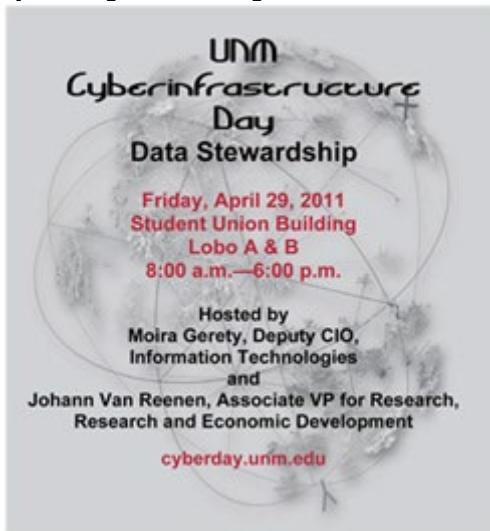


# From Supercomputers to 3D Game Programming: The Impact of CyberInfrastructure on our Youth

Kris Stewart  
CyberInfrastructure Day Apr2011  
Data Stewardship  
University of New Mexico

<http://cyberday.unm.edu/>



[https://www.stewart.sdsu.edu/Stewart\\_CI-UNM\\_29april2011\\_74.pdf](https://www.stewart.sdsu.edu/Stewart_CI-UNM_29april2011_74.pdf)

# What do model Railroads have to do with CyberInfrastructure?

The previous image of Kris was taken at Walt's Barn in Griffith Park, Los Angeles  
Walt = Walt Disney

Stewart has been a fan of Disney since "forever"  
(which was a long time ago)

As Marine Corps brat, Stewart was born at Camp Pendleton  
<http://www.cpp.usmc.mil/> Zip:92055  
coastal San Diego north county – every other tour of duty was Pendleton

Camp Pendleton night at Disneyland, when stationed there, and a visit on each duty change, along with "visit the relatives".

# Walt Disney

(05Dec1901 – 15Dec1966)



Recent Walt/Kris interactions:

11Nov2011 – niece Leigh Birthday And Flag Retreat daily ceremony, Main Street Disneyland

Disney Family Museum, Presidio Park San Francisco (a record of Walt always pushing the Technology envelope)

Cruise ships – Stewart 60<sup>th</sup> birthday through Panama Canal (Disney first to include children in cruising, just like the parks)

Walt's Barn [CPRR] – Griffith Park – 1956 founding member of LA Live Steamers

# How does the fiber map relate to us today?

(Qwest's High Speed Fiber located on the Railroad Right of Way)

[Network Maps:](#)

Qwest North American Fiber Network

[Press Release](#)

Click on any US or Mexico region to zoom in...



## Timeline of Technology (and Stewart's life)

Upd: Jan. 2007/Org: June 2000, SDSU

Thank you for the motivation to reflect on my personal history of life

Date	Technology	Event	Popular Culture	Comments
A Big Picture of timelines			<a href="#">World History</a> : HyperHistory Online navigates through 3,000 years of World History	The <a href="#">Info Scout</a> from the University of Wisconsin is useful to me.
February 14, 1946	<a href="#">ENIAC</a> (U. Pennsylvania)			1997 the Association for Computing Machinery ( <a href="#">ACM</a> ) celebrates its 50 year anniversary, closely tied to the first computer. ACM is the International Professional Society of computer science.
January 10, 1951		Wendy Christine Beard is born		My father (Lt. Col. W.O. Beard) was at Chosin Reservoir, Korea. The attention paid to this <b>Forgotten War</b> a few years ago reminded me that my 50th birthday came and went.
July 1955		Disneyland Opens in Anaheim		
Spring 1969	ARPAnet is born (UCLA)		Centeniel of <a href="#">Golden Spike</a> Transcontinental Railroad Ref: Irving Stone's "Men to Match my Mountains" (Doubleday, 1956)	Kris Beard is Vista High Graduate, on to UCSD to major in Math
1978	Kris builds Z80 Microcomputer Kit Email: qb30087@calstate.bitnet (CSU Cyber)	SDSU Masters Project	"Pirates of Silicon Valley" TNT Movie describes this era. Perhaps we will <b>critically</b> watch next week.	Numerical Analysis in BASIC, available online from <a href="#">SCRUNCH</a> available from <a href="#">GAMS/NIST</a>
1979	NASA Space Craft ( <a href="#">Voyager 1 Encounter</a> ) Internet access to email			Stewart joins Mathematical Software team at Jet Propulsion Lab, Pasadena, with MS in Computer Science
1981	Math Software with Cleve Moler, University New Mexico (witness to <a href="#">MATLAB</a> birth)			Stewart starts work on the PhD at the University of New Mexico, Albuquerque
1984	Stewart returns to SDSU as Asst. Prof. in Numerical Analysis		<a href="#">Apple Ads</a> (look at <a href="#">1984 Movie</a> shown during the U.S. Superbowl)	Stewart works to include computing in numerical analysis curriculum at SDSU
1993	NSF funds STEP at the San Diego Supercomputer Center (1993-1997) <a href="http://www.sdsc.edu/GatherScatter/gsfall94/gsfall_a8.html">www.sdsc.edu/GatherScatter/gsfall94/gsfall_a8.html</a> Supercomputer Teacher Enhancement Program STEP [GatherScatter Fall94]			Stewart introduces high school science teachers to computational science through workshops at SDSC.
Spring 1994	<a href="#">Stewart's Web Page</a> first faculty home page at SDSU			STEP teachers jumped onto the use of the WWW
June 2000	<a href="#">Map the Human Genome</a> June 25, 2000 announcement from White House	Cure for MS? Annette Funicello and I sure hope so.	<a href="#">Chronology/Microcomputers</a> 1995-2001 copyright [watch browser's "location" field] <a href="#">Chronology/Microcomputers</a> 1995-2002 copyright [always try to verify your data]	Author (Who?) Who made available? (Where?) Copyright (When?)

# Kris' Faculty Background

(Kris Stewart, CS Professor, San Diego State University, California State University)

- Numerical Analyst\* led to
- Supercomputing and Undergraduate Education (SUE\*\*) led to
- Supercomputing Teacher Enhancement Program (STEP\*\*\*) led to
- Education Center on Computational Science & Engineering (ECCSE) part of NPACI/EOT-PACI (1997)
- ECCSE joins Engaging People in Cyberinfrastructure (EPIC) led to 3d Game Programming course at SDSU 2005
- CS100 GE programming for non-major – Fall 2011

\* MS/CS SDSU 1979 (built IMSAI/Z80 kit computer), JPL 1981, **PhD UNM 1987**, SDSU 1984

\*\* SDSC (1991); UCES (DoEnergy 1994)

\*\*\* Smithsonian Research Collection (1996)

# NSF Celebrates 50 years 23March2009

**NSF** National Science Foundation  
WHERE DISCOVERIES BEGIN

SEARCH  
NSF Web Site

HOME | FUNDING | AWARDS | DISCOVERIES | NEWS | PUBLICATIONS | STATISTICS | ABOUT | FastLane

## NSF and the Birth of the Internet

2000 1990 1980  
1970 1960

Home | 1960s | 1970s | 1980s | 1990s | 2000s | Resources | Text-only

IN THE BEGINNING  
VINT CERF VIDEO >

NSFNET IS BORN  
GEORGE STRAWN VIDEO >

MOSAIC PICTURES THE WEB  
ERIC BINA VIDEO >

0000000000  
Number of Computers on the Net

0000000  
Baud Rate

Credits

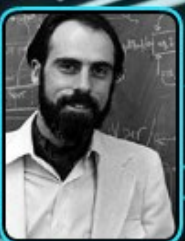
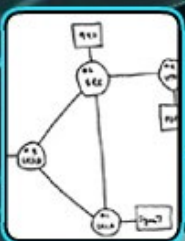
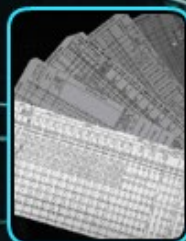
Web Policies and Important Links | Privacy | FOIA | Help | Contact NSF | Contact Webmaster | SiteMap

[www.nsf.gov/news/special\\_reports/nsf-net/](http://www.nsf.gov/news/special_reports/nsf-net/)



NSF and the Birth of the Internet

# 1960s



1960s



0000000004

Number of Computers on the Net

000000004000

Baud Rate

**Note:**  
4 computers  
Speed 4000 baud







NSF and the Birth of the Internet

# 1970s



1970s

1978, K Stewart builds z80/Imsai kit computer (fl pt) for numerical software

▶ Sequential Maps of Internet Growth

0000000**188**

Number of Computers on the Net

0000000**4800**

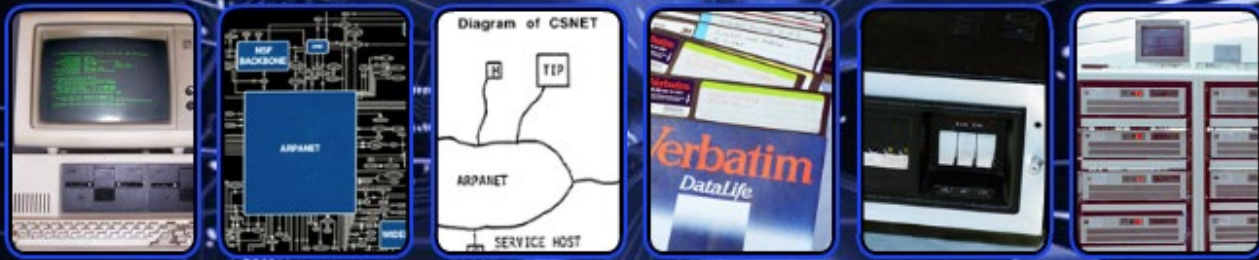
Baud Rate

188 computers  
4800 baud



# NSF and the Birth of the Internet

## 1980s



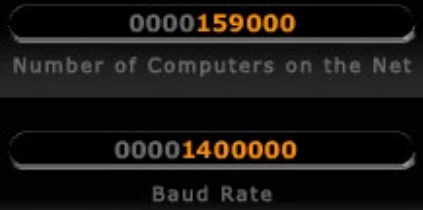
1980s

1985 NSF  
Supercomputer  
Centers

Home | 1960s | 1970s | **1980s** | 1990s | 2000s | Resources | Text-only

159,000 computers  
1,400,000 baud

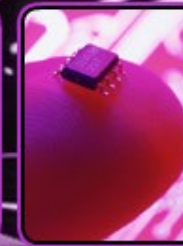
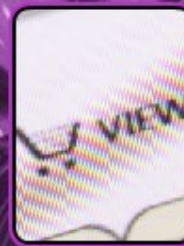
▶ Sequential Maps of Internet Growth



NSF and the Birth of the Internet

# 1990s

**CERN**  
The European Laboratory for Particle Physics (CERN) in Switzerland (2) and Web(4).  
This is the CERN lab Services(5) to the suggestions, see WWW.  
About the Laboratory, Other Subjects(111)  
of the Laboratory



Home | 1960s | 1970s | 1980s | **1990s** | 2000s | Resources | Text-only



▶ Sequential Maps of Internet Growth

**0248000000**  
Number of Internet Users

**00010000000**  
Baud Rate

1990s

248,000,000 computers  
10,000,000 baud

# NSF and the Birth of the Internet


## 2000s



2000s

1.2 G computers  
20,000,000,000 baud

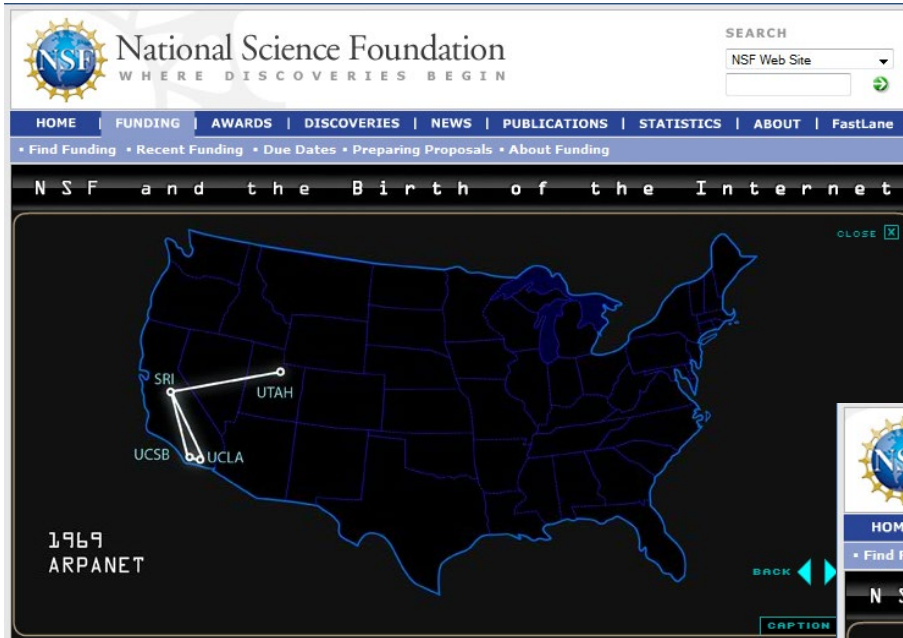
[Home](#) | [1960s](#) | [1970s](#) | [1980s](#) | [1990s](#) | **[2000s](#)** | [Resources](#) | [Text-only](#)

 [Sequential Maps of Internet Growth](#)

**1200000000**  
Number of Computers on the Net

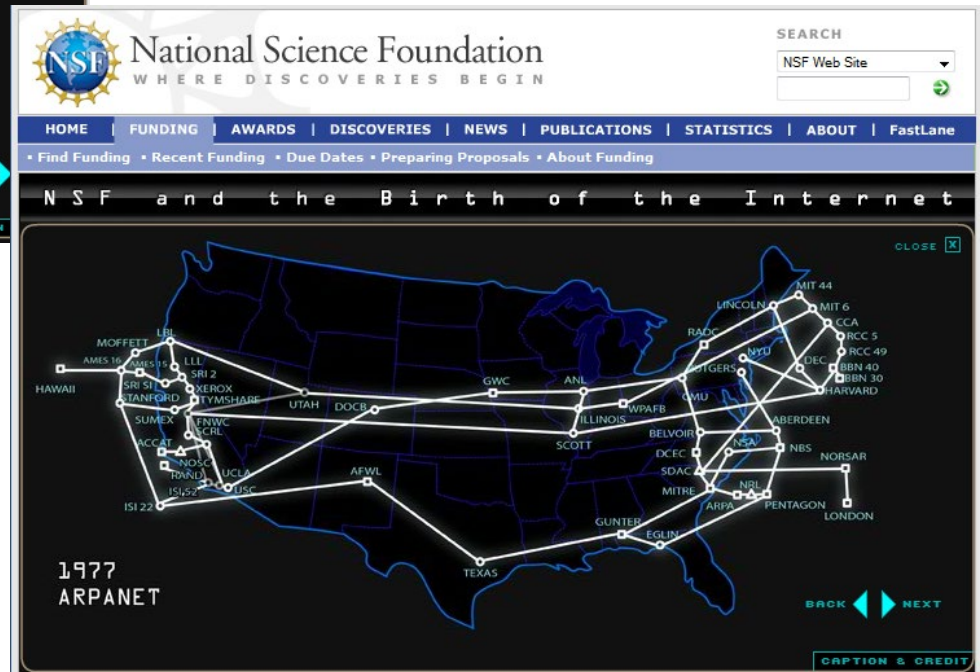
**20000000000**  
Baud Rate

# Evolution of Network-1

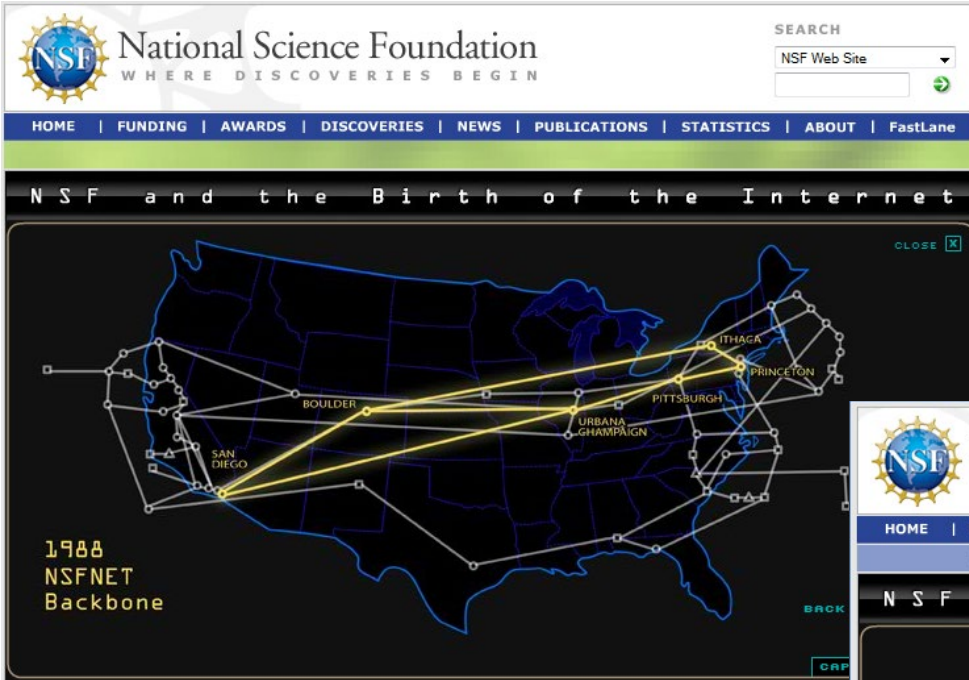


ARPANET 1969

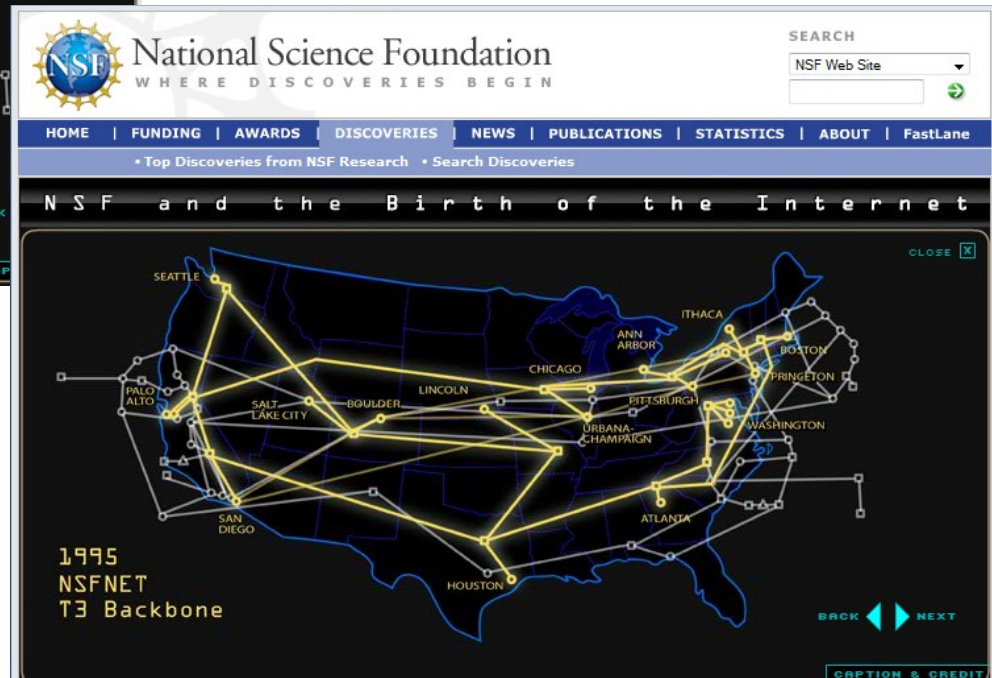
NSFNET 1977



# Evolution of Network-2

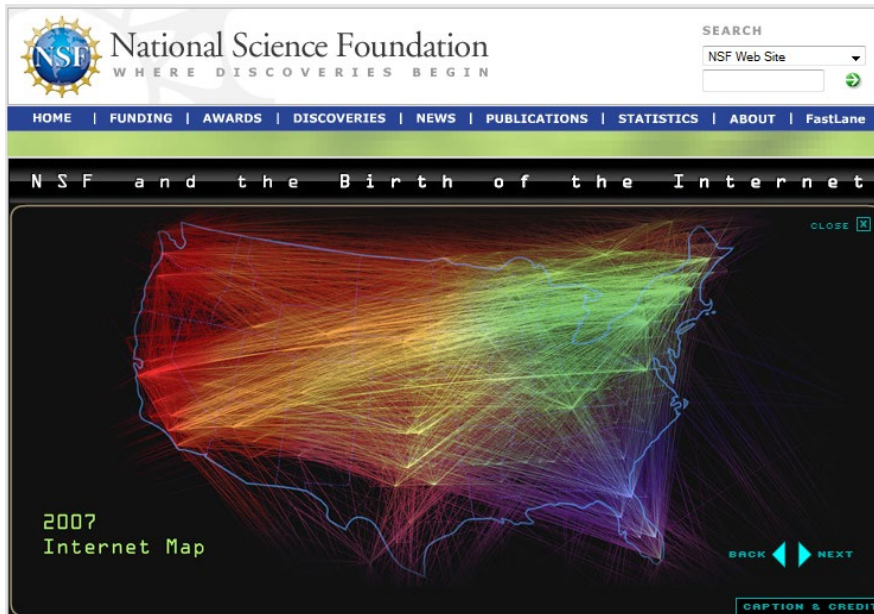


1988 NSFNET Backbone  
Supercomputer Centers hub



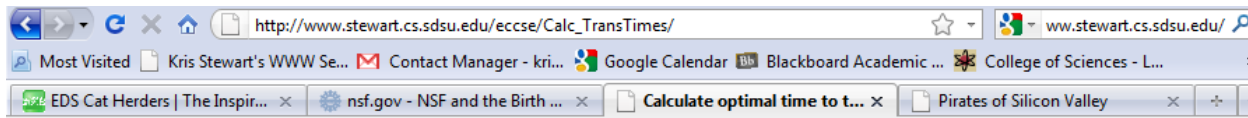
1995 NSFNET T3 Backbone

# Evolution of Internet-3



2007 Internet Map of US

# Calculate Transmit Time for your 1GB ThumbDrive vs. Network Speed



Enter the size of your hard drive and see the resulting transfer time



Enter file size:

Modem 14.4 Kbps (Kilobits per second)	<input type="text" value="177"/>	hours	<input type="text" value="46"/>	minutes	<input type="text" value="40"/>	seconds
Modem 28.8 Kbps (Kilobits per second)	<input type="text" value="88"/>	hours	<input type="text" value="53"/>	minutes	<input type="text" value="20"/>	seconds
Modem 33.6 Kbps (Kilobits per second)	<input type="text" value="74"/>	hours	<input type="text" value="51"/>	minutes	<input type="text" value="13"/>	seconds
Modem 56.6 Kbps (Kilobits per second)	<input type="text" value="39"/>	hours	<input type="text" value="40"/>	minutes	<input type="text" value="57"/>	seconds
64Kbps ISDN (Integrated Services Digital Network)	<input type="text" value="34"/>	hours	<input type="text" value="43"/>	minutes	<input type="text" value="20"/>	seconds
128Kbps ISDN (Integrated Services Digital Network)	<input type="text" value="17"/>	hours	<input type="text" value="21"/>	minutes	<input type="text" value="40"/>	seconds
T1 1.544 Mbps (Megabits per second)	<input type="text" value="1"/>	hours	<input type="text" value="39"/>	minutes	<input type="text" value="27"/>	seconds
T3 45 Mbps (Megabits per second)	<input type="text" value="0"/>	hours	<input type="text" value="3"/>	minutes	<input type="text" value="26"/>	seconds
OC1 52 Mbps (Megabits per second)	<input type="text" value="0"/>	hours	<input type="text" value="2"/>	minutes	<input type="text" value="57"/>	seconds
OC3 155 Mbps (Megabits per second)	<input type="text" value="0"/>	hours	<input type="text" value="0"/>	minutes	<input type="text" value="52"/>	seconds
OC12 622 Mbps (Megabits per second)	<input type="text" value="0"/>	hours	<input type="text" value="0"/>	minutes	<input type="text" value="13"/>	seconds

**For Your Information:**  
 Megabit: About one million bits. Exactly 1,048,576 bits ( $2^{20}$ ).  
 Kilobit: About one thousand bits. Exactly 1024 bits ( $2^{10}$ ).  
 Bit: Smallest unit of data in a computer. A bit has a single binary value, 0 or 1.

Written by [Jerry Kuzminsky](#).



# Overtime, its been great to watch technology enhance

- Processor speeds increasing & multicore
- Memory speed increasing
- Cost decreasing
- Computer Screen resolution and fidelity
- GPUs as well as CPUs
- Mobile computing convenient and powerful

**What an exciting time “the kids” can have**

# Stewart Background / Acronyms

- 1973 BA Math UCSD (unsuccessfully UCB PhD attempt Differential Geometry '74)
- 1976-79 MS Computer Science SDSU (Imsai 8080/Z80 microcomputer kit, separate floating point processor)
- 1979-81 Jet Propulsion Lab, Pasadena Ca
- 1981-87 UNM PhD Applied Math/CS
- 1984 hired SDSU Numerical Analyst faculty
- 1993-96 Supercomputer Teacher Enhancement Program (SD High Schools / SDSC resources) after SDSU tenure
- 1995 HPC at SDSU with SDSC resources NSF grant
- 1997-2006 NPACI (HPC at CSU with SDSC/net resources) SDSU promotion (nontraditional faculty)
- 2005 Engaging People in CyberInfrastructure (EPIC) using Game Engines as Curriculum Tool

UCSD=U.California, San Diego; SDSU=San Diego State U.; JPL = Jet Propulsion Lab of NASA; UNM=U.NewMexico; HPC=High Performance Computing; SDSC=San Diego Supercomputer Center; NPACI=National Partnership for Advanced Computational Infrastructure; EPIC=Engaging People in CyberInfrastructure

# Curriculum Development

- SUE (Supercomputing and Undergraduate Education) workshop for CSU faculty 1990-93
- STEP (Supercomputer Teacher Enhancement Program) workshops High School Teacher Teams to promote Computational Science 1993-96
- NPACI (National Partnership for Advanced Computational Science Infrastructure) 1997-2005
- KUCSEC (Keck Undergrad Computational Science Education Consortium) 2002-2006
- EPIC (Engaging People in Cyberinfrastructure) Game Engines in University Undergrad Curriculum 2005-07
- <http://www.netlib.org/na-digest-html/> full circle back to 1987 (thanks to Jack Dongarra) great for HPC
- CS100 General Ed Principles of Computing using Alice, Fall 2011 Current students were born digital – Stewart is Digital Immigrant with a Green card from UNM

# Key Points in video for Modern Computer History

- 1984 Superbowl commercial announcing Apple Macintosh [http://en.wikipedia.org/wiki/1984\\_\(advertisement\)](http://en.wikipedia.org/wiki/1984_(advertisement)) Dir: Ridley Scott
- Pirates of Silicon Valley [TV movie] [http://en.wikipedia.org/wiki/Pirates\\_of\\_Silicon\\_Valley](http://en.wikipedia.org/wiki/Pirates_of_Silicon_Valley) useful to establish early days and who stole from whom; Xerox PARC <-> iSteve <-> Windows?
- The Machine That Changed the World [TMTCTW] BBC & PBS [http://waxy.org/2008/06/the\\_machine\\_that\\_changed\\_the\\_world/](http://waxy.org/2008/06/the_machine_that_changed_the_world/) Jan1992 US PBS
- Triumph of the Nerds PBS Bob Cringely <http://www.pbs.org/nerds/> June 1996 US PBS (no longer airing – can find YouTube)
- Nerds 2.0.1 Bob Cringely, PBS [http://www.stewart.cs.sdsu.edu/cs440/nerds\\_2\\_0\\_1.html](http://www.stewart.cs.sdsu.edu/cs440/nerds_2_0_1.html) (my YouTube collection) or <http://www.pbs.org/opb/nerds2.0.1/>
- CatHerders 2000 Superbowl commercial [http://www.computerworld.com/s/article/print/9152078/Top\\_10\\_Super\\_Bowl\\_tech\\_ads?taxonomyName=Hardware&taxonomyId=12](http://www.computerworld.com/s/article/print/9152078/Top_10_Super_Bowl_tech_ads?taxonomyName=Hardware&taxonomyId=12)

# Superbowl Commercials from Tech Companies (over time)

My choices are:

Apple Macintosh premier, directed by Ridley Scott), 1984

EDS Cat Herders 2000 and

Bridgestone Tires Beaver carma salute 2011

Computerworld choices:

Xerox: "Monks" (1976)

Apple: "1984" (1984)

Intel: "Play That Funky Music" (1997)

CompuServe: "Not Busy" (1997)

Lotus: "Capitalism" (1997)

lomega: "Bermuda Triangle" (1998)

Network Associates: "Missile Silo" (1998)

EDS: "Cat Herders" (2000)

Computer Associates: "Amnesia" (2002)

Garmin: "Napoleon" (2008)

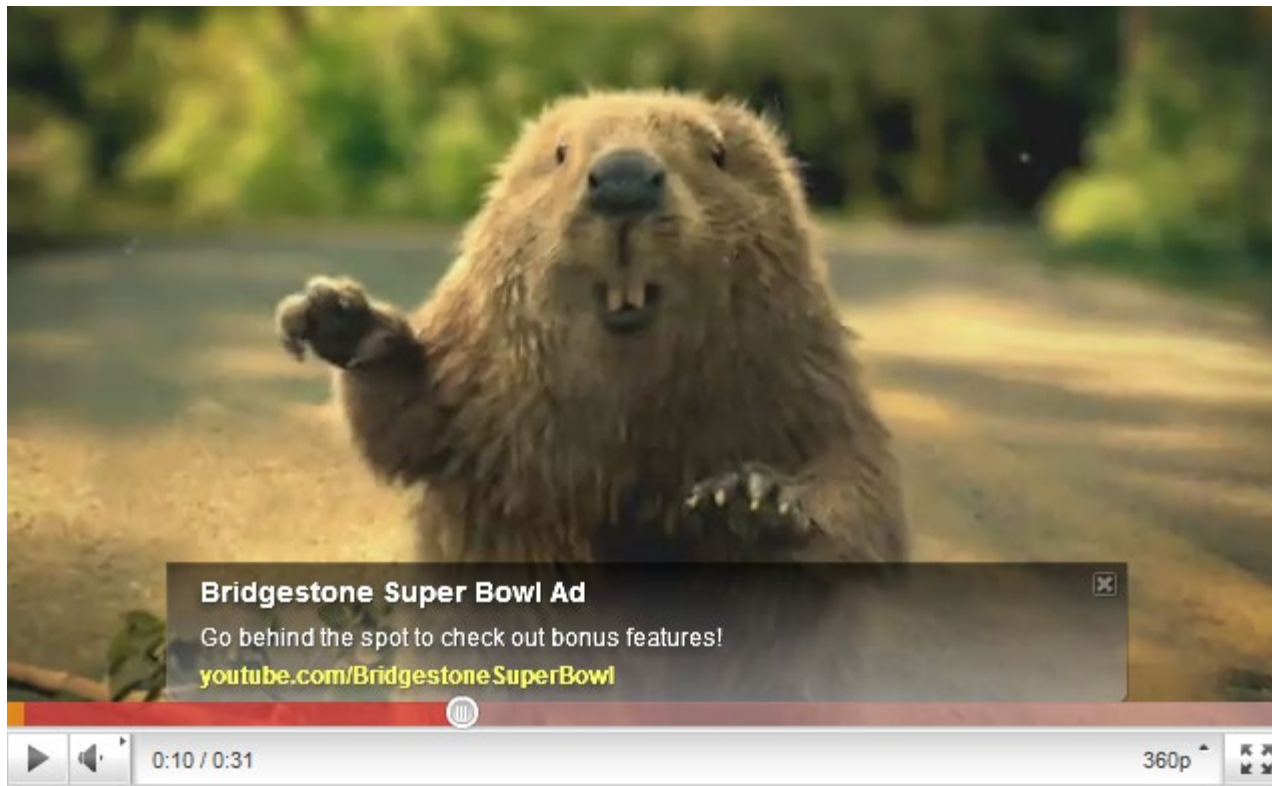
# My Favorite 2011 Superbowl Ad

<http://www.youtube.com/watch?v=EBUcG7xZB-g>

Copy/paste into browser / Bridgestone beaver

<http://youtu.be/7Rw-JUuUrZg>

Carma - salute



# Online Resources - a moving target

- **What criteria to use to evaluate?**  
Who What Where Why When? (date, author, biases, focus, intended audience, how \$-supported ...)
- **Trust Anything from ACM** (Association for Computing Machinery)
- **Research and Documentation in the Electronic Age – Diana Hacker**  
<http://dianahacker.com/resdoc/>
- **Scout Report** Results. Solutions. Knowledge.  
Since 1994, the Internet Scout Project has focused on research and development projects that provide better tools and services for finding, filtering and delivering online information and metadata.  
<http://scout.wisc.edu/>

# Students and Professions need to question and keep log of web resources

- Research and Documentation in the Electronic Age – Diana Hacker

<http://dianahacker.com/resdoc/>

- Campus Infrastructure – SDSU Reference Librarians provide guidance:

Evaluating Sources of Info at SDSU:

<http://infodome.sdsu.edu/research/evaluate/evaluate.shtml>

What resources do you have in your school/lab?

How much support for you (teacher/researcher, your students, users?)

- Cyberinfrastructure requires an investment



# My Favorite online resources

- Scout Report (weekly email and archives)
- ACM Tech News (3 times/wk & archives)
- WayBack Machine
- Library subscription to technical journals
- Wikipedia – how to use effectively. Point out to students its View History [alt-h]

# Student Research:

Resources found on web can be included, if acknowledged correctly

- Avoid Plagerism charges (cheating)
- Respect Copyright and other individuals Intellectual Property (IP)
- It is the “right thing to do” (cultural differences)

# As you move from Supercomputing ...

## What interests me?

Increasing enrollment in Computer Science

Responsible Internet Usage

Programming and Computer Games

My Inspirations (Randy Pausch, John Seely Brown, Jeanne Twenge have each provided me with insights along with MANY more)

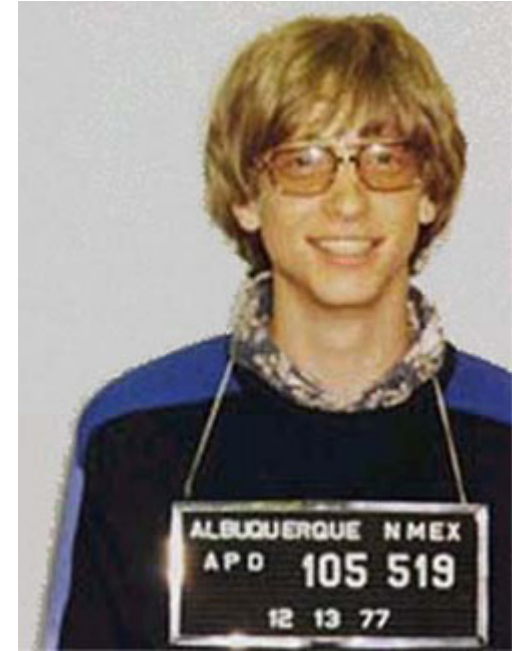
# How CyberInfrastructure Impacts/Engages our Youth

Take away for students, and audience

- Students born digital and shrug off “history lesson” on how new, innovative, exciting, **intrusive** ... connectivity has become
- Internet is dynamic – keep a log (or web page record, find what works for you since resource may move – HtTrack and YouTube Downloader)
- Internet never goes away, so watch out for what you post – Bill Gates mug shot from Albuquerque PD

CSTA and NSF promote CS 100 at the University and AP exam for high school students

Fall 2011 – Stewart teaches course at SDSU for first time




## Stayed tuned!

[www.stewart.sdsu.edu](http://www.stewart.sdsu.edu)

# Outside Wisdom on our Students

John Seely Brown – 17Jan05 @ SDSU



**GROWING UP  
DIGITAL**

*How the Web Changes Work,  
Education, and the Ways People Learn*

By John Seely Brown

**I**n 1831 Michael Faraday built a small generator that produced electricity, but a generation passed before an industrial version was built, then another 25 years before all the necessary accoutrements for electrification came into place—power companies, neighborhood wiring, appliances (like light bulbs) that required electricity, and so on. But when that infrastructure finally took hold, everything changed—homes, work places, transportation, entertainment, architecture, what we ate, even when we went to bed. Worldwide, electricity became a transformative medium for social practices.

John Seely Brown is the chief scientist of Xerox and director of its Palo Alto Research Center.

10 Change • March/April 2000 Change • March/April 2000 11

# JSB

[www.johnseelybrown.com](http://www.johnseelybrown.com)

- Having credentials that a computer science geek respects (Chief Scientist, Director Xerox PARC)
- Having publications that the education community validates (he joined the HBR debate on “IT matters to Higher Ed”\* in letter to editor)

**\*HBR May 2003 IT Doesn't Matter – Nicholas G. Carr**

**\*Does IT Matter to Higher Education?**

**– Jack McCredie, Educause Review Nov02**

# Apply JSB Insights to CS Game Programming

- Students have grown up digital; faculty are analog. I am becoming comfortable with saying, “I am a digital immigrant”. (fought it long time)
- Capitalize on creativity by honoring the vernacular of today’s students (multimedia-literate)
- Communicate complexity simply (a great skill)
- MIT’s architecture studio – all work in public (development and critique) – in context
- Learning to learn “in situ” is key

# Gamer Groups Spr 2006

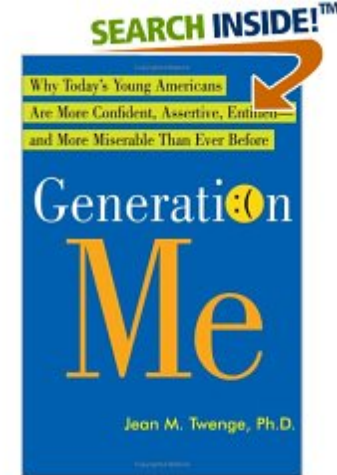
Great Classroom (AH1112) – Varying Engagement



One girl



# Generation ME



- Why Today's Young Americans are more Confident, Assertive and more Miserable than ever before
- Jean M. Twenge, PhD, (Psychology Dept SDSU) colleague

# Gen Me -Twenge argues

- Children of the Baby Boomers (post WW2/pre Vietnam generation who discovered *self*)
- Gen Me raised to have high self-esteem [surveys show feel their lives controlled by outside forces, yielding apathy and cynicism]
- USA: Equality revolution over past 4 decades (1965 Selma march) for minorities, women, gays and lesbians means **Gen Me members were taught equality**. Still more to do. [Internet in 1965?]
- GenMe feel entitled, but no strong sense of duty
- GenMe less likely to believe in moral absolutes.

# ED CENTER ON COMPUTATIONAL SCIENCE & ENGINEERING ENGAGES PEOPLE IN CYBERINFRASTRUCTURE

DR. KRIS STEWART, DIRECTOR

For over eight years, the Education Center on Computational Science & Engineering (ECCSE) promoted the use of high performance computing and its support systems at San Diego State University. The ECCSE originally formed in 1997 as a partnership activity with the San Diego Supercomputer Center's National Partnership for Advanced Computational Science Infrastructure (NPACI) grant from the National Science Foundation (NSF). When NPACI ended in 2004, we seized the opportunity for a new partner with Boston University and its efforts to support science education. We received NSF funding as part of the Engaging People in CyberInfrastructure (EPIC) grant, which is one of the first funded projects from the NSF Office of CyberInfrastructure (OCI).

<http://www.nsf.gov/awardssearch/showAward.do?AwardNumber=0520146>

For our participation we proposed researching how to use the current game engines as a platform to develop education modules to support high school science instruction. We collaborated with two science teachers from Hoover High School, a part of the SDSU Education Collaboratory. Mr. Robert North teaches chemistry and Mr. Hal Cox physics. Both teachers were asked to identify a concept from their curriculum, along with its corresponding California State Standard, that they felt would be aided by a three-dimensional, computer-generated interaction module. We also explored the wide world of computer game engines and chose the Torque Game Engine (TGE) from GarageGames.com based on its broad user community, its effectiveness as a development platform on the personal computer, and its attractive cost of \$100 for an Independent Developer License. We also had a partnership with the Visualization Team at the San Diego Supercomputer Center, who used the Torque Game Engine to develop modules to explore science.

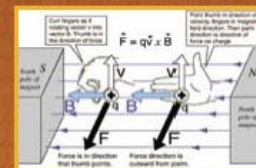
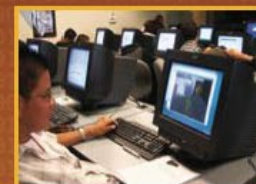
Our development team at SDSU included a professor of computer science, Kris Stewart, staff resources specialist, Kirsten Barber, and two computer science majors as programmers, John Nguyen and Skylar Hayes. Our first project was to visualize a simple molecule to demonstrate the power of the nuclear force, a required topic from the California State Chemistry Standard. Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion. As a basis for understanding this concept, students know protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons.

<http://www.cde.ca.gov/be/st/ss/scchemistry.asp>



After establishing what would be beneficial for Mr. North's students, our student programmers began developing a module for a "Virtual Field Trip to the Lithium Battery." After several iterations with Mr. North, the computer model was refined. The Ed Center team accompanied Mr. North during his presentation regarding our partnership at the August 2005 Chemistry Teacher In-Service workshop for San Diego City Schools.

Mr. North used this module in the computer labs at Hoover High School for his students to learn about nuclear force.



Next we worked Mr. Hal Cox to find an appropriate 3-D model to support concepts his students had difficulty with in physics. Electric and magnetic phenomena, the required topic Mr. Cox selected, are related and have many practical applications. As a basis for understanding this concept, students know the magnitude of the force on a moving particle (with charge  $q$ ) in a magnetic field is  $qvB \sin(\alpha)$ , where  $\alpha$  is the angle between  $v$  and  $B$  ( $v$  and  $B$  are the magnitudes of vectors  $v$  and  $B$ , respectively), and students use the right-hand rule to find the direction of this force.

<http://www.cde.ca.gov/be/st/ss/sphysics.asp>

Our preliminary modules are available for download to an IBM PC computing platform as a zip-file from Virtual Field Trip to a Lithium Battery:  
<http://vissservices.sdsu.edu/projects/explore/LiBattery.php>

Hosted by the Visualization Services Group at the San Diego Supercomputer Center.



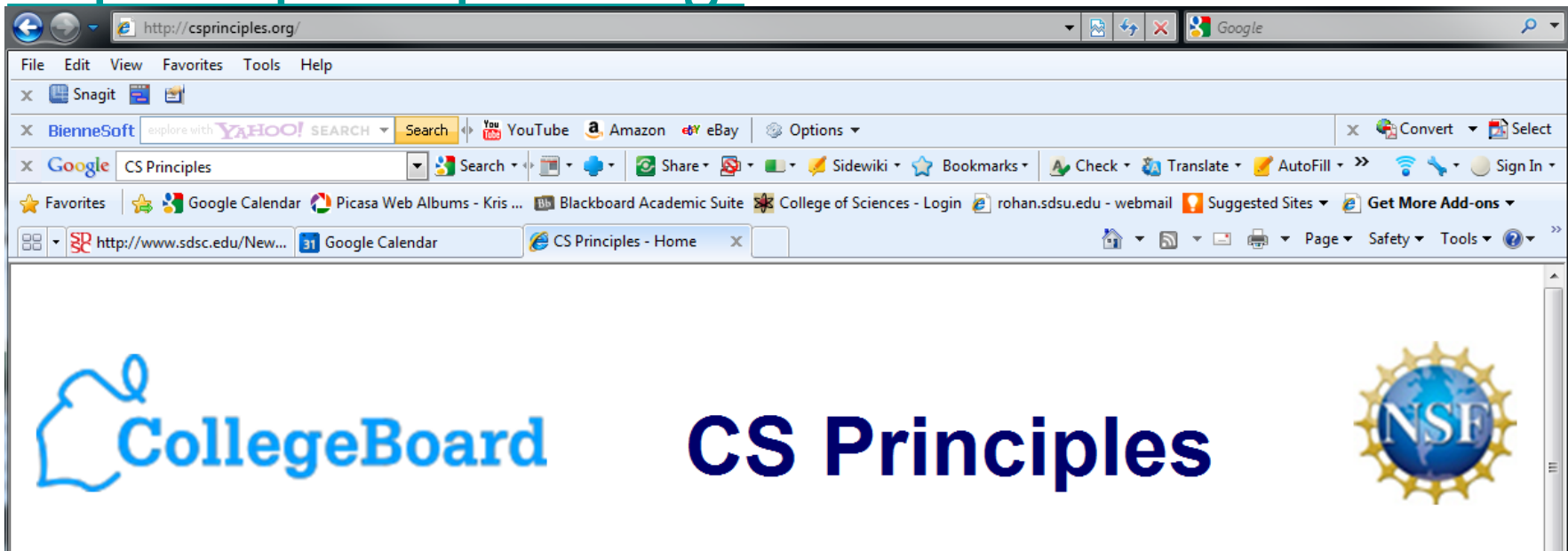
# References

- **SUE** <http://portal.acm.org/citation.cfm?id=224209> SC95 Proceedings
- **STEP** <http://www.stewart.cs.sdsu.edu/SC97/> (Stewart archive from SC97 CD)
- **NPACI** <http://www.sdsc.edu/pub/envision/v14.1/edcenter.html>
- **KUCSEC** <http://www.stewart.sdsu.edu/KUCSEK/>(Stewart online archive)
- **EPIC** <http://portal.acm.org/citation.cfm?id=1516586> (3D game programming as service learning for CS majors)
- **CyberBridge** <http://www.scivee.tv/node/19189> (3:20 of my pitch to schools)
- **CSTA** <http://www.csta.acm.org> (Computer Science Teacher Assn)
- **Wayback Machine** (Bullwinkle and Rocky)  
[http://www.stewart.sdsu.edu/step/wayback\\_machine.html](http://www.stewart.sdsu.edu/step/wayback_machine.html)
- **Scout Report** <http://scout.wisc.edu/>
- **ACM Tech News** <http://technews.acm.org>
- **Alice** <http://alice.org/>

# My References (illustrated)

CS Principles – CS100 for university and AP for the high school and background for middle school ... and the public.

<http://csprinciples.org/>



<http://alice.org/>



# Programming for Middle- and High-school

The screenshot shows the NASA Jet Propulsion Laboratory (JPL) Virtual Field Trip website. At the top left is the NASA logo and the text "Jet Propulsion Laboratory California Institute of Technology" with a link "+ View the NASA Portal". Below this is a navigation bar with tabs for "JPL HOME", "EARTH", "SOLAR SYSTEM", "STARS & GALAXIES", and "TECHNOLOGY". The main heading is "JPL Virtual Field Trip". A central panel contains a "MISSION CONTROL" window with a video of a person at a computer. Text reads: "Welcome to NASA's Jet Propulsion Laboratory. Do you want to be a space explorer? Take our tour to find out how we explore space! First choose a 'face' below and then click on it to join the tour." Below the text are five avatars: a purple alien, a blonde woman, a young boy, a man with glasses, and a woman with brown hair. At the bottom are links for "PRIVACY / COPYRIGHT", "FREQUENTLY ASKED QUESTIONS", and "FEEDBACK". The footer includes the "FIRST GOV" logo, "Freedom of Information Act", the NASA logo, and contact information for Site Manager Susan Watanabe and Webmasters Tony Greicius and Martin Perez. It also states "This site is developed by Numedeon, Inc."

Computer Science Teachers Association

<http://www.csta.acm.org>

Computer Science Education Week  
(CSEdWeek)

U.S. Congress [Grace Hopper  
Birthday week each year 05Dec]



http://scout.wisc.edu/Reports/ScoutReport/

The screenshot displays the website for the Internet Scout Project. At the top left is the logo, which includes a stylized compass rose and the text "Internet Scout PROJECT". A navigation menu below the logo contains links for "Home", "The Scout Report", "Archives", "Projects", "Weblog", and "About Us".

The main content area is titled "Table of Contents" and is dated "April 22, 2011 | Volume 17, Number 16". Below the title is a banner image of a pocket watch. To the right of the banner is a "Printable Page" button. Below the banner is a breadcrumb trail: "Internet Scout Project > The Scout Report > Current Issue".

The page is organized into several sections:

- Research and Education:** A list of links including "Creative Placemaking", "Science at Burning Man", "American Institute for Conservation of Historic and Artistic Works - Publications", "Joint Committee on Atomic Energy", "Cities and Climate Change: Global Report on Human Settlements", "Explorations@scripps", "Regulations.gov", and "Mississippi History Newsletter".
- General Interest:** A list of links including "International Center for the History of Electronic Games", "Nutrition and healthy eating", "U.S. Census Bureau: Random Samplings", "Shepherders of Northern Nevada", "To Make a World: George Ault and 1940s America", "Santa Fe National Forest", "Hmong Cultural Center", and "Center for Alternatives to Animal Testing".
- Network Tools:** A list of links including "PInnr" and "Khan Academy".
- In The News:** A list of links including "With the release of Google Map Maker, users can contribute their own spatial knowledge".

On the left side of the page, there is a sidebar with the following elements:

- A "THE SCOUT REPORT" header with a small icon.
- A list of links: "Table of Contents", "Research & Education", "General Interest", "Network Tools", "In The News", and "Verso".
- A "Previous Issues" section with links for "About the Report", "Selection Criteria", "Subscribe", and "Feedback".
- A "Log In:" section with input fields for "Password:" and a "GO" button.
- Links for "Forget your password?" and "Create a Log In".



http://www.stewart.cs.sdsu.edu/step/wayback\_machine.html

File Edit View Favorites Tools Help

Google ceili irish name Search Share Sidewiki

10aug2007\_re... BC Ferries - Br... Mr. Peabo... http://cohofe...

## Mr. Peabody and his boy Sherman WayBack Machine by Kris Stewart

Upd: 29May2010

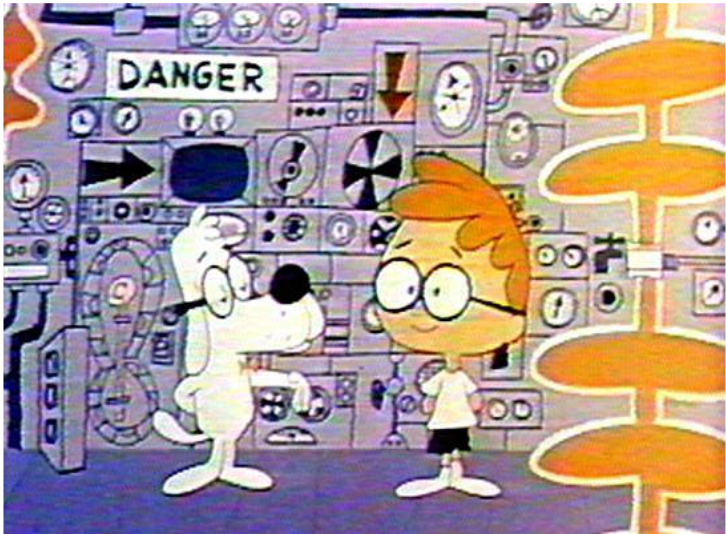
The [www.archive.org/](http://www.archive.org/) WayBack Machine

The WayBack Machine, is an Internet archive that keeps track of "the internet" in its entirety, by year. By entering a URL, you may find web page that you remember "used to be there" but is "unfound" now.

[en.wikipedia.org/wiki/The Rocky and Bullwinkle Show](http://en.wikipedia.org/wiki/The_Rocky_and_Bullwinkle_Show) [wikipedia]

Kris Stewart (formerly [Wendy Beard](#)) is a big fan of the cartoon [Rocky and Bullwinkle](#). I always liked Bullwinkle best, Rocky was just too goody-two-shoes for me. Second best was Dudley Do Right of the Mounties. I guess I was destined to marry a Canadian, eh?

[en.wikipedia.org/wiki/Mister Peabody](http://en.wikipedia.org/wiki/Mister_Peabody) was created by Ted Key.



Mr. Peabody and his boy Sherman in front of the WayBack Machine preparing for another Peabody's **Improbably History** adventure.



## STEP Participants

### [Ana Alvarez](#)

Counselor at [Hoover High School](#)

### [Don Anderson](#)

UCSD faculty, STEP Principal Investigator

### [Bobbie Ball](#)

Chemistry Teacher at Bonita Vista High School

### [Steve Bartram](#)

Marine Science Teacher at [Rancho Buena Vista High School](#)

### [Diana Bentley](#)

Biology Teacher at Mira Mesa High School

### [Peter Burrell](#)

Math Teacher at [Scripps Ranch High School](#)

### [John Cavanaugh](#)

Physics and Chemistry Teacher at San Pasqual High School

### [Hal Cox](#)

Physics & Chemistry Teacher at [Hoover High School](#)  
STEP Lead Teacher

### [Susan Crandall](#)

Biology Teacher at Escondido High School

### [Olin Elliott](#)

Math teacher at Mountain Empire High School  
STEP Lead Teacher

### [Mark Falvo](#)

Math, Chemistry & Physics Teacher at [Morse High School](#)

### [Lynne Gordon](#)

Biology Teacher at San Diego High School

### [Dave Harlow](#)

Computer Teacher at [Gompers Secondary School](#)  
STEP Lead Teacher

### [Barton Hays](#)

Biology and Marine Science Teacher at [Morse High School](#)

### [Henry Herms](#)

Earth Science Teacher at LaCosta Canyon High School

### [John Hoang](#)

Math Teacher at [Hoover High School](#)

### [Jay Klopfenstein](#)

Biology Teacher at Valley Junior High

### [Susan Lafo](#)

Chemistry Teacher at Mountain Empire High School

### [Jeffery Mandrake](#)

Science Teacher at [Gompers Secondary School](#)

### [Jay Maness](#)

Chemistry Teacher at Southwest High School

### [Joe Murray](#)

Physics and Physical Science Teacher at Oceanside High School.

### [Robert North](#)

Chemistry Teacher at [Hoover High School](#)

### [Andres Parra](#)

Math and Environmental Science Teacher at Mar Vista High School

### [Isabel Pereira](#)

Mathematics teacher at [Denbigh High School](#).

### [Paul Pucci](#)

Math and Computer Applications Teacher at [Scripps Ranch High School](#)

### [Chesley Ross](#)

Biology Teacher at Escondido High School

### [Cheri Rossi](#)

Biology Teacher at Morse High School

### [Michael Sixtus](#)

Chemistry Teacher at Mar Vista High School

### [Larry Steinbrecher](#)

Physics Teacher at Mira Mesa High School

### [Kris Stewart](#)

Associate Professor of Mathematical Sciences at [San Diego State University](#)

STEP Curriculum Coordinator

Home Page on [SDCC14 at UCSD](#)

### [Tim Towler](#)

Biology Teacher at [San Diego High School](#)

STEP Lead Teacher

Home Page on [SDCC14 at UCSD](#)

### [Tien Trieu](#)

Math Teacher at [Hoover High School](#)

### [Phill Vanderschaegen](#)

Biology Teacher at San Pasquel High School

### [Steve Wavra](#)

Biology Teacher at [Southwest High School](#)

### [Anna Wilder-O'Neil](#)

Chemistry Teacher at LaCosta Canyon High School

### [Karen Woodworth](#)

Chemistry teacher at Ramona High School

### [Roger Wynn](#)

Science Teacher at Mountain Empire Junior High

### [Bob Zakoski](#)

Chemistry and Computer Science Teacher at San Dieguito High School and UCSD  
STEP Lead Teacher

### [Paul Zeigler](#)

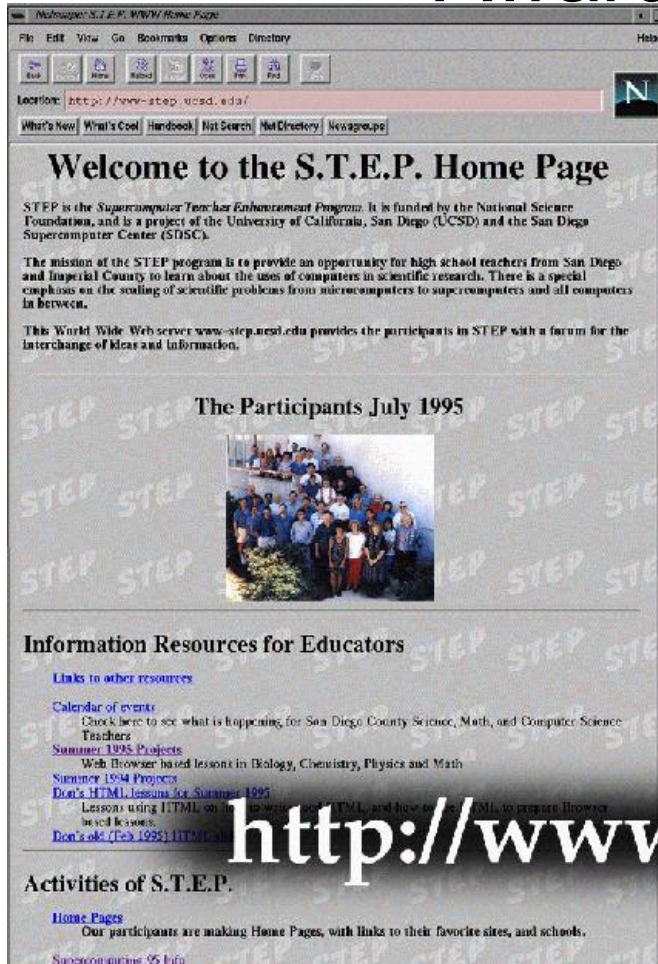
Physics Teacher at Carlsbad High School.

Last Updated July 19, 1996 by Tim Towler

# How the Ed Center on CS & Eng used 3D Game Programming as Service Learning

- Hoover High School collaborators, Mr. Hal Cox (physics) and Mr. Robert North (chemistry)
- Both former STEP teachers
  - Supercomputer Teacher Enhancement Program (1993-1996) teams of teachers from same school
  - Key point was the adoption of Web Browser in school curriculum in 1994
  - Support from local infrastructure for network/computers in the classroom

# 1996 ComputerWorld/Smithsonian InfoTech Award for STEP

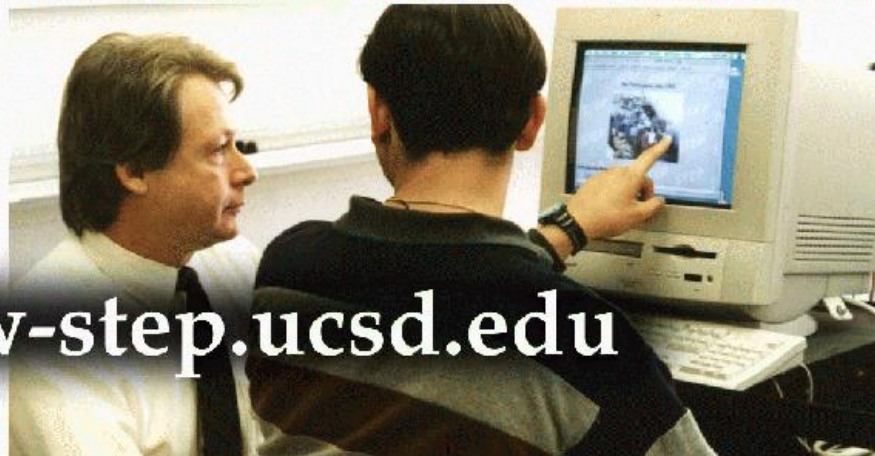


The screenshot shows a Netscape browser window with the address bar containing <http://www-step.ucsd.edu/>. The page title is "Welcome to the S.T.E.P. Home Page". The main text describes the STEP program as the Supercomputer Teacher Enhancement Program, funded by the National Science Foundation and the University of California, San Diego (UCSD) and the San Diego Supercomputer Center (SDSC). It states the mission is to provide high school teachers from San Diego and Imperial County with an opportunity to learn about computer uses in scientific research. A section titled "The Participants July 1995" includes a small photo of a group of people. Below that is a section for "Information Resources for Educators" with links to other resources, a calendar of events, and various project pages. At the bottom, there is a section for "Activities of S.T.E.P." with a link to "Home Pages".



<Robert

<Hal



<Robert

<http://www-step.ucsd.edu>

# Web Page Development Adopted Quickly (wouldn't you prefer to have this young man on campus in the computer lab, than ...)



<http://www-step.ucsd.edu/projects95.html>

# Do you have old links?

<http://replay.web.archive.org/19970717023002/http://www-step.ucsd.edu/step/>



The screenshot shows a Mozilla Firefox browser window displaying the S.T.E.P. WWW Home Page. The address bar shows the URL <http://replay.web.archive.org/19970717023002/http://www-step.ucsd.edu/step/>. The page content includes a navigation menu with links like "Home Pages", "Supercomputing '95 Info", "Supercomputing '94", "Summer 1994 Projects", and "May 7 STEP meeting". A large group photo of participants is featured under the heading "The Participants July 1995". Below the photo, there is a section titled "Current Information Resources for Educators" with links to "Links to other resources", "Summer 1995 Projects", "Calendar of events", "Don's HTML lessons", and "Susan Crandall's JavaScript Frame Template".

## Activities of S.T.E.P.

### [Home Pages](#)

Our participants are making Home Pages, with links to their favorite sites, and schools.

### [Supercomputing '95 Info](#)

Application and information on STEP's involvement in SC'95 in San Diego, December 1995

### [Supercomputing '94](#)

Supercomputing '94 was in Washington D.C., and had a great Education Component.

### [Summer 1994 Projects](#)

### [May 7 STEP meeting](#)

Pictures of our May 7, 1994 meeting.

## Resources From Previous Summers

### [1994 Workshop Agenda](#)

The Agenda for our 1994 summer workshop.

### [1993 and 1994 Workshop Notes](#)

The Notes for our 1993 and 1994 workshops.

[webeditors@www-step.ucsd.edu](mailto:webeditors@www-step.ucsd.edu)

Editors

[Tim Towler](#)

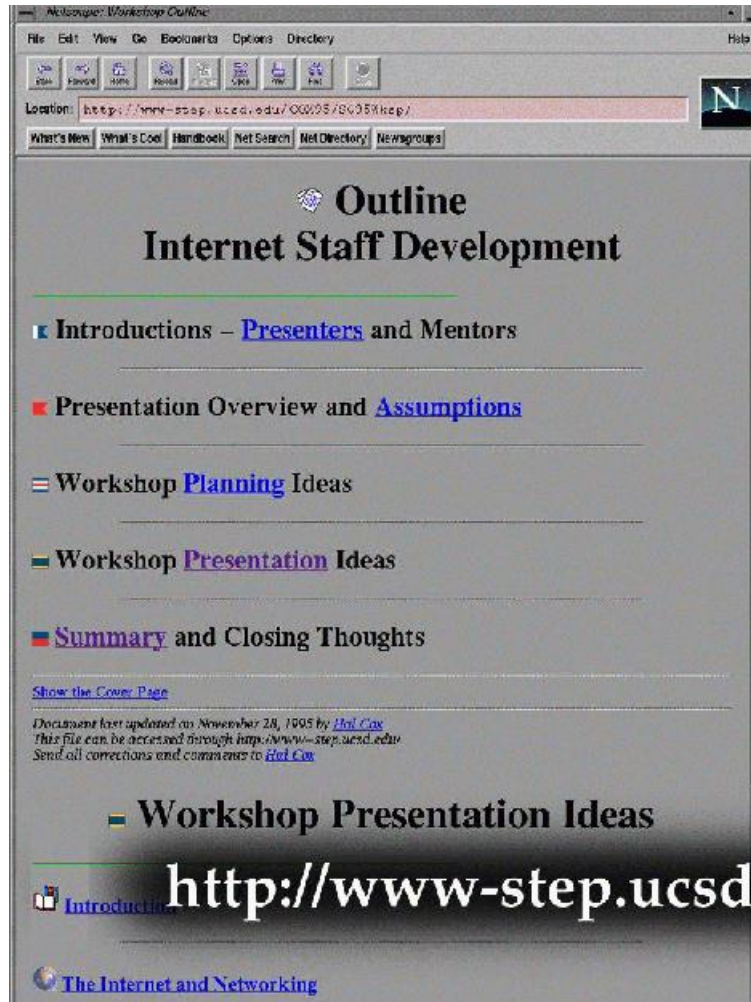
[towler@sdc14.ucsd.edu](mailto:towler@sdc14.ucsd.edu)

[Bob Zakoski](#)

[zakoski@sdc14.ucsd.edu](mailto:zakoski@sdc14.ucsd.edu)

<http://www-step.ucsd.edu/step/>

# STEP Lead Teachers (Hal Cox)



Netscape: Workshop C95Wksp

File Edit View Go Bookmarks Options Directory Help

Location: <http://www-step.ucsd.edu/COX95/SC95Wksp/>

What's New What's Cool Handbook Net Search Net Directory Newgroups

## Outline Internet Staff Development

- Introductions – [Presenters](#) and Mentors
- Presentation Overview and [Assumptions](#)
- Workshop [Planning](#) Ideas
- Workshop [Presentation](#) Ideas
- [Summary](#) and Closing Thoughts

[Show the Cover Page](#)

Document last updated on November 28, 1995 by [Hal Cox](#)  
This file can be accessed through <http://www-step.ucsd.edu/>  
Send all corrections and comments to [Hal Cox](#)

### ■ Workshop Presentation Ideas

[Introduction](#)

[The Internet and Networking](#)

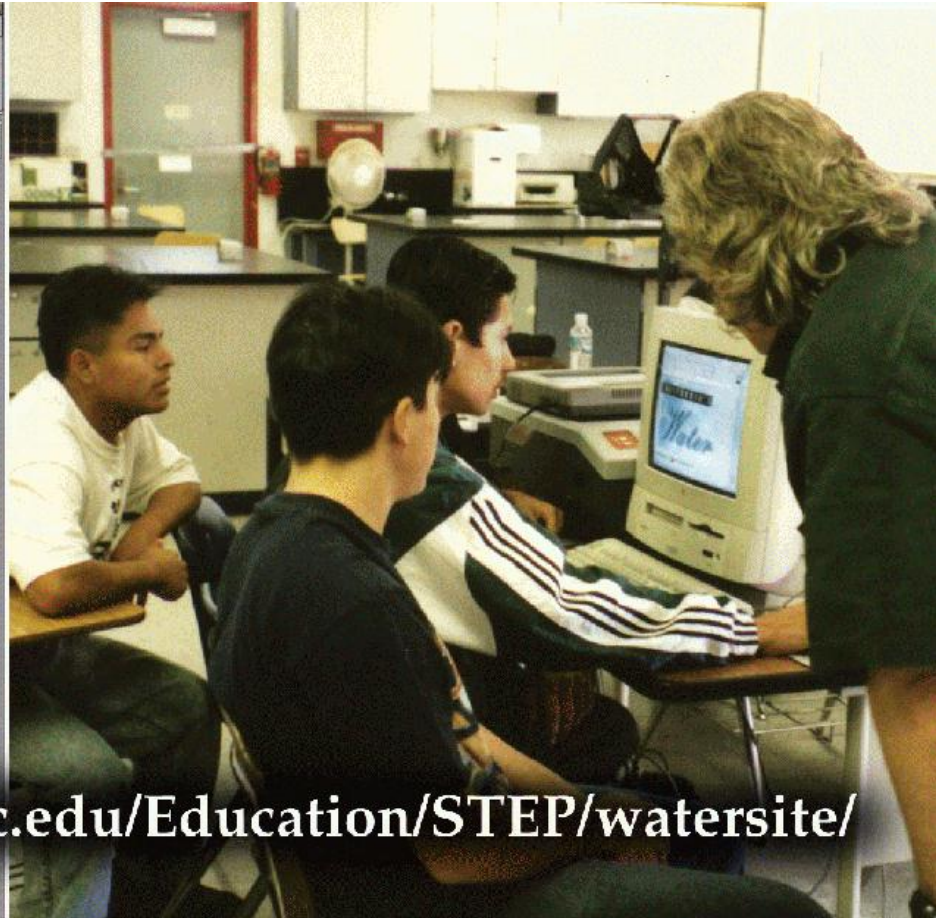
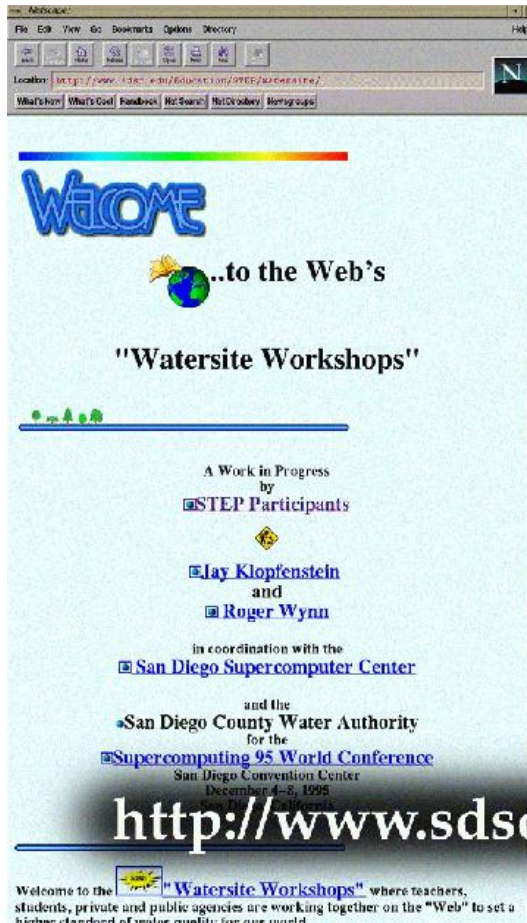


<http://www-step.ucsd.edu/COX95/SC95Wksp/>

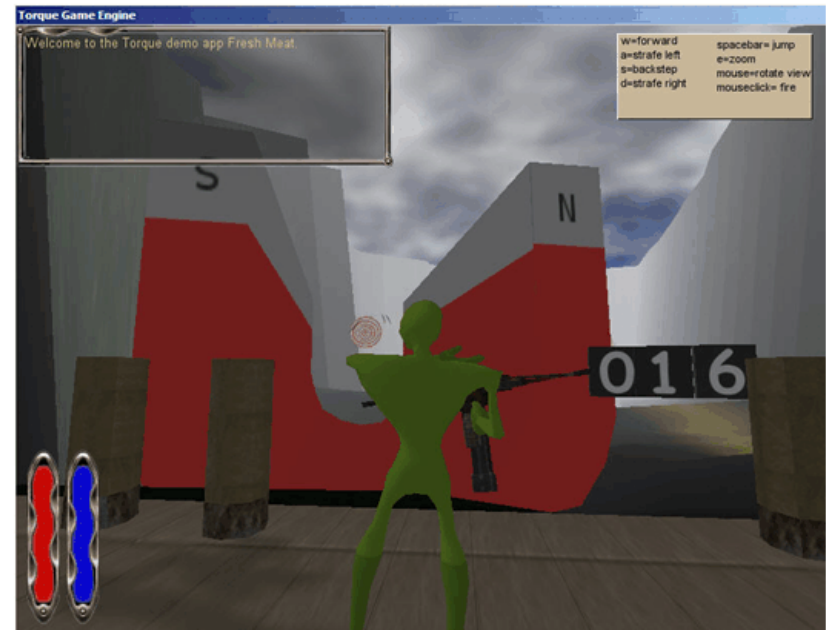
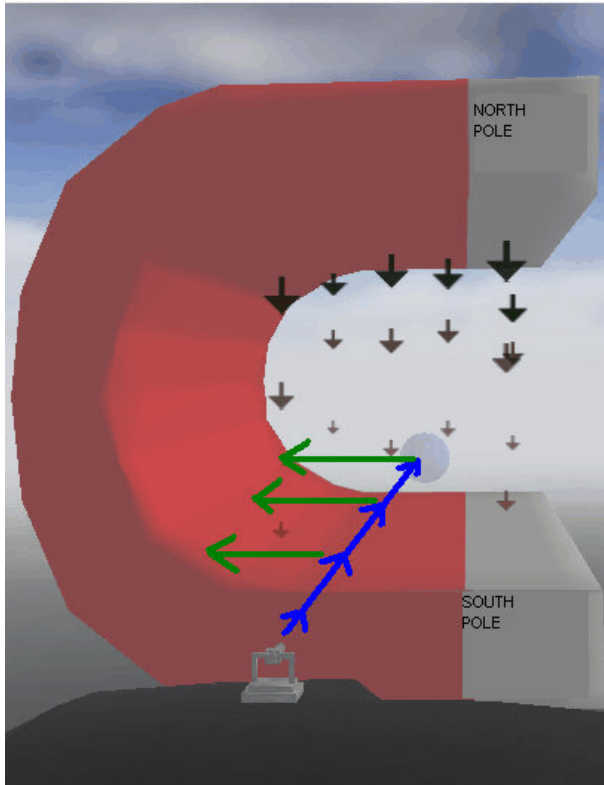


# Computing Power a Decade Ago

(look familiar to you, or were you born digital?)



# ECCSE collaboration with SDSC's Steve Cutchin using Torque



Score increases. Also magnet rotates after each successful "hit", challenging the player to make the appropriate correction for the magnetic force effect.

Try our their "Assignment Antarctica" and model archives

# EPIC Grant: Visualize Education

as service learning

Students described their project to Mr. North:

“It’s a First Person Shooter...”

Robert’s face goes white

Afterwards discuss term FPS with students.

Though standard term in game industry, have you heard of Columbine?

[http://en.wikipedia.org/wiki/Columbine\\_High\\_School\\_massacre](http://en.wikipedia.org/wiki/Columbine_High_School_massacre)

Put yourself in shoes of clients – see from their point of view – **First Person Point of View**

# California State Standard Exam Topic

## 5n: Electric and Magnetic Phenomena

Electric and magnetic phenomena are related and have many practical applications. As a basis for understanding this concept: *n Students know* the magnitude of the force on a moving particle (with charge  $q$ ) in a magnetic field is  $qvB \sin(a)$ , where  $a$  is the angle between  $v$  and  $B$  ( $v$  and  $B$  are the magnitudes of vectors  $v$  and  $B$ , respectively), and students use the right-hand rule to find the direction of this force.

[<http://www.cde.ca.gov/be/st/ss/scphysics.asp>]

# Luxo, Jr. Pixar

<http://youtu.be/qGxoui3IFS0>



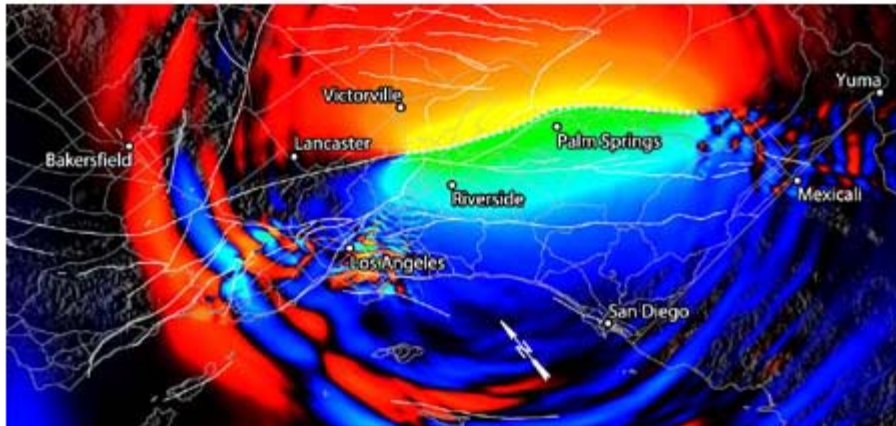
SDSC Visservices returned from SigGraph98 with these shorts – amazing emotion

# SDSC Simulation of SoCal Earthquake (Terashake)

01.23.06

TeraShake 2: Simulating Earthquakes for Science and Society

*SDSC Helps SCEC Simulate Magnitude 7.7 Earthquake on San Andreas Fault*



*Instantaneous movement in the fault-parallel  $x$  direction, 110 seconds after the start of the northwest-moving rupture on the San Andreas Fault near the Salton Sea. Note the continued shaking in the sediment-filled Los Angeles basin well after the initial earthquake waves have passed. Simulation: SCEC scientists Kim Olsen, Steven Day, SDSU et al; Yifeng Cui et al, SDSC/UCSD. Visualization: Amit Chourasia, SDSC/UCSD.*

<http://www.sdsc.edu/News%20Items/PR0123061.html>

# SDSC 25 year timeline 1985-92 – 1 of 8

(brought 20 free flyers for UNM CyberDay 2011 attendees)

GA Technologies wins an NSF cooperative agreement in collaboration with UCSD to establish a supercomputer center.



SDSC opens doors; Sid Karin is SDSC's founding director.

SCS-40 supercomputer installed at SDSC.

SDSC, through SDSCnet, becomes first NSF center to have NSFnet access.

In pioneering efforts in drug design, Paul Bash, et. al., using SDSC supercomputers, determine free energies of solvation for proteins and nucleic acids, and relative free energies for binding, published in *Science*.



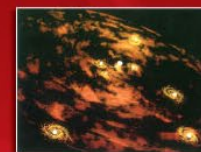
Governor George Deukemejian signs legislation, introduced by Assemblyman Dominic Cortese, giving SDSC \$6 million to develop state-of-the-art visualization lab at SDSC.

NSFnet backbone becomes a production network.

CERFnet officially dedicated at SDSC; Vinton Cerf (no relation to the network) conducts dedication.



CRAY Y-MP8/864 supercomputer arrives at SDSC and made available December 22.



Dave Nadeau and Holliday Horton at SDSC create an animation of accretion disks – the fiery nebulae and spinning clouds in a primordial solar system – for a planetarium show at S.D.'s Reuben H. Fleet Space Center and Theatre.



UCSD/SDSC researchers solve the structure for protein kinase, likened to the body's transistor, and considered one of the Grand Challenges in biological sciences; research makes cover of *Science*.

SDSC becomes first site to send messages cross country through the NSFNET T-3 backbone; at 45 Mb/s, it's the fastest openly available network for research and education.

Computer studies of corannulene, a bowl-shaped molecule that constitutes one-third of the molecular shell of the Bucky Ball, is subject of cover story of *Chemical and Engineering News*; research by Kim Baldrige and Jay Siegel from SDSC/UCSD.

SDSC launches STEP (Supercomputer Teacher Enhancement Program) to develop education outreach programs for K-12 with local educators.

1985

1986

1987

1988

1989

1990

1991

1992

# SDSC 25 year timeline 1985-92 -1bof8

1985



SDSC's first supercomputer, the CRAY XMP-48, arrives.

First calculations made on the SDSC CRAY on December 4, 1985 by Herbert Hamber, UC Irvine.

1986

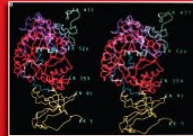
Over 100 peer-reviewed computational science projects authorized for NSF, Cray and SDSC allocations.

1987

SDSC establishes laboratory for graphics and animation.

Electronic mail gateway established at SDSC; users exchange email with peers.

1988



3-D structure of RuBisCo, the key enzyme in the initiation of photosynthesis and most abundant protein found in nature, is solved with aid of SDSC supercomputers and published in *Science*.

KidLab, an after-school program for 10-12 year olds, established at SDSC.

1989

Charles Keeling, et. al., with SDSC supercomputers, construct 3-D model of the terrestrial carbon cycle confirming the importance of fossil fuel combustion in loading the atmosphere with carbon dioxide.

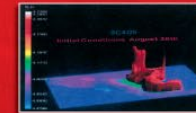
1990

SDSC acquires 32-node iPSC/860 parallel computer from DARPA, built by Intel.



SDSC acquires 256-node NCUBE 2 parallel computer.

1991



UC receives a 3-year, \$15 million grant from DEC to develop an advanced information and data management system to increase the productivity of researchers studying global change – called Project Sequoia.

1992

First workshop to discuss issues related to the National Metacenter, a synthesis of the intellectual and computational resources of the four NSF supercomputing centers – SDSC, Cornell Theory Center, NCSA, and PSC – was held at SDSC.



# SDSC 25 year timeline 1993-99 – 2 of 8

$$\begin{aligned} \vec{F} &= m \frac{d\vec{v}}{dt} & \nabla \times \vec{E} &= -\frac{\partial \vec{B}}{\partial t} \\ \vec{f} &= -\nabla^2 \vec{u} + \lambda \nabla (\nabla \cdot \vec{u}) & \nabla \cdot \vec{D} &= \rho \\ \int_{\partial V} \vec{U} \cdot d\vec{S} &= \int_V \frac{\partial U}{\partial x} dV & \nabla \times \vec{H} &= \frac{\partial \vec{D}}{\partial t} + \vec{j} \\ & & \nabla \cdot \vec{B} &= 0 \end{aligned}$$

SDSC unveils "Grand Challenge Equations" exhibit.



Intel Paragon supercomputer arrives at SDSC.

A data transfer speed record of 630 Mb/s is achieved across the 100-mile CASA Gigabit Testbed link between SDSC and Caltech, accelerating solution of the reaction of atomic hydrogen with molecular heavy hydrogen (deuterium) by a factor of 3.3.



SDSC establishes the telemanufacturing facility to rapidly prototype 3D models from digital geometry data.

Tsutomu Shimomura, SDSC Senior Fellow, collaborates with federal agents to track down alleged "notorious cybercriminal" Kevin Mitnick, then considered the "most-wanted computer criminal in the United States."

SDSC receives \$8.4M contract from DARPA to develop Distributed Object Computation Testbed (DOCT) for handling complex documents on geographically distributed data archives and computing platforms; to focus on the needs of the US Patent and Trademark Office.

The cover of *Chemical and Engineering News* features an image of cyclohexatriene molecule; research results from computational and experimental collaboration of Kim Baldridge at SDSC and Jay Siegel, at UCSD.



SDSC named leading-edge site for the National Partnership for Advanced Computational Infrastructure (NPACI), launched in October.



CAIDA established with a NSF seed grant to promote a more robust, scalable Internet infrastructure; principal investigator, kc Claffy.



The world's largest and most powerful transmission electron microscope is operated from UC San Diego and the National Center for Microscopy and Image Research (NCMIR) in a successful demonstration of trans-Pacific telemicroscopy by American and Japanese researchers.



The Research Collaboratory for Structural Bioinformatics (RCSB), under the management of Helen Berman at Rutgers University, and Phil Bourne at UCSD/SDSC, assumes primary responsibility for the Protein Data Bank – the world's largest archive for biomedical structures used in pharmacological and medical research.

1993

1994

1995

1996

1997

1998

1999

# SDSC 25 year timeline 1993-99– 2bof8

1993



CRAY C90 supercomputer arrives at SDSC; officially installed during November press briefing.

1994

NIH approves \$3.286M to SDSC to fund the National Biomedical Computation Resource (NBCR).



Thinking Machines CM-2 arrives at SDSC to support UCSD education and research.

1995

For the first time, SDSC harnesses the power of a new very high-speed network (vBNS) by distributing portions of a computation across high-performance computers located on the east and west coasts.

Chris Mihos and Lars Hernquist of UC Santa Cruz collaborate with computer artists at NCSA, using computational resources at SDSC CRAY C90, to create high-resolution images of a galaxy encounter for IMAX cosmic voyage, which debuts at the Smithsonian National Air and Space Museum in D.C.

1996

A model of the nicotinic acetylcholine receptor is developed by Igor Tsigelny, Naoya Sugiyama and Palmer Taylor at UCSD/SDSC, in collaboration with Steven Sine at the Mayo Foundation; enzyme is a target for addictive activity from nicotine.



CRAY T3E supercomputer installed at SDSC.

1997



SDSC publishes "Women in Science," featuring bios of women who had a career in, or made significant contributions, to a scientific discipline.

1998

The Storage Research Broker (SRB) 1.1 is released as "middleware" to hold together data cache sites from NPACI, led by SDSC. The SRB software is built on work led by SDSC's Reagan Moore; Chaitan Baru, Michael Wan, Arcot Rajasekar and Wayne Schroeder are members of the original team that developed SRB.

With large-scale computer simulations run at SDSC, researchers led by J. Andrew McCammon at UCSD show how one of the fastest enzymes in the world, acetylcholinesterase, does its work; results are published in the *Proceedings of the National Academy of Sciences*.

# SDSC 25 year timeline – 3 of 8

Animated visualizations made possible for the first time by SDSC's Galactic MPIRE volume-rendering software and *Blue Horizon* are displayed in the all new Hayden Planetarium of the American Natural History Museum on New Year's Eve.



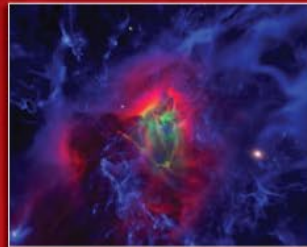
Using sophisticated "backscatter analysis", CAIDA researchers track the progress of a worm dubbed Code-Red Worm, which infected hundreds of thousands of Web servers around the world.



IBM's *Blue Horizon* is delivered to SDSC as the most powerful computer available to the US academic community – capable of 1 trillion FLOPS.

SDSC organizes the first San Diego TEACHERTECH, designed to allow San Diego K-12 teachers to explore and examine different multimedia and web applications for use in the classroom.

Fran Berman becomes director of SDSC.



"The Search for Life: Are We Alone?" – a new space show at the Hayden Planetarium in New York – premieres to rave reviews. SDSC plays a key role in creating a realistic animation showing the birth of our solar system

PRAGMA (Pacific Rim Applications and Grid Middleware Assembly), launched during a workshop at SDSC and funded by NSF, shows how relationships and expertise developed to tackle computational research could also help thousands of SARS patients in Taiwan.



SDSC's High Performance Storage System (HPSS) reaches the milestone of one petabyte of stored data.

Mike Norman, and colleagues at Center for Astrophysics and Space Sciences at UCSD, run the world's largest and most complex scientific simulation of the evolution of the universe ever performed.



Data experts at SDSC collaborate with American Red Cross to help locate missing loved ones in the wake of Hurricane Katrina; results in "Safe and Well" website.

CENIC announces that the first production 10 Gigabit Ethernet campus connection in the U.S. has been installed from UCSD.

SDSC launches DataCentral, the first program of its kind to support large community data collections and databases.

2000

2001

2002

2003

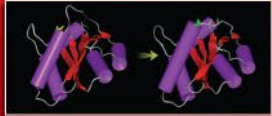
2004

2005

# SDSC 25 year timeline – 3b of 8

1999

The HPC Systems group completes the first installation of a user file system that is greater than one terabyte in capacity.



Molecular dynamics simulations, led by J. Andrew McCammon at UCSD, show how to attack a third enzyme target integrase, a crucial enzyme used by HIV to replicate; research led to the development of Isentress, an anti-AIDS drug marketed by Merck.

2000

A map showing possible paths an email message might take in the Internet, created by the skitter tool developed at CAIDA at SDSC, makes the cover of *Nature*.

SDSC-developed storage and visualization technologies — integrated into a National Library of Medicine project — create one of the largest-ever medical image databases.

NSF awards \$2.3 million, three-year grant to UCSD to create, demonstrate, and evaluate a non-commercial prototype, high-performance wide-area wireless network for research and education (HPWREN)—a multi-institutional collaboration led by Hans-Werner Braun at SDSC and Frank Vernon at SIO.

2001



NSF establishes TeraGrid to support world-class scientific discovery and education through a grid-based cyberinfrastructure; SDSC is one of the founding sites.

A team led by Vincent Crespi at Penn State used computer simulations and resources at SDSC to discover carbon fibers with mechanical strength comparable to a diamond — strong and stiff carbon tubes called nanotubes.

2002

The first analysis of the potential impacts of climate change for an entire country, Mexico, is reported in a paper published in *Nature* by a team that included researchers from SDSC.

2003



The TeraGrid enters production with two clusters installed at SDSC: IBM/Intel IA-64 TeraGrid Phase 1 Cluster and IBM/Intel IA-64 TeraGrid Phase 2 Cluster.

2004

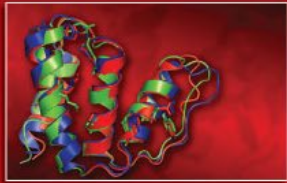
Scientists led by UCSD's J. Andrew McCammon use molecular simulations and SDSC resources to identify a potential mechanism underlying the drug resistance of the worst mutant HIV strain; in same work, the researchers identify a separate region of protease enzyme that might serve as new drug target.



SDSC is the first academic institution in the world to install the new IBM eServer Blue Gene Solution computing system.

# SDSC 25 year timeline – 4 of 8

NARA and SDSC, with concurrence from NSF, sign a landmark MOU that provides an avenue for preserving valuable digital data collections; first time NARA establishes an affiliated relationship for preserving digital data with an academic institution.



Researchers at SDSC – working with colleagues at the University of Washington – achieve the largest-ever protein structure prediction and complete the simulation in less than three hours.



UCSD/SDSC researchers zero in on causes of Parkinson's disease, Alzheimer's disease, and other neurological disorders with a computer model featured on cover of the *Federation of European Biochemical Societies Journal (FEBS)*.

The source of spider silk's strength, as strong as steel, is simulated by MIT scientists in collaboration with applications scientist Ross Walker at SDSC, on SDSC's IBM Blue Gene/L supercomputer.



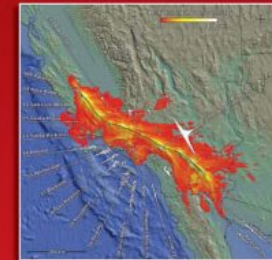
A team led by Laura Carrington at SDSC successfully completes a record-setting, petascale-level simulation of the earth's inner structure; a finalist for Gordon Bell Prize.



SDSC awarded 5-year, \$20 million grant from NSF to build *Gordon*, a powerful supercomputer featuring "flash memory" and "supernodes" to solve critical data-intensive science problems.

SDSC unveils *Dash*, a "flash-memory-based" supercomputer to accelerate solutions for data-intensive science problems.

The CIPRES portal, used to help researchers track evolutionary relations among species, becomes the most heavily used portal in the TeraGrid, accounting for 20% of active TeraGrid users during the first quarter of 2010.



Researchers at SDSC, SDSU and UCSD create the largest-ever simulation of a Magnitude 8 earthquake, primarily along the southern section of the San Andreas fault.

2006

2007

2008

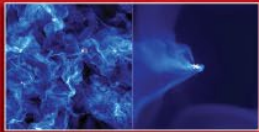
2009

2010

# SDSC 25 year timeline – 4b of 8

2005

SDSC receives \$2.2M award from NIH to provide Next Generation Biology Workbench, building on the work of the “Workshop” concept developed by Shankar Subramaniam at UCSD/SDSC.



Astrophysicist Richard Klein from UC Berkeley and others use simulations run at SDSC to explode one of two competing theories about how stars form inside immense clouds of interstellar gas; results published in *Nature*.

2006



Firefighters facing fast-spreading wildfires urgently request cyberinfrastructure resources from HPWREN to help combat the “Horse Fire” in Cleveland National Forest.

The most true-to-life computer simulation ever made of our sun’s corona – created by researchers at Science Applications International Corp., with the help of SDSC resources – successfully predicted its actual appearance during the total solar eclipse of March 29.

2007

A team of researchers from NCAR, SDSC, LLNL and IBM Watson, led by Allan Snavely at SDSC, set U.S. records for size, performance, and fidelity of computer weather simulations, modeling the kind of “virtual weather” that society depends on for accurate weather forecasts; a finalist for Gordon Bell Prize.

Science is coming to the YouTube generation with the advent of “SciVee,” a collaboration between the NSF and SDSC, under the direction of Phil Bourne, UCSD/SDSC.

2008



SDSC dedicates a new, energy-efficient building extension as a key resource for UC San Diego and beyond.

CAIDA researchers Dmitri Krioukov and kc Claffy, along with Marián Boguñá (Universitat de Barcelona), reveal in *Nature Physics* a previously unknown mathematical model called “hidden metric space” that may explain the “small world phenomenon,” offering a potentially more efficient way to pass messages on the Internet.

2009

SDSC officially launches the *Triton Resource*, an integrated data-intensive computing system primarily designed to support UCSD and UC.



SDSC completes a comprehensive upgrade to its tape-based archival storage capacity, increasing its total to 36 petabytes, the largest digital storage capacity of any academic center in the world.

2010

Mike Norman named SDSC director.



SDSC launches a volunteer internship program for high school students – Research Experience for High School Students (REHS) – to help them gain experience in a particular area of computational research.

SDSC installs *Trestles*, a 100-Tflop/s computer funded by NSF and designed to increase productivity for a broad spectrum of users.

# Informed Citizenry

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## An Informed Republic

The role of an educated citizenry in our democratic society, as intended by America's founders — and viewed in today's information age

On the founding of the United States: "It wasn't going to be on autopilot. It required direct citizen participation. And I think there were many at the time who thought that it was an experiment that couldn't succeed. That self-rule was very unlikely in a society as diverse as what was happening in this country, with people coming from various places in the world and, as it turned out, a very geographically large country to be in. So there were lots of doubts about how it would work. It was clear I think very early in the United States that it was necessary to have some form of getting our citizens informed about the structure of government, and how citizens could participate and be part of it. That was essential."

—Justice Sandra Day O'Connor (ret.)  
United States Supreme Court In Interview with David Freudberg

[http://www.humanmedia.org/catalog/player/playsingle.php?f=excerpts/151\\_informed\\_republic\\_1.mp3](http://www.humanmedia.org/catalog/player/playsingle.php?f=excerpts/151_informed_republic_1.mp3)

Large set of curricula at related site

<http://www.icivics.org/>

Addresses journalism vs. “local TV news” as a source of information and the “fall of newspapers”

# Sid Karin

- Member, National Science Foundation Technical Advisory Group for Supercomputer Centers, 1984-1985
- Founder/Director SDSC, 1985-1995 (?)  
Stewart SDSC Steering committee member, front row seat
- Founder/Director NPACI, 1996-2001  
Distinguish SDSC through data stewardship for National Partnership for Advanced Computational Infrastructure response to NSF's PACI solicitation

Reagan Moore, SRB and LoC



# NPACI partners

## NPACI PARTNERS

University of California, San Diego/  
San Diego Supercomputer Center

California Institute of Technology

University of Texas, Austin

University of Michigan

University of California, Berkeley

University of California, Santa Barbara

University of Southern California/Information  
Sciences Institute

University of Virginia

Baylor College of Medicine

California State University/San Diego State  
University

University of California, Davis

University of California, Irvine

University of California, Los Angeles

The Johns Hopkins University

University of Maryland

Montana State University

University of New Mexico/Long-Term Ecological  
Research Network

New York University

Ohio State University

Oregon State University

Rice University

Rutgers, The State University of New Jersey

Salk Institute for Biological Studies

The Scripps Research Institute

Stanford University

University of Tennessee

Washington University

University of Wisconsin, Madison

Center for Advanced Research in Biotechnology

Jet Propulsion Laboratory

Kitt Peak National Observatory

Lawrence Berkeley National Laboratory/National  
Energy Research Scientific Computing Center

Lawrence Livermore National Laboratory

Los Alamos National Laboratory

University of Massachusetts

Pacific Northwest National  
Laboratory/Environmental Molecular Sciences  
Laboratory

University of Pennsylvania

BioComputing Unit, Centro Nacional de  
Biotecnología, Madrid, Spain

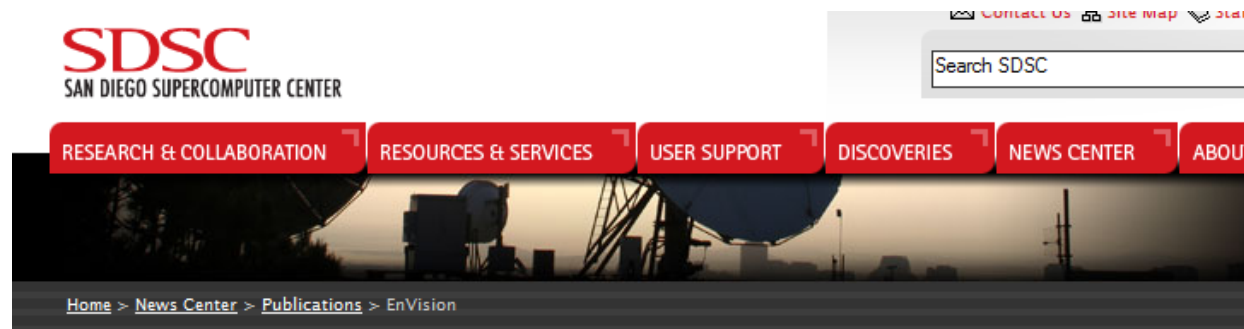
Parallel Computing Center, Royal Institute of  
Technology, Stockholm, Sweden

University of Queensland, Brisbane, Queensland,  
Australia

Research Institute for the Management of Archives  
and Libraries, University of Urbino, Italy

# Sid Karin

## Importance of Science Literacy in a Computing World



[FROM THE DIRECTOR](#) | [Contents](#) | [Next](#)

### [The Importance of Science Literacy in a Computing World](#)

BY

Sid Karin, NPACI Director

**T**he rapid growth of the Internet, the appearance of computers in our cars, homes, and phones, and the convergence of telephone, television, and computing networks are leading up to an environment that I have called the "computing continuum." The emerging continuum, including what's being called the computational grid, affects everyone, whether you have a computer at home or not, by accelerating the dissemination of information at speeds never before possible. This rising tide of information and the increasing presence of technology throughout our society makes scientific and computational literacy more critical than ever for the long-term interests of society.

[The National Science Board's Science and Engineering Indicators 1998 report](#)

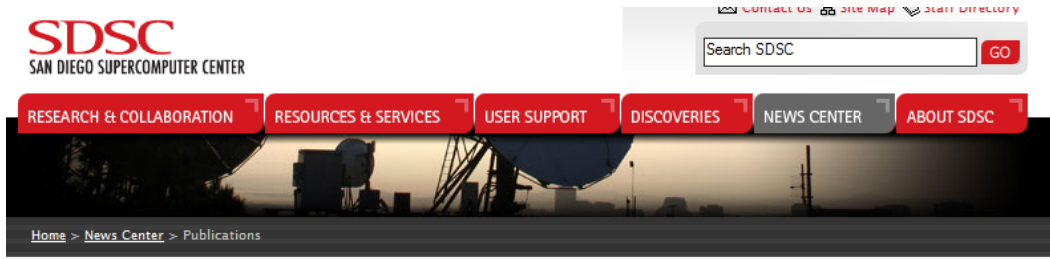
emphasizes the contradictions in American society related to scientific literacy. On the one hand, nearly 80 percent of the public agreed that the federal government should support basic research. On the other hand, only one in five Americans consider themselves very well informed on those issues. Furthermore, according to the report, only one-quarter of Americans understand the nature of scientific inquiry well enough to make informed judgments about scientific results reported in the media.

**[CRITICAL THINKING](#)**  
**[SHAPING TOMORROW'S](#)**  
**[WORLD](#)**

<http://www.sdsc.edu/pub/envision/v15.2/director.html>

# SDSC Archives online

<http://www.sdsc.edu/news/Publications.html>



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## Publications

[\*UC San Diego CyberLink\*](#) ([subscribe](#)) is a monthly e-publication -- jointly published by SDSC, Calit2, the Jacob School of Engineering, and the UC San Diego Library, in collaboration with Administrative Computing & Telecommunications (ACT) -- describing the latest cyberinfrastructure news and events at UC San Diego.

*SDSC NewsBytes* is a monthly compilation of the latest science and technology --related news from SDSC.

[\*SDSC Research Advances\*](#) is a publication presenting SDSC's leading-edge research in data cyberinfrastructure and computational science.

[\*SDSC Technical Reports\*](#) - SDSC provides these documents to disseminate research and development results and allow researchers to cite these results in other publications.

## ARCHIVE

- [\*SDSC Nuggets\*](#) an email monthly communication with about news at SDSC that has now been replaced by UC San Diego CyberLink.
- [\*SDSC Thread\*](#) an email newsletter with news and items of interest to users of SDSC's resources.
- [\*EnVision\*](#) magazine presents leading-edge research in cyberinfrastructure and computational science at SDSC.
- [\*Cyberinfrastructure Technology Watch Quarterly\*](#) (*CTWatch Quarterly*) an online venue designed to engage the science and engineering research community in the news, ideas, and information surrounding the emergence of cyberinfrastructure as the essential foundation for advanced scientific inquiry.
- [\*A Process-Oriented Approach to Engineering Cyberinfrastructure\*](#) (F. Berman, J. Bernard, C. Pancake, L. Wu; 2006).
- [\*Women in Computer Science\*](#)
- [\*Women in Science\*](#)
- [\*Workshop on Cyberinfrastructure for the Social and Behavioral Sciences: Final Report\*](#) (F. Berman and H. Brady; 2005).



Official Start of a New Era for SDSC  
▶ More...



Focused on Sustainability  
Q&A WITH DALLAS THORNTON  
The "Greening" of Datacenters at SDSC and Beyond  
▶ VIEW PROFILE



Interesting, dynamic overview

# Fran Berman, SDSC Director

2001-2009, thoughts on Data Stewardship

## COMMUNICATIONS CACM.ACM.ORG OF THE ACM 12/08 VOL.51 NO.12



**Surviving the Data Deluge**

DOI:10.1145/1409380.1409376

**Tools for surviving a data deluge to ensure your data will be there when you need it.**

BY FRANCINE BERMAN

# Got Data? A Guide to Data Preservation in the Information Age

Figure 1: Data cyberinfrastructure at the San Diego Supercomputer Center.



# Fran Berman

Now at RPI <http://www.cs.rpi.edu/~bermaf/>

## Digital Data Terms and Conditions

The following definitions are derived from a number of sources, including the American Library Association ([www.ala.org/ala/](http://www.ala.org/ala/)), National Information Assurance Glossary ([www.cnss.gov/](http://www.cnss.gov/)), and Joint Information Systems Committee Digital Information Briefing Paper ([www.jisc.ac.uk/](http://www.jisc.ac.uk/)):

### APPRAISAL

Evaluation and selection of digital material for long-term curation and preservation, documented policies, guidance, and legal requirements may require that it be done securely;

### AUTHENTICATION

Security measure designed to establish the validity of a transmission, message, or originator or a means of verifying an individual's authority to receive specific categories of information;

### CURATION

Digital curation, broadly interpreted, is about maintaining and adding value to a trusted body of digital information for current and future use. It builds on the underlying concepts of digital preservation while emphasizing opportunities for added value and knowledge through annotation and continuing resource management;

### DIGITAL RIGHTS MANAGEMENT

The use of technologies to control how digital content is used and reused;

### INGEST

Controlled or secure transfer of material to an archive, repository, data center, or other custodial environment in adherence to documented guidance, policies, or legal requirements;

### INTEGRITY

The condition when data is unchanged from its source and has not been accidentally or maliciously modified, altered, or destroyed;

### METADATA

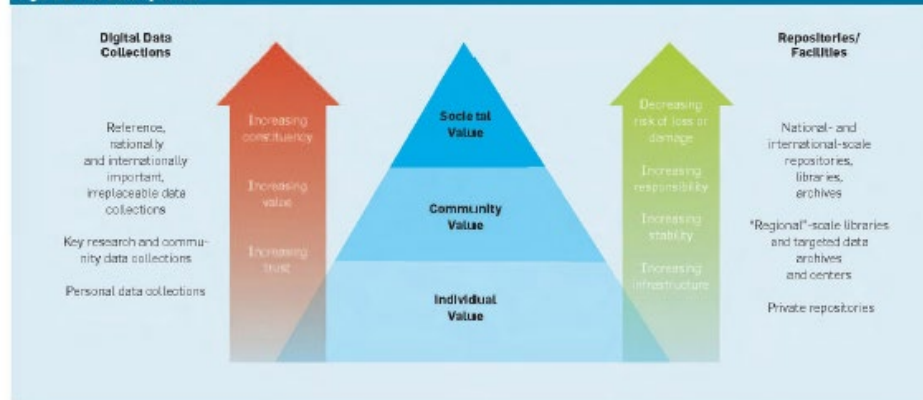
Documentation relating to data content, structure, provenance (history), and context (such as experimental parameters and environmental conditions). Standards for metadata provide a basis for widespread community data sharing; and

### PRESERVATION ACTION

Actions undertaken to ensure the long-term viability and availability of the authoritative nature of digital material. Preservation actions should ensure the material remains authentic, reliable, and usable while its integrity is maintained; such actions include validation, assigning preservation metadata, assigning representation information, and ensuring acceptable data structures and file formats.



Figure 2: The Data Pyramid.



# Earthquake Simulation

# Mike Norman

Astrophysicist (NCSA then UCSD)/current SDSC Director

- Modeling universe back to Big Bang

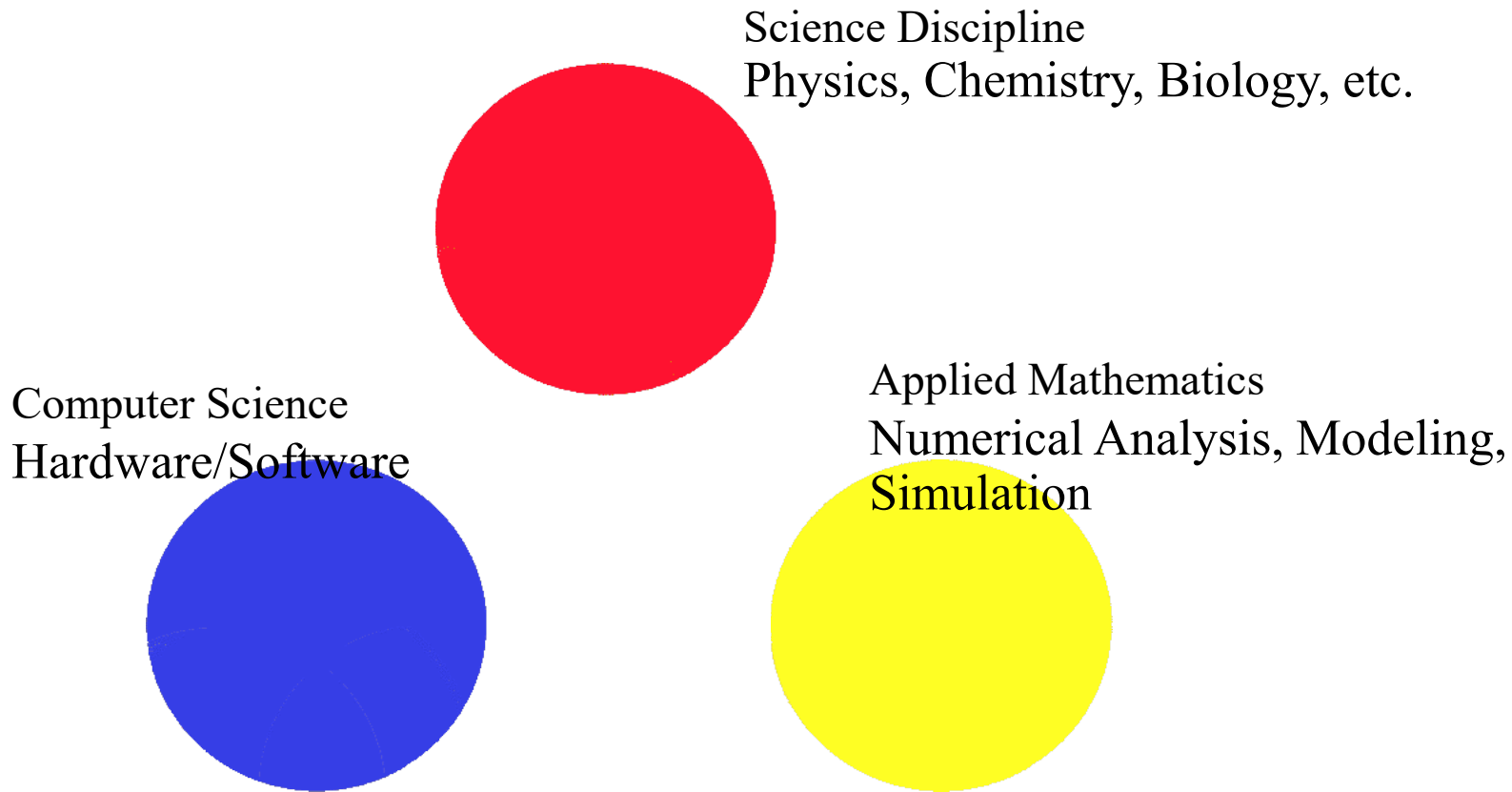
# Running on Empty:

Failure to Teach K–12 Computer Science in the Digital Age

- <http://www.acm.org/runningonempty/fullreport.pdf>
- The Computer Science Teachers Association
- Genesis of CS100 for Fall2012
- CACM April 2011 – Bobby Schnabel  
“Educating Computing’s Next Generation



# What is Computational Science?



# What is Computational Science?

