

History of GIS

In the Computer Automation Era
Part II – 1971 to 2008

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Background

- Why?
 - Random conversation in Matt McGrath's office in April 2007 (we both knew *very little* about this topic)
- Focus
 - Timeline style approach
 - Nothing truly historical (e.g., before computers)
- Caveats
 - We are not historians, merely curious ESRI development staff
 - **Intended to be low-key and fun – not scholarly**
 - Determining what is historical is quite hard ...

Overview

- Timeline of GIS development
- Key academic developments
- Significant contributors
- Commercial technologies
- Cold War's influence
- Impact of computer technology
- ESRI's role

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- Key academic developments
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- Commercial technologies
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- Impact of computer technology
- ESRI's role
- ***Lots of amazing trivia***

Message to Our External Reviewers

Your chance to influence history! Shape how young minds perceive the past! Cement your place (and your friends) in the historical record! Expunge your enemies and the wannabees!

1971

- **Highway Inventory Information System**
 - Developed by **Robert Tweedie** of the N.Y. State Department of Transportation
 - Based on a data bank that contained items such as the physical road characteristics, a road inventory, bridge records, traffic volumes
- Intel releases the first **microprocessor** (the 4004)
 - 4-bit cpu, 2300 transistors
 - \$60 (\$300 today)

1971

- The **Urban Data Management Society (UDMS)** was founded
 - European organization to promote information systems development in local government
 - Traditional focus on urban applications
 - First conference held in Bonn

1972

- The first **Landsat** satellite was launched (also known as ERTS-1)
 - First civilian satellite-based remote sensing
 - Provided systematic repetitive observation of the Earth
 - Greatly expanded number of scientists interested in multispectral analysis
- IBM's **GFIS (Geographic Information Systems)** development begun
 - Historical descendent of the Public Service of Colorado (PSCo) CINS system (first AM/FM)
- **GISP (General Information System for Planning)** developed by the UK Department of the Environment

1972

- Hewlett-Packard introduces the **HP-35**
 - First scientific pocket calculator to offer basic trig and exponential functions
 - 5.8" long and 3.2" wide - the size of William Hewlett's pocket, hence "*pocket calculator*"
 - Considered the death of the slide rule
 - Cost \$395 (~\$1750 today)

1972

- **Bruce Baumgart** develops **winged-edge data structure** for representing polygon models (fixed length format, topology and geometry)
 - More significantly, Bruce wins the **Five-Man Free-For-All at First Intergalactic Spacewar Olympics** at Stanford

1973

- **MAGIS (Maryland Automatic Geographic Information System)** began
 - ESRI developed
 - One of the first state-wide GIS projects
- The USGS began development of **GIRAS (Geographical Information Retrieval and Analysis System)**
 - Intended to manage and analyze large land resources databases that were being created
 - Topological data model

1973

- UK Experimental Cartography Unit (ECU) publishes first **computer-made map series**
 - With British Geological Survey

1974

- First building on the ESRI New York Street campus arrives

1974

- The first **AUTOCARTO** conference held in September in Reston, Virginia
- IBM begins development of **System R**, the first implementation of SQL
- Mike Stonebraker and Eugene Wong (Berkeley) release the **Ingres RDBMS**
- Finkel (Stanford) and Bentley (UNC) publish the original **quadtree data structure** paper

1974

- **TCP/IP** protocol suite developed by **Vinton Cerf** and **Robert Kahn** (DARPA Information Processing Technology Office)
 - Military computer networking standard in 1982
 - ARPANET standard in 1983
 - **The basis for the modern Internet**

1974

- **Oak Ridge National Labs (ORNL)** produces the Oak Ridge Regional Modeling Information System (**ORRMIS**)
 - Project begun in 1969
 - Comprehensive geographic data management system, led by **Richard Durfee** and **Jerome Dobson**
 - Based upon raster structure with 2.7 acre cell size (3.75 arc seconds of latitude and longitude)
 - Data gathered at various resolutions, stored in a nested hierarchy
 - Intended to support regional modeling (e.g., coal strip mining and associated environmental problems)

1974

- **Ted Nelson** publishes *Computer Lib/Dream Machines*
 - First sentence:
 - “Any nitwit can understand computers, and many do. Unfortunately, due to ridiculous historical circumstances, computers have been made a mystery to most of the world”
 - Considered an astonishingly prescient book that is one of the tap roots of the soon to be born microcomputer and cyber cultures
 - **Counterculture computing**
 - E.g., Palo Alto-based Homebrew Computer Club
 - **Project Xanadu** – first hypertext project (term coined in 1965, along with hypermedia)
 - 1960 project started, 1998 first incomplete release ...

1975

- **Thomas Poiker and Nick Chrisman** from the Harvard Lab publish *Cartographic Data Structures* in *The American Cartographer*
 - Seminal paper on spatial data structures
 - POLYVRT

1975

- The **MIT Altair 8800** was released
 - Microcomputer based on the Intel 8080, designed by **Ed Roberts**
 - Sold as a kit through *Popular Electronics*
 - **The Altair is widely recognized as the spark that led to the personal computer revolution**
 - Named after Star Trek destination by Les Solomon's young daughter
 - Harvard students **Bill Gates** (19) and **Paul Allen** wrote Altair Basic, their first product (4KB interpreter)

1976

- **MLMIS (Minnesota Land Management Information System)**, another significant state-wide GIS, began
 - Research project at the Center for Urban and Regional Analysis, University of Minnesota
 - Based upon digital land use map prepared from aerial photography (raster data structure – 40 acre cells, very coarse)
 - Very extensive natural resources database

1976

- Cray Research releases the **Cray-1**
 - \$8.8 million (\$32 million today)
 - 160 MIPS, 136 MFLOPS
 - 80MHz, 64-bit arch.
 - vector processor
 - Over 80 sold
- Today's IBM Blue Gene/L is 280.6 TFLOPS
 - 2 million times faster

1977

- **Endicott House GIS Symposium**

- More formally, the *First International Advanced Study Symposium on Topological Data Structures for Geographic Information Systems*
- Invited symposium with deliberately international scope
- 57 papers distributed one month in advance; all participants assumed to have read each paper
- Papers presented by discussant, not author
- 77 participants – stimulating discussions, not passive lectures
- Attendees included: Jon Bentley, Brian Berry, Nick Chrisman, Jim Corbett, Bruce Cook, Donald Cooke, Howard Fisher, Mike Goodchild, Stephen Guptill, Ben Kuipers, David Mark, Scott Morehouse, Donna Peuquet, Tom Poiker, Carl Reed, Azriel Rosenfeld, Mike Shamos, David Sinton, Waldo Tobler, Roger Tomlinson, Marvin White
- Signaled a change in generations – papers often presented by students of the GIS pioneers

1977

- USGS develops the **Digital Line Graph (DLG)** spatial data format
- Regional Institute for Environmental Protection in Baden-Wuerttemberg was the first federal state to develop a **landscape database (LDB)**
- Digital Equipment Corporation introduces the **VAX 11/780** 32-bit minicomputer
 - Commercial pioneer in using **virtual memory**

VAXbar

- Vance Haemmerle invention, unveiled at DECUS '97
 - Natural evolution of the VAX family architecture

1978

- **ERDAS (Earth Resources Data Analysis System)** was founded by Lawrie Jordan and Bruce Rado
- **MOSS (Map Overlay and Statistical System)** released; first full function, fully interactive vector-based GIS
 - Funded by EPA and US Fish and Wildlife Service
- **AM / FM International** founded

1978

- **Global Positioning System (GPS)** first experimental Block-1 satellite launched (led by **Roger L. Easton**)
- **Bill Joy** (Berkeley) releases first version of **BSD UNIX**
 - Second BSD version launched a few months later with the full kernel source code
 - Became the backbone of the Internet and introduced the **open source** concept

1978

- **First Harvard Computer Graphics Week**
 - Attracted many influential pioneers of computer mapping and GIS (often 300-500 people), including:
 - Fred Broome, Nick Chrisman, James Corbett, Jack Dangermond, Geoffrey Dutton, Howard Fisher, Randolph Franklin, Mike Goodchild, Stephen Guptill, Duane Marble, Scott Morehouse, Thomas Poiker, Azriel Rosenfeld, David Sinton, Waldo Tobler, Marvin White
 - Hybrid between an academic conference and a trade show

1978

- The first **SPAM email** message was sent from THUERK at DEC-Marlboro
 - Marketing the DEC System 20 to 400 people

1979

- **ODYSSEY GIS** developed at the Harvard Lab
 - The first significant vector-based analysis package with efficient polygon overlay
 - **Considered by some to be the prototype contemporary vector GIS**
 - Began as research into data structures and algorithms for spatial analysis in 1975-1979
 - **Denis White** and **Nick Chrisman** started the work; later joined by **Scott Morehouse**, **James Dougenik**, and **Randolph Franklin**

1979

- Creation of **SICAD** GIS in Germany
- Oracle releases the first commercial **SQL Relational Database Management System (RDBMS)**
- **PlanGraphics** founded by John Antenucci
 - Initial focus on automated mapping/facilities management (AM/FM) systems

1980

- **MAP (Map Analysis Package)** developed by **Dana Tomlin**
 - A raster-based GIS based upon David Sinton's IMGRID
 - Keyword approach of IMGRID was changed to an English-using command language
 - Many features for easy raster manipulation
 - Eventually installed at several thousand locations

1981

- IBM releases the **Personal Computer**
 - Model 5150
 - Starting price of \$1565 (\$3700 today)
 - Intel 8088 CPU (4.77MHz, 16 bit)
 - 16KB RAM
 - 160KB 5.25” floppy drive
 - 63.5W power supply
 - PC named the Time’s **1982 Man of the Year**

1981

- ESRI held its first **User Conference**
 - Attended by 16 people at the ESRI office in Redlands
 - Representing 11 user sites

New Brunswick Forestry
first customer

1982

- ESRI releases **ARC/INFO 1.0**
 - Followed CGIS idea of separating attribute and locational information
 - Combined a standard RDBMS (INFO) to handle attribute data with specialized software to handle objects stored as arcs (ARC)
 - A toolbox with command-driven, product-oriented user interface
 - First GIS to take advantage of super-minis (Prime; then IBM, VAX, DG)
 - **Took 9 months to develop (10/81 – 6/82)**

ESRI – Turnkey Systems

- ESRI would come to your site and in one week:
 - Install the hardware (including its OS)
 - Install the software
 - Run the communication lines
 - Install the plotter
 - Install the printer
 - Install the digitizing tablet
- “Intro to ARC/INFO” training
 - 2 weeks, comprehensive, on site
- Phone support by anyone who answered the phone

1982

- The **SPOT Image Company** founded
 - First commercial company established to distribute geographic information derived from Earth Observation Satellites worldwide
- **University of Maryland** obtains first academic ARC/INFO license
- **Nova Scotia Land Survey Institute (COGS)** was one of first schools to get an ARC/INFO license

1982

- Development of **GRASS (Geographic Resources Analysis Support System)** began at the U.S. Army Construction Engineering Research Labs
 - Originally called **FHGIS** (Fort Hood Geographic Information System)
 - Raster-based GIS program
 - Developed on a VAX 11/780

1982

- **Sun Microsystems** founded
 - Stanford graduate students Andy Bechtolsheim, Vinod Khosla, Scott McNealy, and Bill Joy (Cal Berkeley, primary developer of BSD Unix)
- **Silicon Graphics** founded
 - James Clark (EE professor at Stanford), along with a group of seven grad students and research staff from Stanford
- **Adobe** founded
 - John Warnock and Charles Geschke from Xerox PARC
 - Focus was to develop and sell the PostScript page description language

1982

- **Autodesk** founded by John Walker
 - Released AutoCAD, one of the first CAD packages to run on a PC
- **Scott Fahlman** of Carnegie Mellon invents the **smiley**, the first emoticon

Emoticons

- Three years earlier (April 12, 1979), **Kevin McKenzie** (USC) of Arpanet's MsgGroup:
 - Original message lost until September 2002
 - Retrieved from old VAX backup tape from 1982
 - Ambrose Bierce (1912), the *snigger point* - for ironical sentences

1982

- **First PC computer virus (Elk Cloner) hatched by Rich Skrenta**
 - Student at Mt. Lebanon Sr. High School near Pittsburgh
 - Developed on an Apple II
 - A boot sector virus on floppies
 - Every 50th boot, a poem would appear, saying in part, "It will get on all your disks; it will infiltrate your chips."
 - Anti-virus market - \$38B in 2008

1983

- **ETAK** digital mapping company was formed by Stanley Honey and seven others from the Stanford Research Institute (SRI)
- ESRI released **ARC/INFO 2.0**
 - NETWORK
 - ARC COGO

1984

- The first **International Spatial Data Handling Symposia (SDH)** was held, organized by Kurt Brassel (University of Zurich)
- Marble, Calkins, and Peuquet's "*Basic Readings in Geographic Information Systems*" was published
 - Considered the first accessible source of info about GIS
- Apple releases the **Macintosh**

1984

- Antonin Guttman (Berkeley) publishes the original **R-tree spatial data structure** paper
 - Multidimensional extension to B-trees

1985

- ETAK produced the **first automated car navigation system**
- ESRI released **ARC/INFO 3.0**
 - CLEAN and BUILD
- Microsoft released **Windows 1.0**

1985

- **Ozone hole** was confirmed by measurements from the **Nimbus-7** Total Ozone Mapping Spectrometer
 - TOMS launched in 1978
 - Ozone hole first noted by British scientists
 - Led to the first **Montreal Protocol**, where forty nations agreed to a 50% reduction in the use of chlorofluorocarbons (CFCs) by 1999

Arc Mystery

- A port of Mystery Mansion text-based adventure game to ARC/INFO 3
 - The object was to find one's way through a run-down, mansion in order to find various treasures, solve a murder, and avoid getting killed before the mansion is destroyed by fire at midnight to end the game
 - Also known as the “maze game” due to difficult maze that was part of the game
- Removed from ARC/INFO once Support got calls asking how to get out of the maze

1986

- **BBC Domesday Project, the first multimedia GIS application**, completed by Rhind, Openshaw, and others
 - The original *Domesday Book* was the record of the great survey of England completed in 1086, executed for William the Conqueror
 - The new multimedia edition was compiled between 1984 and 1986
 - It included a new 'survey' of the United Kingdom - people (mostly school kids) wrote about their daily lives
 - Over 1 million people participated in the project
 - One of first attempts to publish government statistics and data collected by kids in an accessible way
 - Linked with maps, many color photos, statistical data, video, and 'virtual walks'

1986

- **MapInfo** was founded by four students from the Rensselaer Polytechnic Institute
- Peter Burrough's *"Principles of Geographic Information Systems for Land Resources Assessment"* published
 - First textbook on GIS
- The first **SPOT** satellite was launched
- **COGS (Nova Scotia College of Geographic Sciences)** formed from the Nova Scotia Land Survey Institute

ESRI - 1986

- ESRI released **PC ARC/INFO**
- Operated on IBM PC AT under DOS 3.1
- PC version of INFO
 - Used INFO until 1990, then dBASE
- Technical Support becomes a formal department with two fulltime staff
- Training - new training center
 - Single two week course

1987

- **GEOVIEW** developed by Waugh and Healey at the University of Edinburgh
 - **Represented all data within an RDBMS** (both spatial and non-spatial), using a very simple schema – an ENTITY table and an ATTRIBUTES table
 - Highly normalized representation
- The first **GIS/LIS Conference** was held as part of the ACSM/ASPRS Conference in Baltimore

1987

- The **International Journal of Geographical Information Systems (IJGIS)** was first published
- The **IDRISI Project** was started by **Ron Eastman** at Clark University
 - Popular as an academic tool for teaching the principle theories behind GIS
- **SPANS GIS** was released by Tydac

1987

- Association of American Geographers creates the GIS Specialty Group
 - Largest specialty group in AAG
- First ESRI User Conference in **Palm Springs**
- ESRI releases **ARC/INFO 4**
 - AML
 - UNIX Workstations
 - UNIX installs done by user
 - 1,500 ARC/INFO systems in use

The Geocoding Experiment

- **Peter Gould** (Penn State) sent envelopes to 34 colleagues worldwide with **Waldo Tobler's** (UCSB) geographical coordinates
 - Test universality of geocoding standards
 - $34^{\circ}26'41''\text{N}$, $119^{\circ}48'26''\text{W}$
 - Four letters arrived
 - Unexpected routing

1988

- **Smallworld** was founded by ten researchers with experience in computer graphics and databases from the CADCentre in Cambridge, and Cambridge Interactive Systems – the producer of Medusa (CAD)
- New **ESRI regional offices**: Olympia, Charlotte

1988

- The **GIS-L** Internet list-server was started by Ezra Zubrow, SUNY Buffalo
- The first public release of the U.S. Bureau of Census **TIGER (Topographically Integrated Geographic Encoding and Referencing)** digital data product
- First **IRS (Indian Remote Sensing)** satellite is launched - IRS-1A
- New **ESRI regional office**: Minneapolis

1989

- Stan Aronoff's ***Geographic Information Systems: A Management Perspective*** published
- First **Symposium on the Design and Implementation of Large Spatial Databases (SSD)** held in Santa Barbara
- **Association for Geographic Information (AGI)** established in the UK based upon the Chorley Committee report of 1987

1989

- The **WWW (World Wide Web)** was created by Tim Berners-Lee, for CERN (Conseil Européen pour la Recherche Nucléaire) in Geneva
- Concepts introduced:
 - HTML
 - HTTP
 - URL

1989

- The **NCGIA (National Center for Geographic Information and Analysis)** was established through NSF grant
 - University of California at Santa Barbara
 - SUNY Buffalo
 - University of Maine at Orono
- Intergraph launches **MGE**
- ESRI released **ARC/INFO 5.0**
- New **ESRI regional offices**: Boston, Washington DC, Denver, Austin
- 300 ESRI employees

1990

- ***The American Cartographer*** renamed ***Cartography and Geographic Information Systems***
 - Reflected desire to be more inclusive of GIS
 - Later in 1996 renamed ***Cartography and Geographic Information Science***

1991

- The first **ERS (European Remote Sensing)** satellite launched – ERS-1
- **Harvard Lab** closed
- **Linux kernel** first released

1991

- Seen as the turning point in the GIS industry due to the beginning of mass acceptance of GIS
- ESRI released **ArcView 1** and **ARC/INFO 6.0**
 - Major reengineering
 - Redesigned menu-interface
 - Dynamic segmentation
 - Enhanced cartographic tools
 - GRID extension for raster modeling

1992

- **DCW (Digital Chart of the World)** released by US Defense Mapping Agency (now NGA)
 - First integrated 1:1million scale database with global coverage
 - \$10M contract to ESRI (awarded 1989) – resulted in large increase in ESRI employees
- **First KH-12 reconnaissance satellite**
 - Presumed similar to the Hubble Space Telescope
 - Estimated 10cm resolution

1993

- The first Web-based interactive map (**Xerox PARC Map Viewer**) was developed by Steve Putz
 - implemented as a perl script
 - accepted requests for map renderings and returns an HTML document including an inlined GIF image
- **Mosaic**, first popular web browser, released by NCSA (National Center for Supercomputer Applications)

1993

- The **GPS system** achieved initial operational capability
 - A complete constellation of 24 satellites
 - A mere 30+ years after TRANSIT
- First **ACM-GIS workshop** in Arlington, Virginia
- First **COSIT** (Conference on Spatial Information Theory) in Elba, Italy
- **EUROGI** founded
 - Mission was to maximize the availability and effective use of geographic information throughout Europe

1993

- **Windows NT** was released, first version to use 32 bit flat virtual memory on 32 bit processors
 - Opened the door to migration from Unix workstations to the PC platform for high end applications such as GIS

ESRI Professional Services: 1969 – Present

- 1970's
 - Site and Parcel Mapping
 - Environmental Analysis
 - Facility Siting
- 1980's
 - City, State and Regional Mapping
 - Land Capability/Suitability Analysis
 - New Town Siting and Planning
- 1990's
 - National Mapping/Database Development
 - Natural Resource Analysis and Management
 - Utility/Facility Mapping and Analysis
 - **Rent-A-Tech Program**
- 21st Century
 - Global Database Development
 - Nautical/Aeronautical Data Management
 - Enterprise Design and Implementation
 - **EEAP/BPAP Programs**
 - Application Solution Development

1994

- **NSDI (National Spatial Data Infrastructure)** was formed in the U.S. by an executive order of President Bill Clinton
 - Spatial data is considered a national capital asset
 - The NSDI manages the distribution of these assets across all interconnected systems, federal and private sector, and analyzes it to determine the impact of the world economically, physically, and socially upon the United States
- **OpenGIS Consortium** formed
- ESRI released **ARC/INFO 7.0** and **ArcView 2.0**

ArcView GIS

- 1.0 (late 1991)
 - Easy to use desktop display and query software
 - Shipped 10,000 copies in first half of 1992
- 2.0 (1994)
 - Authorized Training Program (ATP)
- 3.0 (1996)
 - Shapefiles
 - Avenue
 - Extensions
- 3.2 (1999)
 - ModelBuilder

1995

- **RADARSAT** developed and launched by Canada
 - An Earth observation satellite with Synthetic Aperture Radar (SAR) to monitor environmental change and support resource sustainability
 - Orbit path repeats every 24 days
- Britain's Ordnance Survey achieves first **complete digital map coverage of a country** (Great Britain) in a database
 - 230,000 maps (1:1250, 1:2500, 1:10,000)

1995

- **NGDF** (National Geospatial Data Framework) launched in the UK
 - The UK's spatial data infrastructure
 - Improve knowledge of existing GI and encourage easier access to it
 - Standards (e.g., metadata) and Services
 - Public and private sector
- Oracle releases **SDO** (Spatial Data Option) on top of Oracle 7
- **ESRI employment** reaches 1000 people

1996

- First generation **Internet-based GIS products** released by major vendors (Autodesk, ESRI, Intergraph, and MapInfo)
- **MapQuest internet mapping service** launched by Donnelly Geosystems
 - Within the first week of its launch, both of the company's servers went down; within three months, 50 servers needed to handle demand
- **ESRI** expands the Redlands campus across New York St. with the addition of a three-story R&D Center (**Building M**)
- **MapObjects 1.0** released

ESRI - 1997

- First User Conference to be held in **San Diego**
- **ArcView 3.0** released
- Work begun on **ArcGIS**
- The numbers
 - 58,000 calls handled by Support
 - 100,000 ARC/INFO seats
 - 200,000 ArcView seats
 - 20,000 SDE seats

1998

- **TerraServer** project started as a joint research project between Aerial Images, Microsoft, the USGS, and Compaq
 - Aerial Images wanted to sell imagery online
 - Microsoft Research needed a large database to demonstrate the capabilities of its new database software
- **Google** founded by Larry Page and Sergey Brin (Stanford PhD students)

1998

- The **Association of Geographic Information Laboratories for Europe (AGILE)** was established
 - Promote academic teaching and research on GIS at the European level
 - Facilitate networking activities between geographic information laboratories at the European level
- AM / FM International changes name to **GITA** (Geospatial Information and Technology Association)

1999

- **First GIS Day**
 - November 19th
 - Grassroots GIS education event
 - 1.2 million participants worldwide
- **IKONOS** launched
 - First commercial high resolution imaging satellite
 - 90cm resolution panchromatic and multi-spectral images
- National Geographic's **Map Machine**

ESRI - 1999

- **ArcInfo 8**
 - Reengineering of its GIS software as a large collection of C++/COM objects
 - Geodatabase
 - ArcCatalog, ArcMap, and ArcToolbox desktop apps
- **ArcSDE**
 - Storage of spatial and tabular data in commercial DBMS products
- **MapObjects 2.0**
- **ArcIMS 3.0**

2000

- Microsoft releases **MapPoint**
 - Originally developed from Expedia Streets which was included with Office 97
 - Intended for business users but competed in the low-end GIS market

2001

- More than **1 million users of GIS**
 - 5 million estimated casual users
- GIS marketplace > \$7 billion
 - Hardware, software, services
 - >10% growth per year
- **Keyhole** launched as spin-off of Intrinsic Graphics (reference to KH recon satellites)

ESRI - 2001

- ArcGIS 8.1 released
- The numbers:
 - Over 10,000 users at Users Conference
 - Over 100,000 users
 - Over 1,000,000 licensed software seats
- 29 ESRI Press Books
- Training
 - Instructor-Led Training: 15,271 students in 1649 classes
 - Virtual Campus: 122,000 members from 178 countries
- Support
 - 65 analysts handled 46,052 calls

2004

- **National Geospatial-Intelligence Agency (NGA)** formed
 - Biggest GIS user in the world
 - NIMA renamed to NGA to emphasize geo-intelligence
- ESRI released **ArcGIS 9.0**
 - **ArcGIS Engine**, for embedding GIS functionality into desktop and field applications
 - **ArcGIS Server**, a centrally managed framework for serving enterprise GIS applications
- **Harvard Graphics Lab reunion** at the ESRI User Conference

2005

- **Mashup** term first used in context of combining content from one website with another
 - The combination of the music from one song with the a cappella from another
 - Typically, the music and vocals belong to completely different genres

2005

- **AJAX** (for Asynchronous JavaScript and XML) web development technique appears
 - used for creating interactive web applications
- **Google Earth** virtual globe program released
 - Originally developed by Keyhole (called Earth Viewer); purchased by Google in 2004
- Microsoft released **Virtual Earth**
 - Website and SDK
 - MSNs answer to Google Maps

2006

- Nick Chrisman publishes *Charting the Unknown: How Computer Mapping at Harvard Became GIS*
- Harvard opens **Center for Geographic Analysis**
- ESRI released **ArcGIS 9.2**
 - Significant Geodatabase and Server enhancements

2007

- **3rd International Polar Year (IPY)**
 - First occurred in 1882, second was in 1932
 - Motivated the IGY in 1957; focus of IPY:
 - **Status:** to determine the environmental status of the poles
 - **Change:** to understand historical change and improve future projections
 - **Global linkages:** understand the links and interactions between polar regions and the rest of the globe
 - **New frontiers:** push the frontiers of science at the poles
 - **Vantage point:** use the vantage point of the poles to enhance observatories from the interior of the Earth to the sun and stars
 - **Human dimension:** investigate the cultural, historical and social processes and identify their contributions to global cultural diversity

ESRI - 2007

- ESRI breaks ground on new headquarters building on New York Street

2008

- ACM SIGSPATIAL formed
 - *ACM SIGSPATIAL addresses issues related to the acquisition, management, and processing of spatially-related information with a focus on algorithmic, geometric, and visual considerations. The scope includes, but is not limited to, geographic information systems (GIS).*
 - www.sigspatial.org

ESRI Staff Profile

- ~1900 employees in Redlands, almost 2700 worldwide
- Represent 700 universities (200 outside the USA)
- Most college graduates from:
 1. Univ. of Redlands
 2. Cal State, San Bernardino
 3. UC Riverside
 4. Cal Poly, Pomona
 5. UCLA
 6. San Diego State
 7. COGS
 8. SUNY Buffalo
 9. Peking/Beijing University
 10. Hollywood Upstairs Medical College
- 560 employees representing over 70 countries
- US employees represent all 50 states
- 765 have worked at ESRI >10 years
- 88 have worked at ESRI >20 years
- Citizenship Top 10
 1. USA
 2. India
 3. Canada
 4. China
 5. Russia
 6. UK
 7. Germany
 8. Australia
 - 9/10. New Zealand and Mexico

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- Harlan Heimgartner (ESRI)
- Hugh Keegan (ESRI)
- Mike Kevany (PlanGraphics)
- Robert Laurini (INSA Lyon)
- David Maguire (ESRI)
- Scott Morehouse (ESRI)
- Bill Moreland (ESRI)
- Peter Woodsford (1Spatial)
- Pusheng Zhang (Microsoft)
- John (docent, USS Midway)