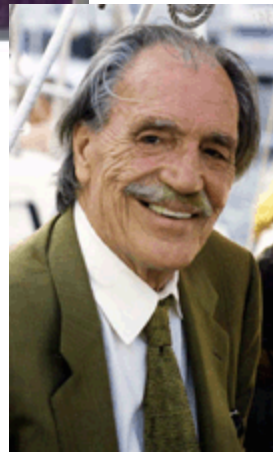
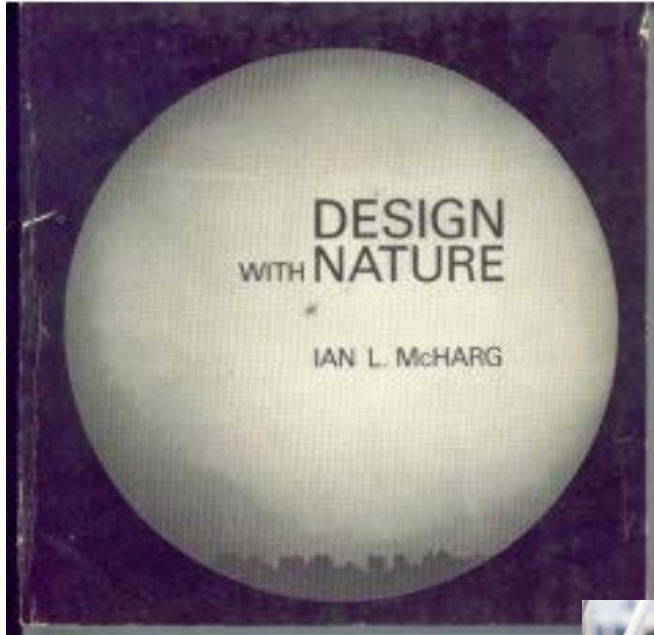
A Brief History of GIS

- GIS's origins lie in thematic cartography
- Many planners used the method of map overlay using manual techniques
- Manual map overlay as a method was first described comprehensively by Jacqueline Tyrwhitt in a 1950 planning textbook
- HcHarg used blacked out transparent overlays for site selection in *Design with Nature*

Tyrwhitt: Town & Country Planning



McHarg: Binary Overlays



SLOPE



SURFACE DRAINAGE



SOIL DRAINAGE



BEDROCK FOUNDATION



SOIL FOUNDATION

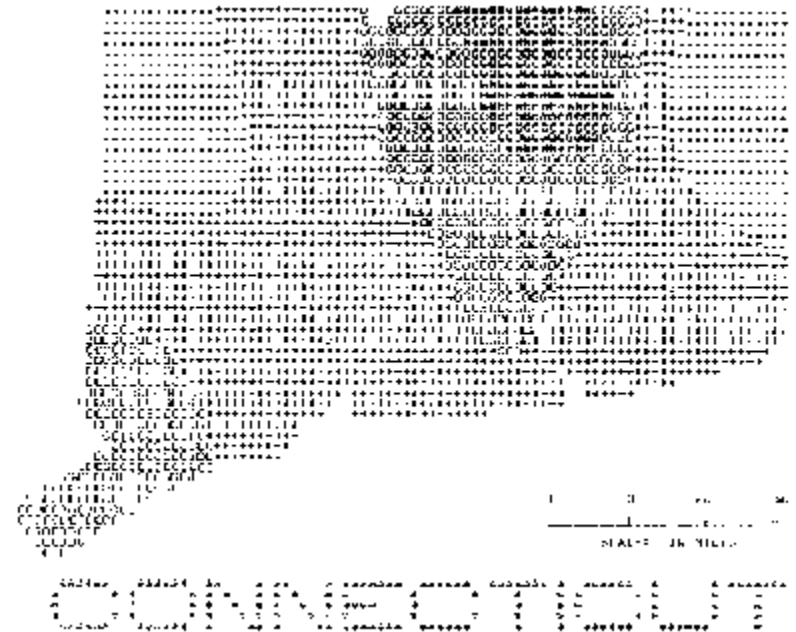
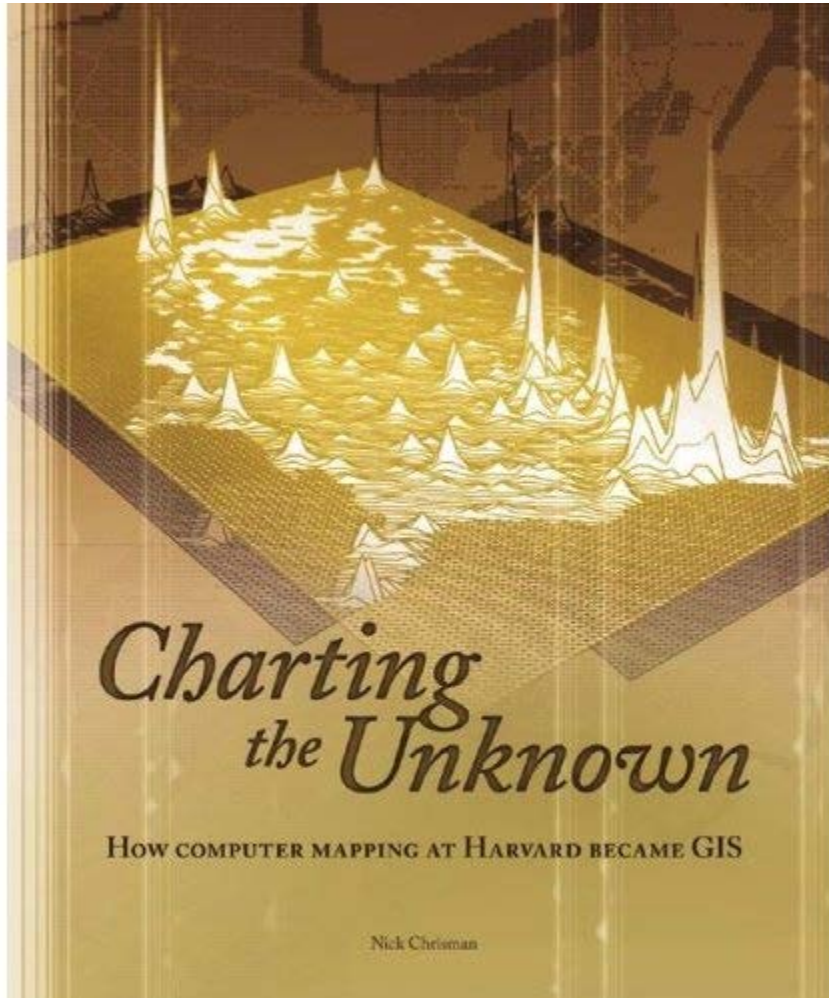


SUSCEPTIBILITY TO EROSION

A Brief History of GIS (ctd)

- The 1960s saw many new forms of geographic data and mapping software
- Computer cartography developed the first basic GIS concepts during the late 1950s and 1960s
- Linked software modules, rather than stand-alone programs, preceded GISs
- Early influential data sets were the World Data Bank and the GBF/DIME files
- Early systems were CGIS, MLMIS, GRID and LUNR
- The Harvard University ODYSSEY system was influential due to its topological arc-node (vector) data structure

ODYSSEY

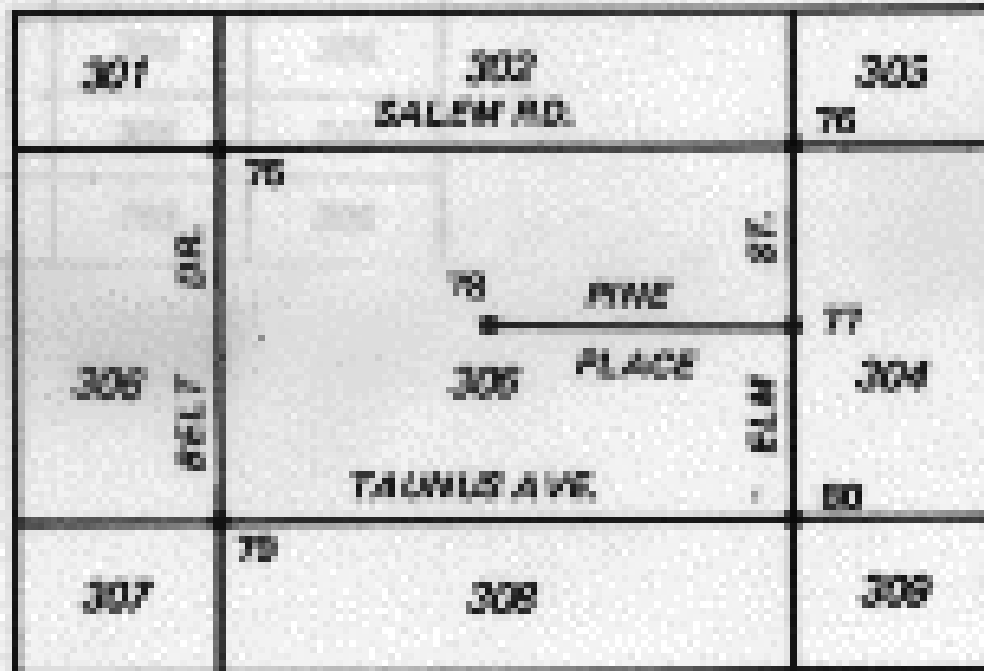


Some software

- The first GIS, Canada Geographic Information System was developed in mid-1960s to identify the nation's land resources and their existing, and potential uses
- In the late 1960s, US Bureau of the Census created the DIME program (Dual Independent Map Encoding) for all US streets to support automatic referencing and aggregation of census data
- In late 1970s, Harvard University's Laboratory for Computer Graphics and Spatial Analysis developed a general-purpose GIS (ODYSSEY GIS).

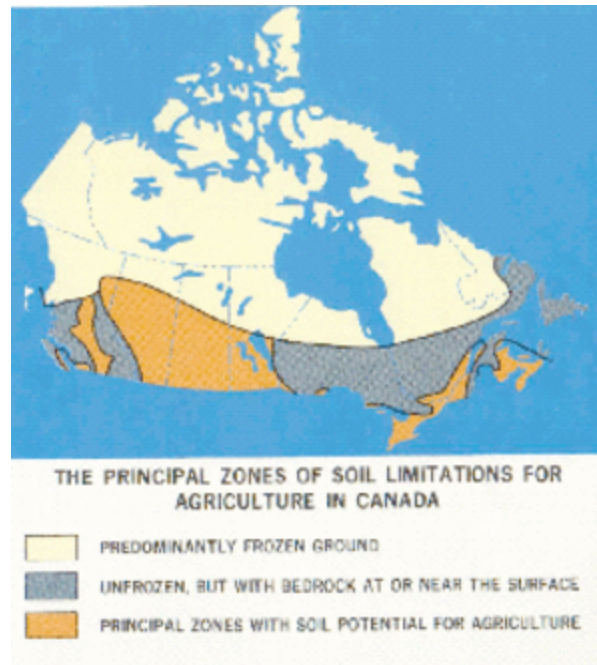
GBF/DIME 1965-1979

Segment name	From node	To node	Block left	Block right
Salem Rd.	75	76	302	303
Elm St.	78	77	304	305
Elm St.	77	80	304	305
Townus Ave.	80	79		
Belt Dr.	79	78		
Pine Place	77	78		



CGIS

- Canada Land Inventory was designed in the late 1960's and implemented between 1967 and 1977.
- CGIS was the driver software
- In its lifetime over 15,000 capability maps were produced



A Brief History of GIS (ctd)

- GIS was significantly altered by (1) the PC and (2) the workstation
- During the 1980s, new GIS software could better exploit more advanced hardware
- User Interface developments led to GIS's vastly improved ease of use during the 1990s
- During the 1980s, new GIS software could better exploit more advanced hardware

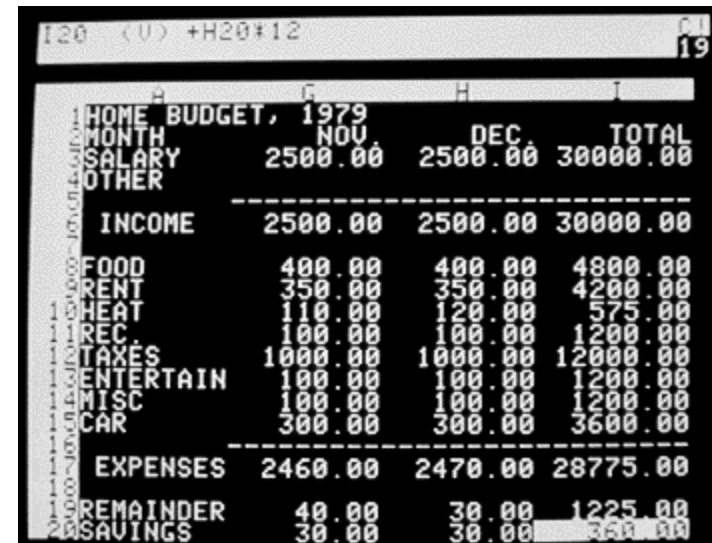


GIS software in 1979

- A historical GIS “snapshot” was the IGC survey conducted in 1979
- In the 1979 survey, most GISs were sets of loosely linked FORTRAN programs performing spatial operations
- Computer mapping programs had evolved GIS functionality

GIS in the 1980s

- Spreadsheet was ported to the microcomputer, allowing “active” data
- Relational DBMS evolved as the leading means for database management
- Single integrated user interface
- Degree of device independence
- Led to the first true GIS software
- ESRI Arc/INFO 1981



HOME BUDGET, 1979			
MONTH	NOV	DEC	TOTAL
SALARY	2500.00	2500.00	30000.00
OTHER			

INCOME	2500.00	2500.00	30000.00

FOOD	400.00	400.00	4800.00
RENT	350.00	350.00	4200.00
HEAT	110.00	120.00	575.00
REC	100.00	100.00	1200.00
TAXES	1000.00	1000.00	12000.00
ENTERTAIN	100.00	100.00	1200.00
MISC	100.00	100.00	1200.00
CAR	300.00	300.00	3600.00

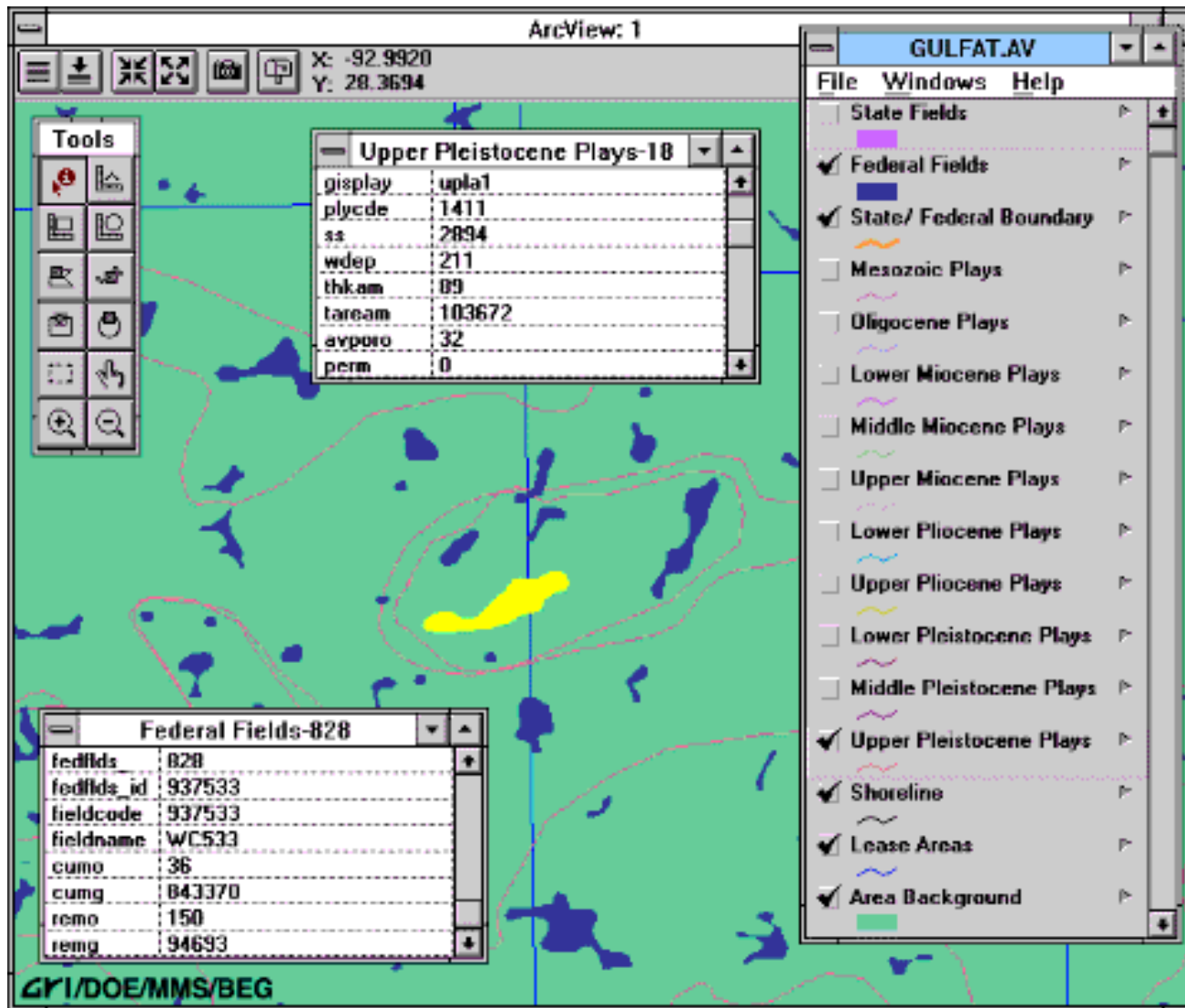
EXPENSES	2460.00	2470.00	28775.00

REMAINDER	40.00	30.00	1225.00
SAVINGS	30.00	30.00	360.00

GIS in the 90s

- Used graphical user interfaces and the desktop/WIMP model
- Unix workstations integrated GIS with the X-windows GUI
- GISs began to use the OS GUI instead of their own
- PCs integrated GIS with the variants of Windows and other OSs

ArcView 1.0 1995

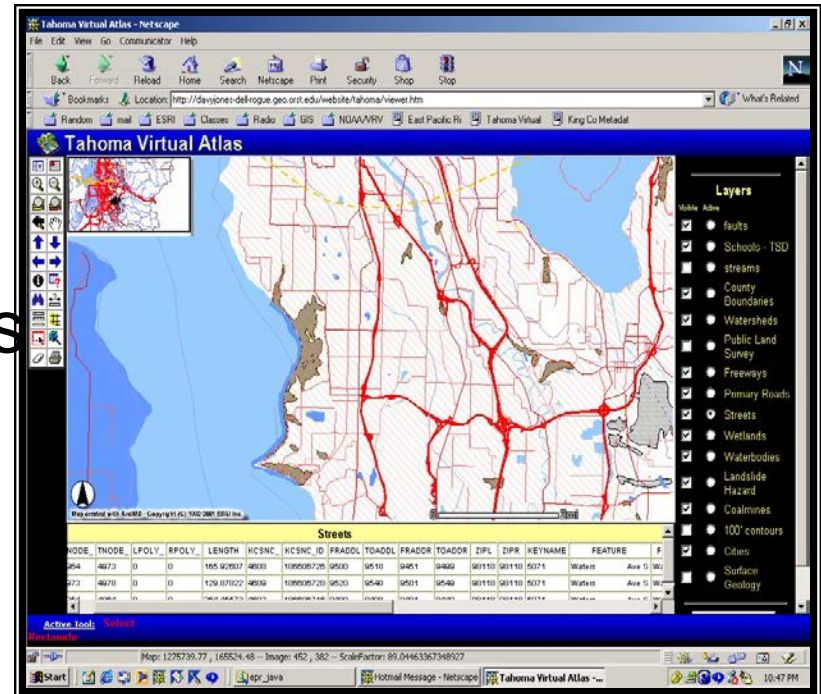


GIS in the 2000s

- Mobile systems
- Web-based extensions
- Distributed systems and data
- Most software now object-oriented
- New competition
- Web services
- Location-based services

Arc Internet Map Server (ArcIMS)

- Advanced web GIS
- Product of ESRI
- Simplified ArcView
 - Basic GIS functions
- Single interface
- Uses ArcView Shapefiles



ArcGIS Online: The “Cloud”

The image shows a screenshot of the ArcGIS Online homepage as viewed in a web browser. The browser's address bar displays the URL <https://www.arcgis.com/home/>. The page features a navigation menu with links for **ArcGIS**, **Features**, **Plans**, **Gallery**, **Map**, **Scene**, and **Help**. A **Sign In** button and a search box are located in the top right corner. The main content area is dominated by a large blue banner with the **ArcGIS** logo on the left and the **esri** logo on the right. Below the banner is a carousel of four featured items: **Esri Drought Tracker** (a map of the western United States with a color-coded legend), **International Airports in the U.S.** (a map showing airport locations with labels for Chicago, Detroit, Cleveland, and Cincinnati), **Solar System Atlas** (a glowing orange planet), and **The Uprooted** (a photograph of people walking on a dirt path). At the bottom of the page, there are four prominent buttons: **Sign-up now**, **Make a Map**, **ArcGIS for Developers**, and **Discover Lessons**. The Windows taskbar at the bottom of the screen shows various application icons and the system clock indicating the time is 11:31 AM on 3/7/2016.

Web server GIS tools

http://localhost - VCO A PIEDI - Cartografia dei sentieri del Verbano Cusio Ossola - Mozilla Firefox

VCO A PIEDI - I sentieri del Verbano Cusio Ossola Link sulla mappa attuale

Cerca per...
Scala 1: 17660

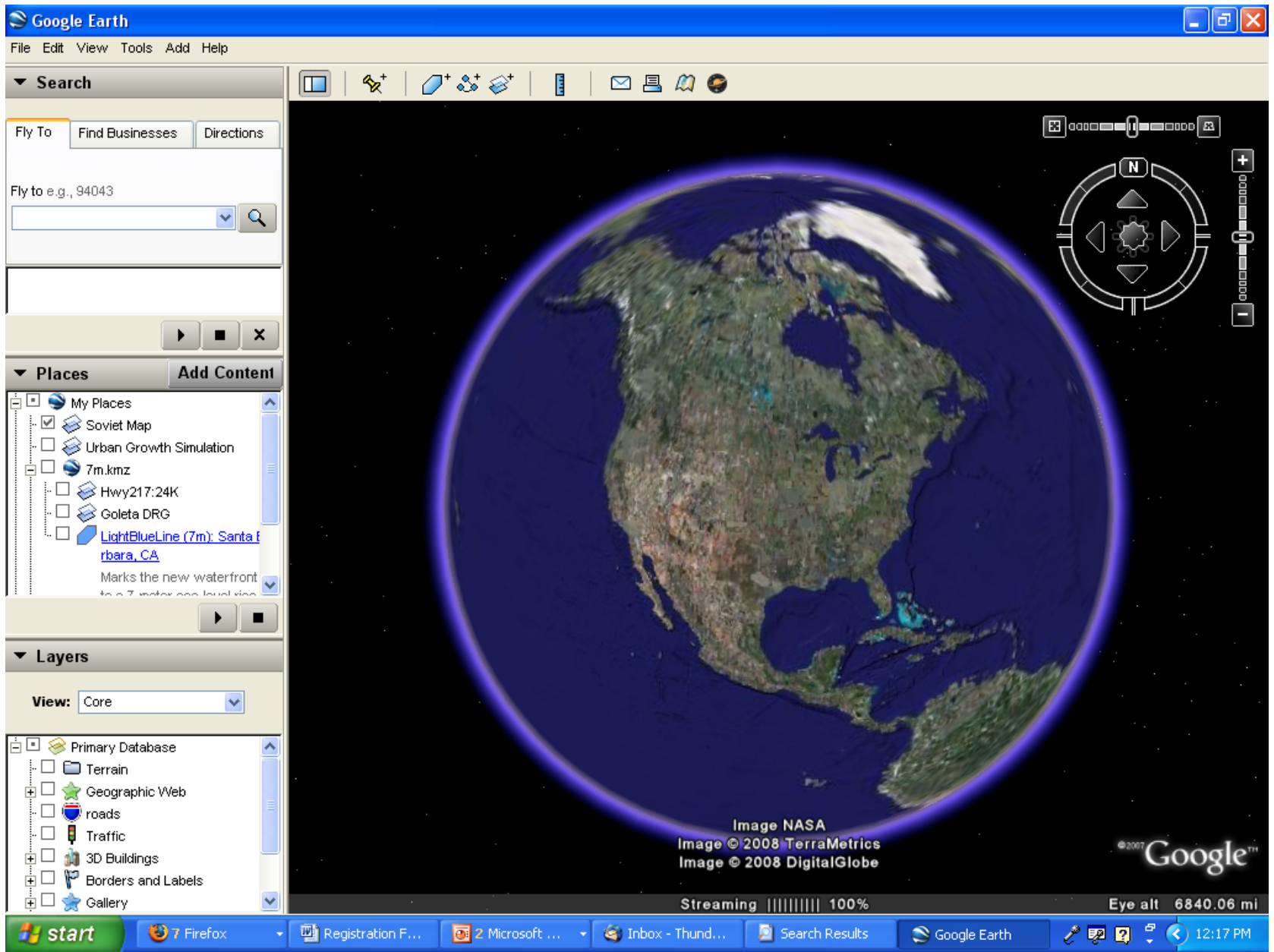
Zone

- Risorse
 - Eventi
 - Notizie
 - Accoglienza
 - Immagini dal territorio
- Itinerari
 - Itinerari
 - Escursionisti esperti con attrezzatura
 - Escursionisti esperti
 - Escursionisti
 - Turistici
- Parchi
 - Parchi naturali
 - Parco naturale
- Servizi
 - Servizio
 - Centro informazioni parco
 - Ufficio turistico

X: 444224 Y: 5128424
Proiezione: WGS84 - UTM 32N - Unità di misura: metri

Completato PR:n/a

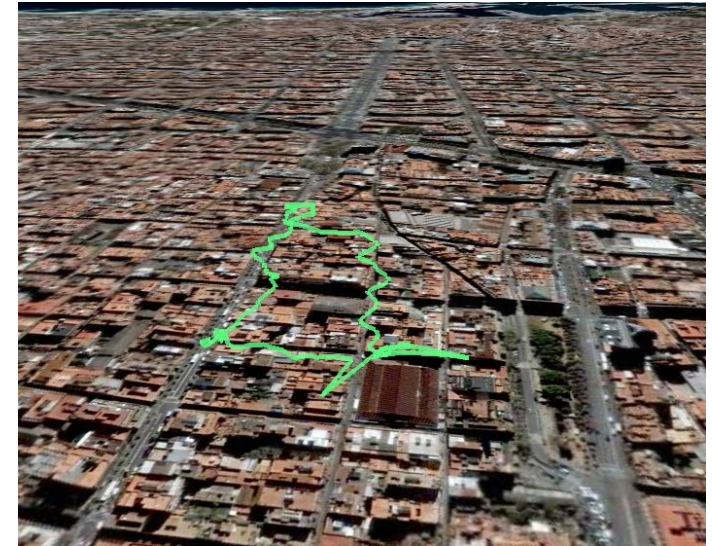
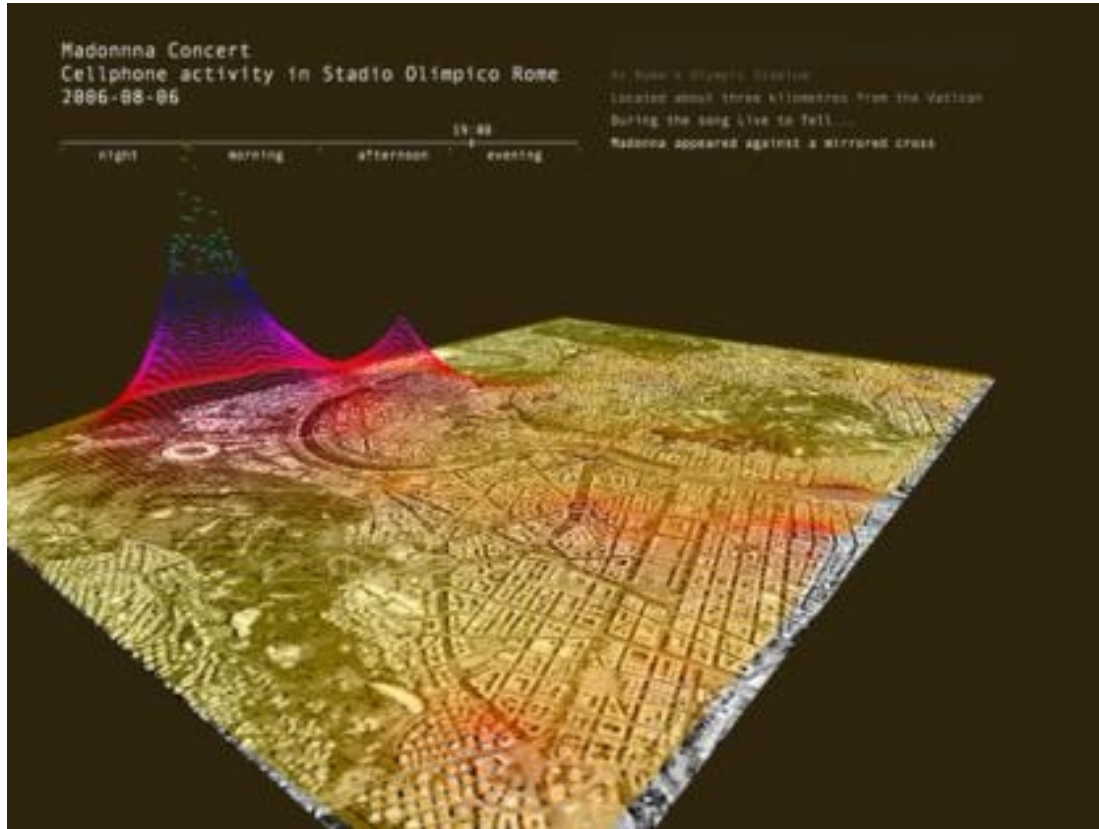
New distributed applications



New mobile applications



Visualization options



Summary

- Internet origins 1960s ARPA
- Development leading to web browser, then geobrowser
- Many factors aligned after about 2000
- Google Earth as an example
- Covered early history of computer mapping, GIS
- Reviewed new applications