IEEE Milestone Celebration

The Rich History Highlighted by the Milestones Program

Mei Lin Fung

Chair, i50 IEEE

Co-Founder with Vint Cerf:

People-Centered Internet

Brian Berg

IEEE HISTORY COMMITTEE

- Independent consultant – data storage/flash memory
- IEEE volunteer:
  - History Committee: Vice Chair
  - Milestones Subcommittee: Chair
  - Santa Clara Valley Section: past Chair
  - Region 6 History Chair
  - IEEE Consultants' Network of Silicon Valley: Director
- Lover of History

IEEE Santa Clara Valley Section

IEEE Region 6

BERG SOFTWARE DESIGN

IEEE-CNSV Consultants' Network of Silicon Valley

Thanks to IEEE.tv for Streaming This Event!

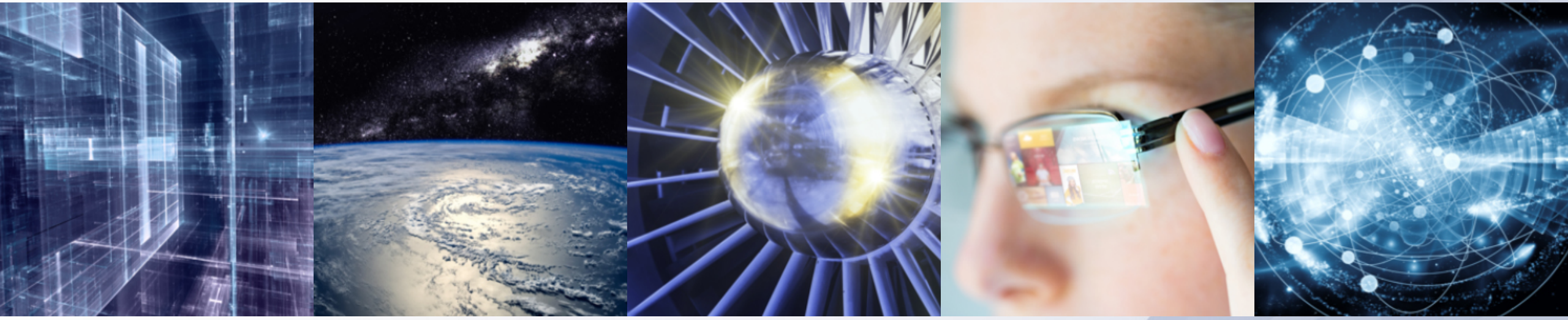
- This is the 3rd of 3 events since Friday that IEEE.tv has streamed for us.
- We thank IEEE.tv for streaming this event throughout the world right now!

Acknowledgments

- Dick Ahrons
  - He got me started working on Milestones back in 2010
  - He's now 92
- Amber Huffman
  - Intel Fellow
  - Now at Google Cloud
  - She got me the contact at Google that made their Milestone possible

Joseph Wei

- Corporate Board Advisor & Mentor
- Active IEEE volunteer
- Santa Clara Valley Section past Chair
- Region 6 Director-Elect
- IEEE Entrepreneurship
- Consumer Tech. Society Officer



The Future of the IEEE

Joseph Wei

IEEE Region 6 Director-Elect

ieee.org

IEEE
Advancing Technology for Humanity

Inspiring a Global Community of Innovation

Where forward-thinking technology professionals collaborate

- Discover what's next in technological innovation
- Create international standards
- Build technical communities
- Shape and share research

Our Mission

The core purpose of IEEE is to foster technological innovation and excellence for the benefit of humanity

Our Vision

IEEE will be essential to the global technical community and to technical professionals everywhere, and be universally recognized for the contributions of technology and of technical professionals in improving global conditions

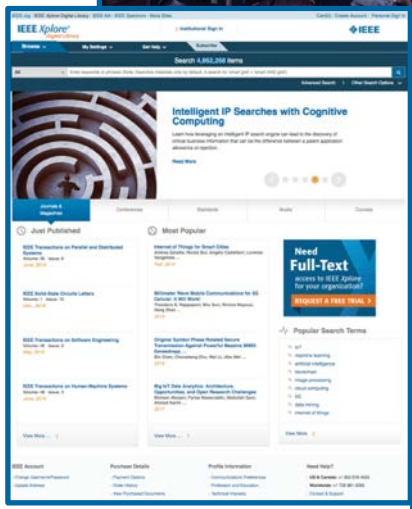
IEEE Legacy

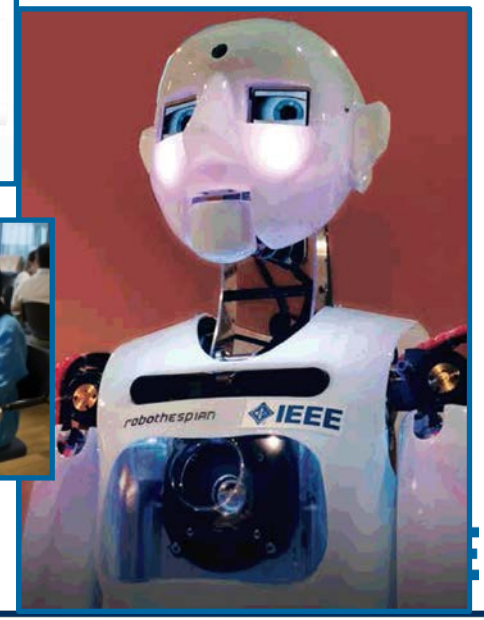
IEEE's story of innovation begins with a spark of collaborative spirit

- Since 1884, IEEE has been fostering technical advancement for the benefit of humanity
  - In 1884, Thomas Edison, Alexander Graham Bell, and others founded the American Institute of Electrical Engineers (AIEE)
  - In 1912, the Institute of Radio Engineers (IRE) formed with a focus on the new industries of wireless technologies and electronics
  - Nearly 60 years ago, on 1 January 1963, AIEE and IRE merged to become the Institute of Electrical and Electronic Engineers or IEEE

IEEE at a Glance

- Over **460,000** members in over **190** countries
- Sponsors **2,000+** conferences in more than **96** countries annually
- **5 million+** documents in the IEEE *Xplore*® digital library, with **15 million+** downloads each month
- Publish approximately **200** transactions, journals, and magazines
- **1,076** active standards and **900+** standards under development
- Continuing Technology Education Resources
- Global public policy and professional ethics





All figures as of April 2022

Technical Expertise that is Broad and Deep

IEEE provides thought leadership and resources for the global tech community

- Aerospace & Defense
- Biomedical Engineering
- Broadcasting
- Circuits
- Communications
- Computer Science
- Control and Automation
- Cyber Security
- Electronics
- Environment
- Industrial systems
- Information Technology
- Internet of Things
- Life Sciences
- Nanotechnology
- Optics
- Power and Energy
- Robotics and AI
- Semiconductors
- Smart Cities
- Smart Grid
- Sustainable Energy
- Transportation and Vehicles
- And more…

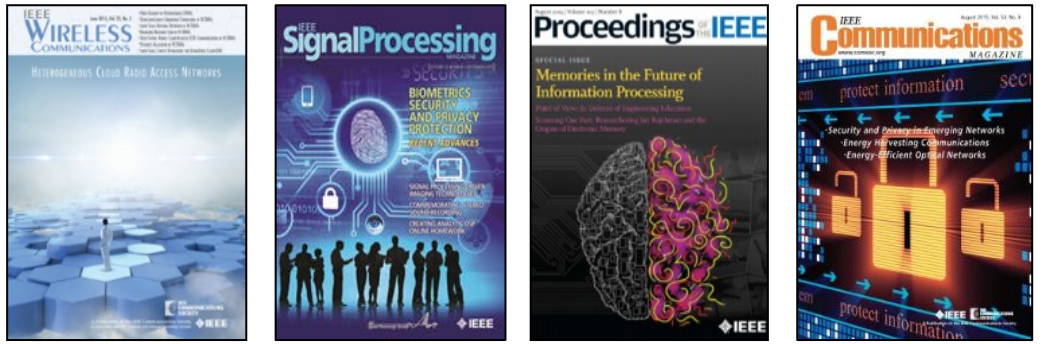
The Top-cited IEEE Publications in the Fields of Interest

IEEE Publishes:

- **8 of the top 10** journals in Electrical and Electronic Engineering
- **9 of the top 10** journals in Telecommunications
- **3 of the top 5** journals in Artificial Intelligence
- **3 of the top 5** journals in Automation & Control Systems
- **3 of the top 5** journals in Computer Science—Hardware & Architecture
- **3 of the top 5** journals in Computer Science—Software Engineering
- **3 of the top 5** journals in Cybernetics
- **3 of the top 5** journals in Imaging

IEEE Journals are:

#1 in Automation & Control Systems, Cybernetics (Computer Science), Hardware & Architecture (Computer Science), Information Systems (Computer Science), and Imaging



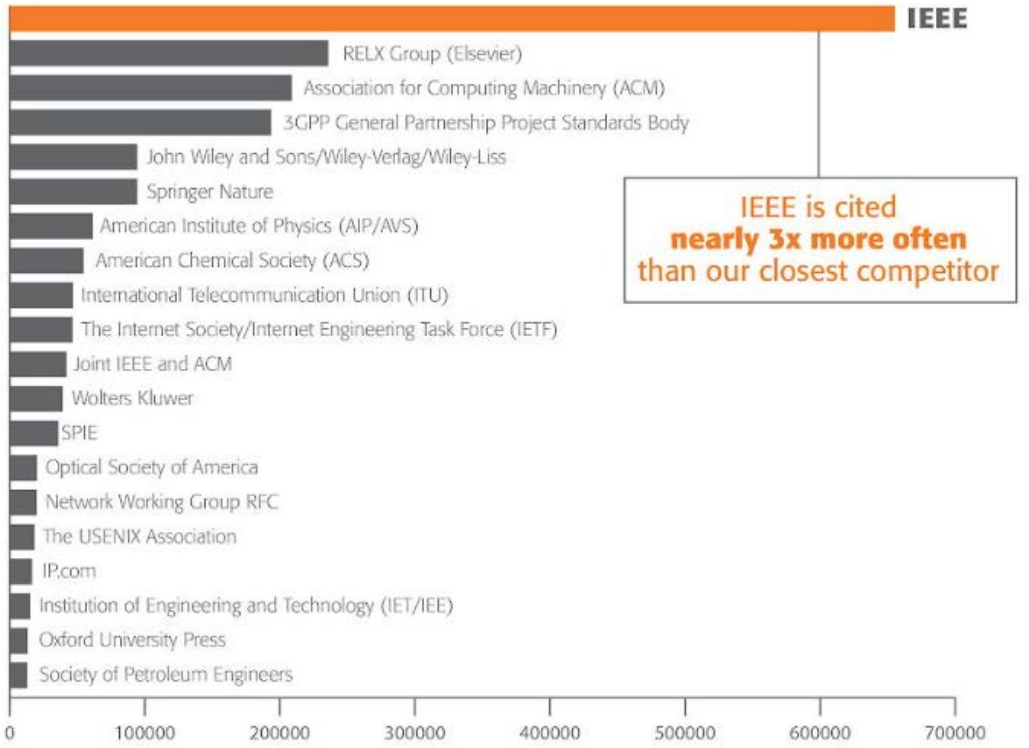
The Journal Citation Reports from Clarivate Analytics presents quantifiable statistical data that provides a systematic, objective way to evaluate the world's leading journals. Based on the 2021 study released June 2022.

IEEE Research Powers New Patents

IEEE is the most-cited publisher in new patents from top patenting organizations.

A study of the top 50 patenting organizations ranks IEEE #1 again

- Nearly 3x more citations than any other publisher
- Patent referencing to IEEE increased 864% since 1997
- Analyzed by discipline, IEEE is the #1 most referenced publisher in **AI, Blockchain, Computing, Cybersecurity, IoT, Power Systems, Semiconductors, Telecom and more**
- The importance of sci-tech literature in patents is rising
- IEEE research is increasingly valuable to innovators



13 *Source: 1790 Analytics LLC, Copyright 2022.*

IEEE Standards Association (IEEE SA)

Standards nurture, develop, and advance the building of global technologies.

- Consumers around the world enjoy the benefits of IEEE Standards:
  - Provide the bricks and mortar for a globally level playing field for innovation
  - Protect public safety, health & wellbeing
  - Contribute to a sustainable future

COMPETITION
Influencing the competitiveness of industries & companies

CONFIDENCE
Demonstrating quality to customers by meeting expectations & requirements

INNOVATION
Providing an essential platform on which new technologies & processes can build

GROWTH
Facilitating trade & economic growth

PERFORMANCE
Fine-tuning performance and improving efficiency

SUSTAINABILITY
Making technology safer, interoperable and sustainable for the future

standards.ieee.org

IEEE Special Interest Groups

IEEE SIGHT

Special Interest Group on Humanitarian Technology

IEEE Women in Engineering WIE 25 YEARS

IEEE Entrepreneurship

IEEE youngprofessionals

IEEE-USA

HKN IEEE-Eta Kappa Nu

IEEE

Technology Policy for the Public Good

Coordinated activities at the national, regional, and international levels

- Facilitate global collaboration between the IEEE and governments, regulatory, and other industry organizations to work together on important technical issues
- Provides independent and unbiased viewpoints
- Inform policy-makers, IEEE members, and the public of the benefits, risks, and social implications of technology
- Promote discussion of technology-related public policies
- IEEE holds United Nations Economic and Social Council (ECOSOC) Consultative Status

ECOSOC
Economic and Social Council

globalpolicy.ieee.org

IEEE Members Impact on Society

- The work of professional engineers, technologists, educators, young professionals, and students preparing for technical careers, will continue to be in high demand and have a great impact
- IEEE is committed to scientific and technical discovery and innovation that improves our standards of living and helps us care for each other and for our planet

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IEEE: Your Resource For Technology Decisions

- Technology of all sorts drive the world's economy
- IEEE is the largest technical professional organization in the world
- IEEE members are involved in all aspects of technology creation and use
- IEEE research powers patents and IEEE creates world's technical standards

- IEEE fosters efforts in future directions, technical roadmaps and tracking megatrends
- IEEE can inform public policy and is a resource for technical discussions

IEEE

Advancing Technology for Humanity

Connect with me on LinkedIn:
https://www.linkedin.com/in/josephwei

Joseph Wei
IEEE Region 6 Director-Elect
joseph.wei@ieee.org

Karen Galuchie

IEEE Foundation 50 YEARS

- Executive Director of this philanthropic partner of IEEE
- Received recent awards for exemplary performance and impact

IEEE Foundation

About the IEEE Foundation

Karen Galuchie, Executive Director

20 May 2024

IEEE

IEEE Foundation

Where technology and philanthropy intersect

Illuminate

Educate

Engage

Energize

Future

Together, we deliver opportunity, innovation and impact across the globe.

IEEE

https://vimeo.com/904536191

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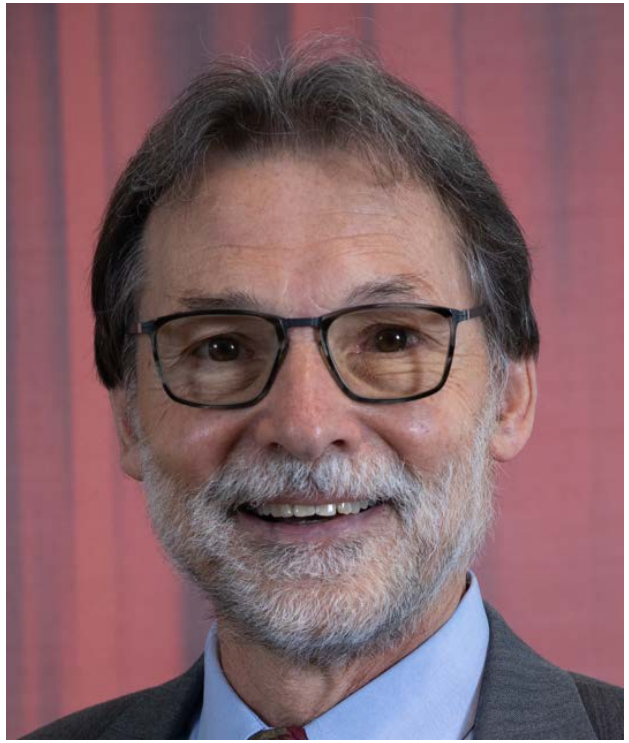
Brian Berg



IEEE Milestones:
Have Fun and Meet Cool People

Brian A. Berg

IEEE History Committee Vice Chair

IEEE Milestones Subcommittee Chair

IEEE Region 6 History Chair

20 May 2024

People-Centered Internet

The IEEE Milestone Program

- Milestones honor an achievement or a location, not a person
- Achievement must be at least 25 years old
- Funding: IEEE Foundation
- Here is the CDMA Milestone plaque at Qualcomm, San Diego

- This plaque greets visitors to Qualcomm's HQ
- SRI's visitors will be greeted similarly!

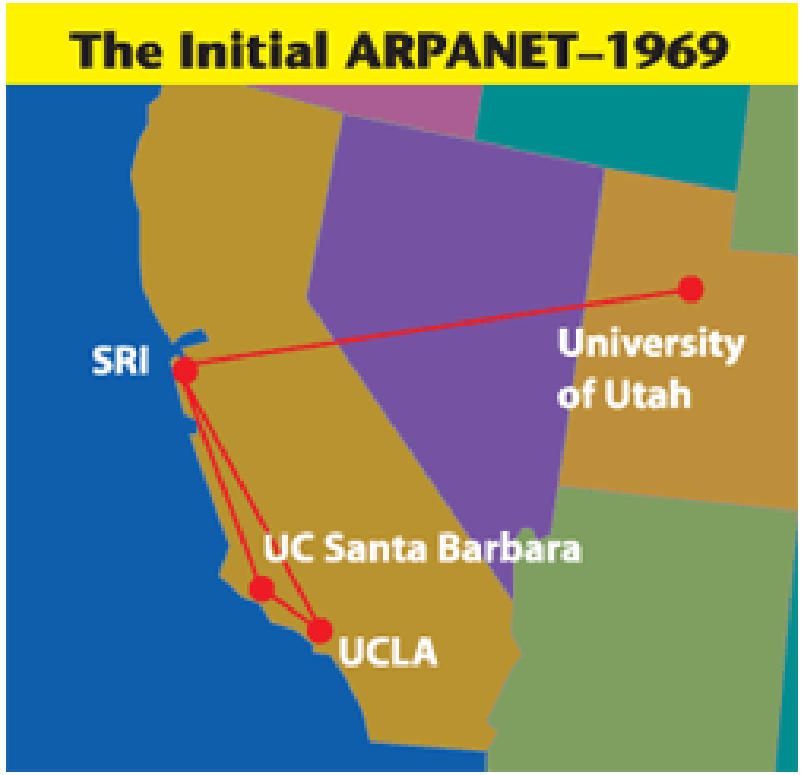
Thanks to the Milestone Expert Reviewers

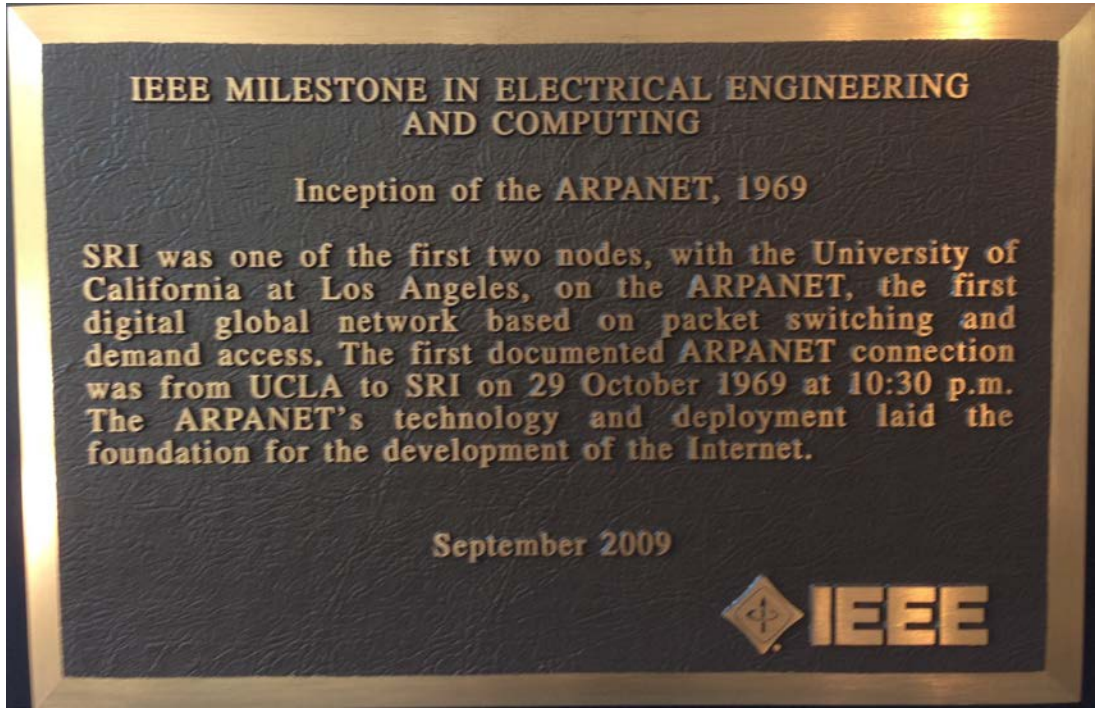
- **TCP Enables the Internet**
  - Stephen Crocker, David Clark, and Craig Partridge
- **IEEE 802 Standards Committee**
  - Robert Garner, Peter Jones, and Steve Diamond
- **PageRank and Birth of Google**
  - David Gleich and Soumen Chakrabarti

IEEE Milestones in Electrical Engineering and Computing

- 252 Milestones dedicated since 1984, incl.:
  - Maxwell's Equations, 1860-1871 (London)
  - Stereo Sound Recording, 1931 (EMI Studios, later renamed Abbey Road Studios)
  - Bletchley Park Code Breaking, 1939-1945
  - Bullet Train, 1964 (Japan)
  - Deep Space Station 43, 1972-1987
    - Australia: part of NASA's Deep Space Network
  - CD Audio Player. 1979 (The Netherlands)
  - **Today's are #253, 254 and 255**

Inception of the ARPANET, 1969: First transmission, from UCLA to SRI





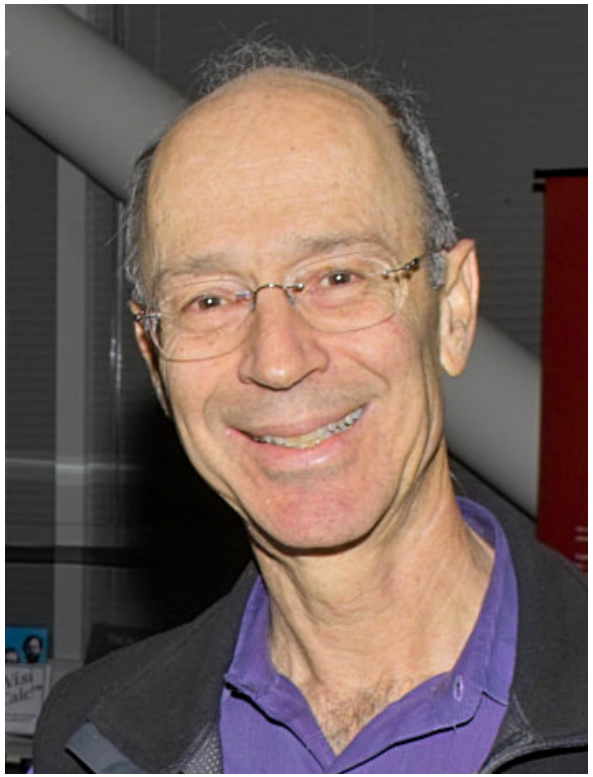
This is one of 3 plaques in SRI's Visitors Lobby in Menlo Park

Dedicated in 2009 for ARPANET's 40th anniversary, in conjunction with IEEE's 125th anniversary at the Computer History Museum, where Vint Cerf spoke

“SHAKEY: The World’s First Mobile, Intelligent Robot, 1972” at SRI

I worked closely with Peter Hart on the Milestone proposal

Shakey is the 1st duplicate plaque on front brick wall here at the Museum



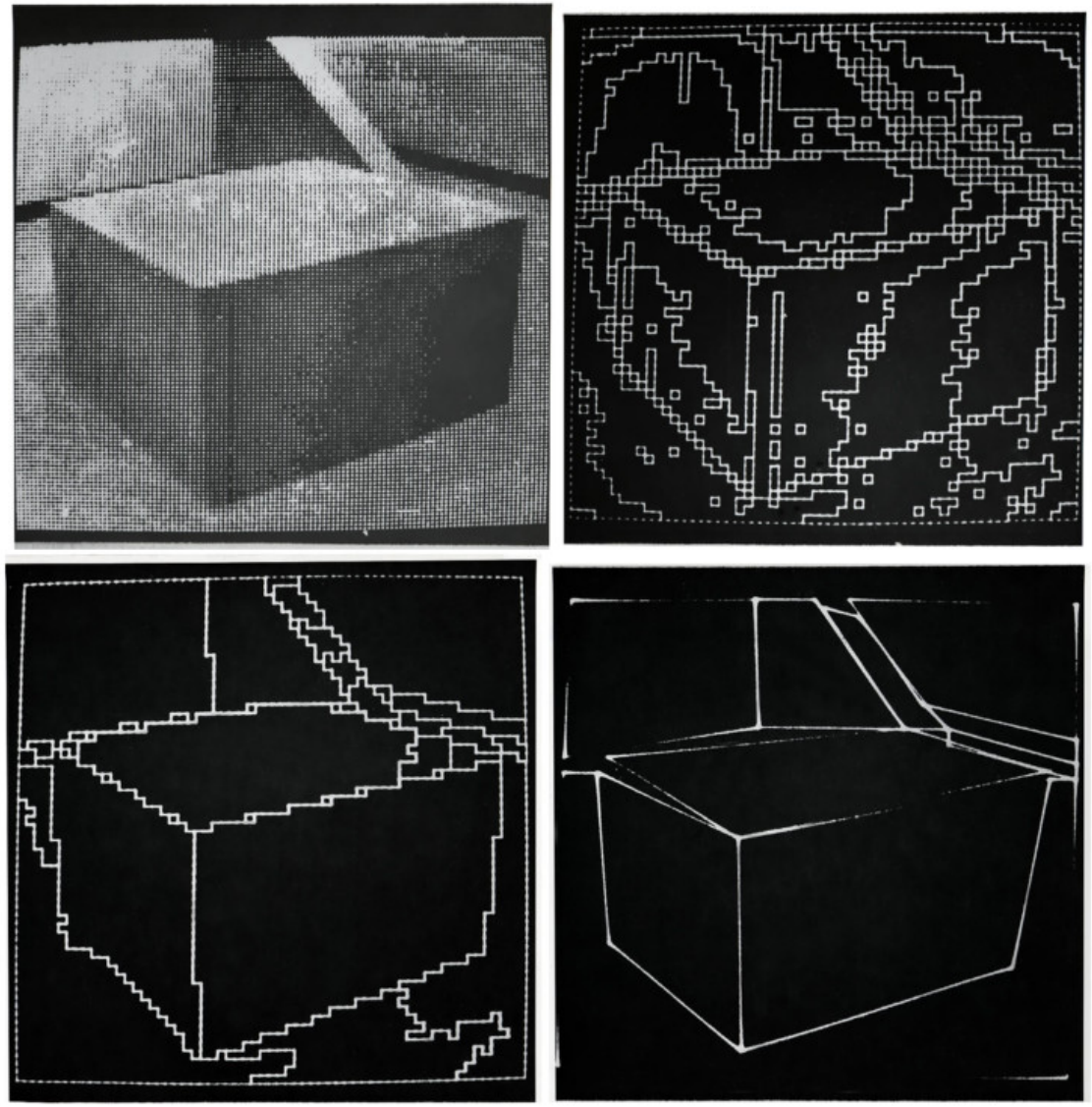
“SHAKEY: The World’s First Mobile, Intelligent Robot, 1972” at SRI

Shakey is the “centerpiece” of the Artificial Intelligence and Robotics portion of the *Revolutions* exhibition here at the Museum

“SHAKEY: The World’s First Mobile, Intelligent Robot, 1972” at SRI

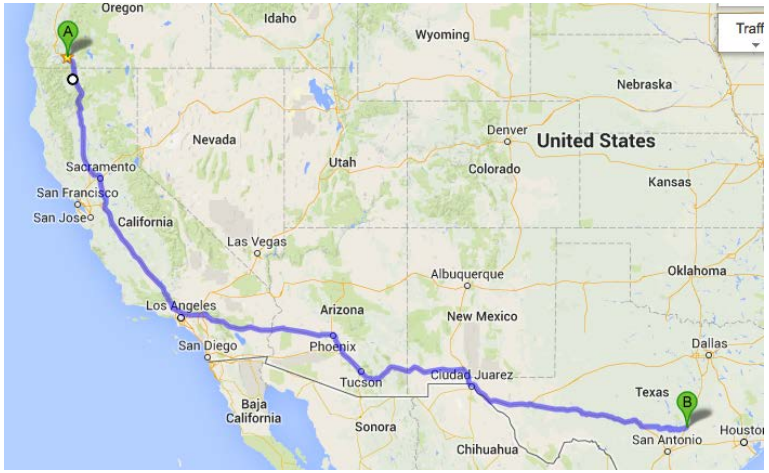
- Peter Hart: 2nd from right
- Helen Chan (sitting) was the 1st robotics programmer
- SRI got ARPA funding by proposing to build a mobile automaton
- More info at my site: ShakeyMilestone.com

SHAKEY: Perceiving Regions of What It “Sees”



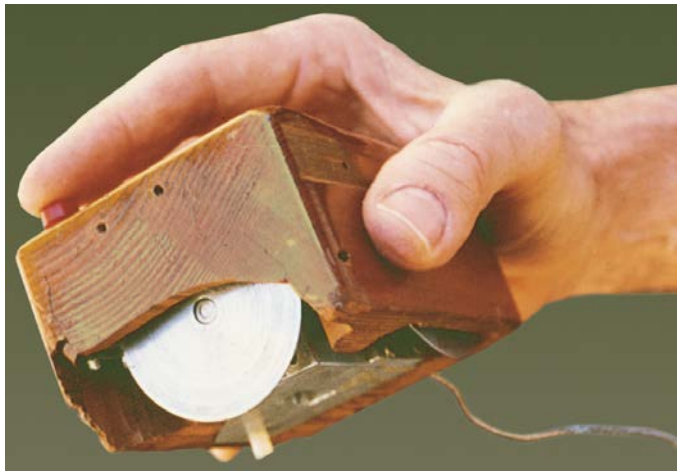
Two Important Functionalities Used Worldwide Originated with Shakey

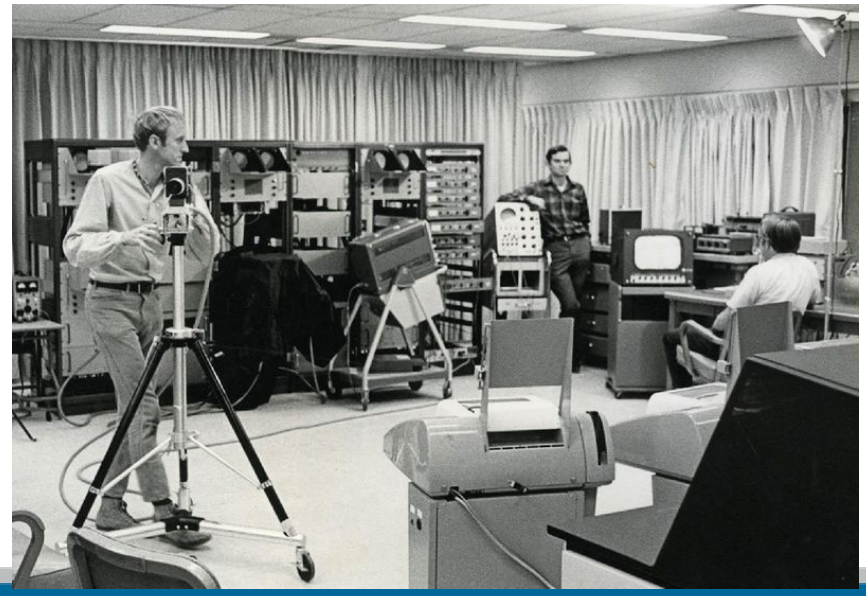
- The modern form of the “Hough” Transform: detect lines and curves in pictures
- The A* shortest path algorithm is used for route finding by Waze, Google Maps, etc.



“Mother of All Demos” by Doug Engelbart, 1968: (SRI)

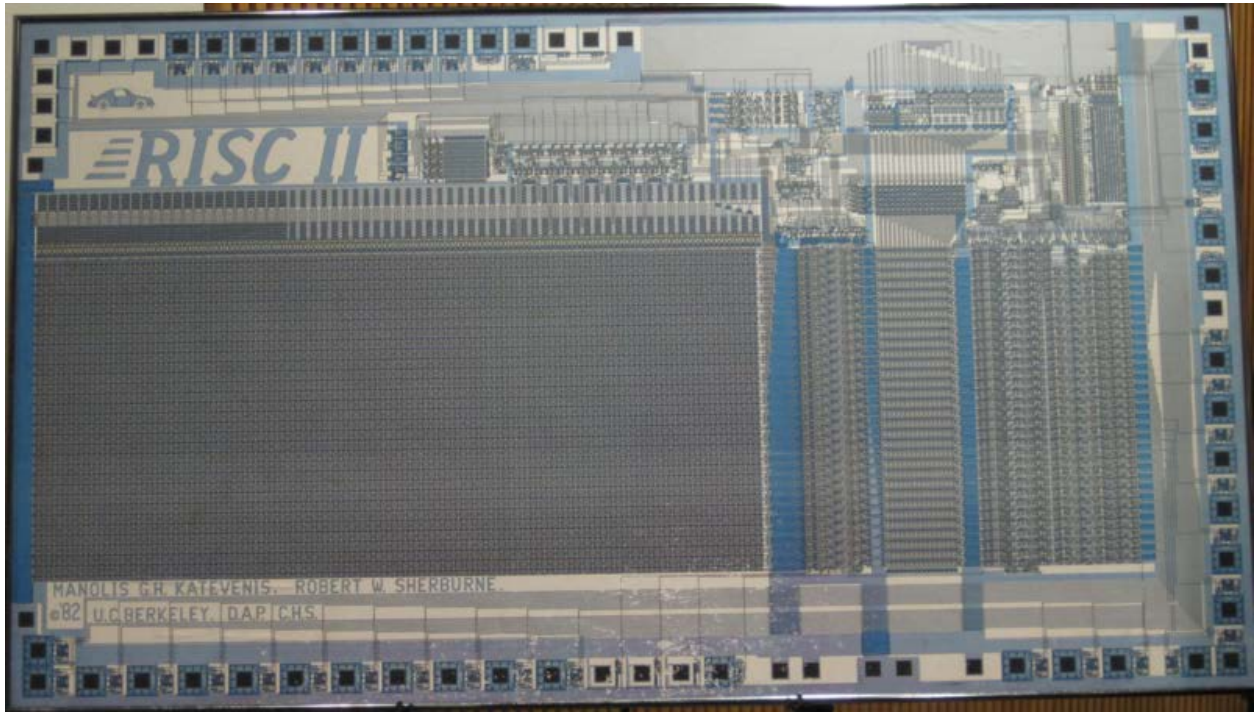
- I worked with Marc Weber on its Dedication in this room
- First public demo of:
  - the mouse
  - collaborative online editing
  - Hypertext, video conferencing
  - word processing, spell checking
- Demo in San Francisco
- Computer and team members in Menlo Park
- Photo at right during Demo prep at SRI:
  - Stewart Brand was Asst. Stage Manager
  - Stewart later edited *Whole Earth Catalog* and founded the WELL and the Long Now Foundation
- *This is the 2nd duplicate plaque*





First RISC (Reduced Instruction-Set Computing) Microprocessor 1980-1982

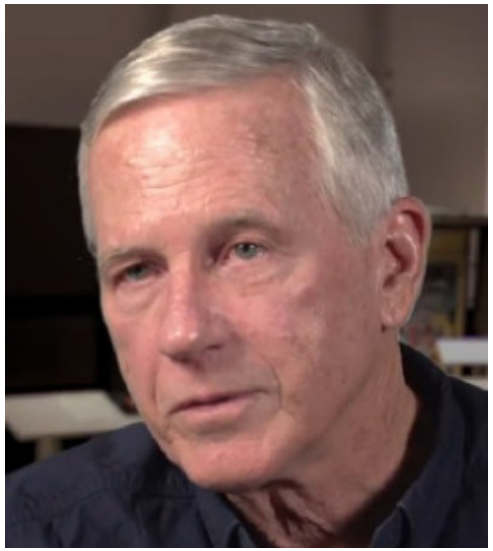
- "UC Berkeley students designed and built the first VLSI reduced instruction-set computer in 1981."
- This Milestone honors the work that Dr. Dave Patterson led that established the viability of RISC
- This started the RISC v. CISC debate that lasted years
- **RISC now dominates the world, e.g., ARM processors**
- *This is the 5th duplicate plaque*



SPARC RISC Architecture, 1987

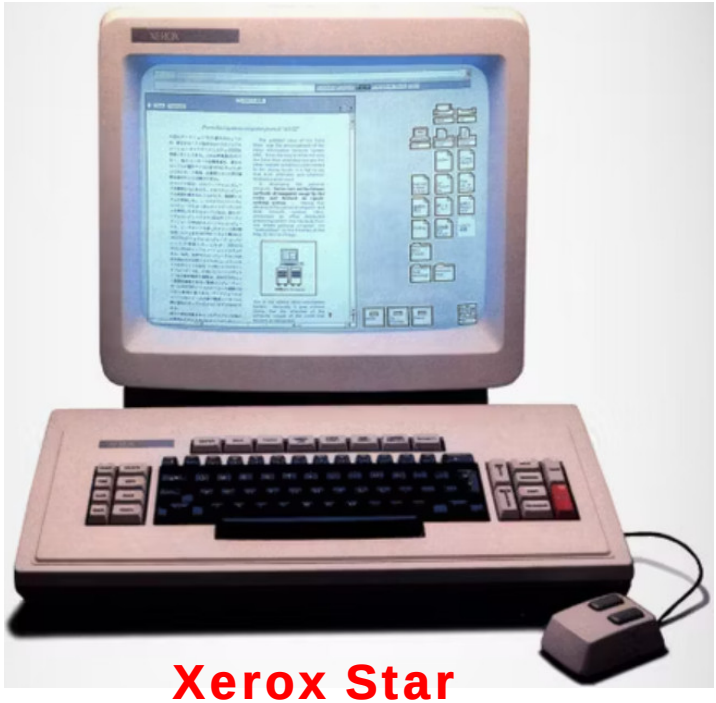
- "Sun Microsystems introduced SPARC (Scalable Processor Architecture) RISC in 1987."
- This Milestone honors the first commercially successful RISC architecture processor
- Dave Patterson consulted for Sun to create the first SPARC microprocessor chips
- *This is the 4th duplicate plaque*

Recognizing Robert Garner



Working on a book about Ethernet; he has done over 110 interviews

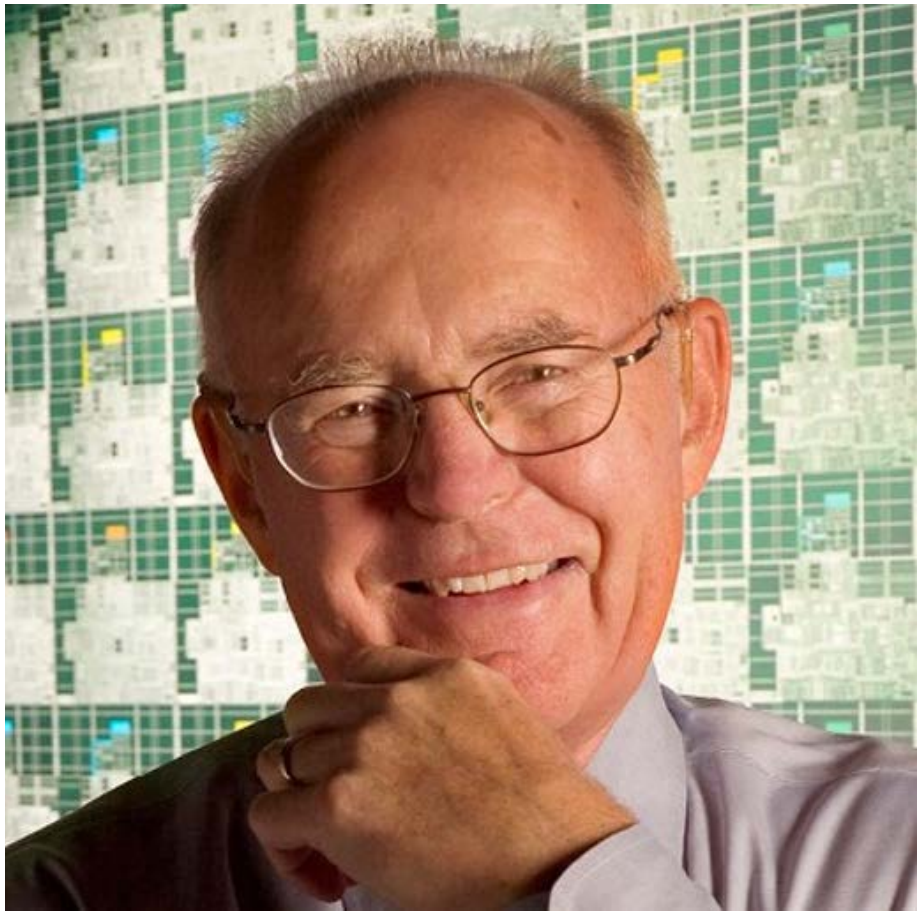
- Xerox PARC work:
  - Co-designed an early Ethernet controller & CPU for Xerox Star, commercialized version of the Alto
- Sun Microsystems work:
  - SPARC lead architect
  - Worked with Dave Patterson and co-founder Bill Joy
  - *Crafted the words of the SPARC Milestone citation*



Xerox Star

Garner thus has a close connection with 4 Milestones (Alto, Ethernet, RISC, SPARC) all of which have duplicate plaques here

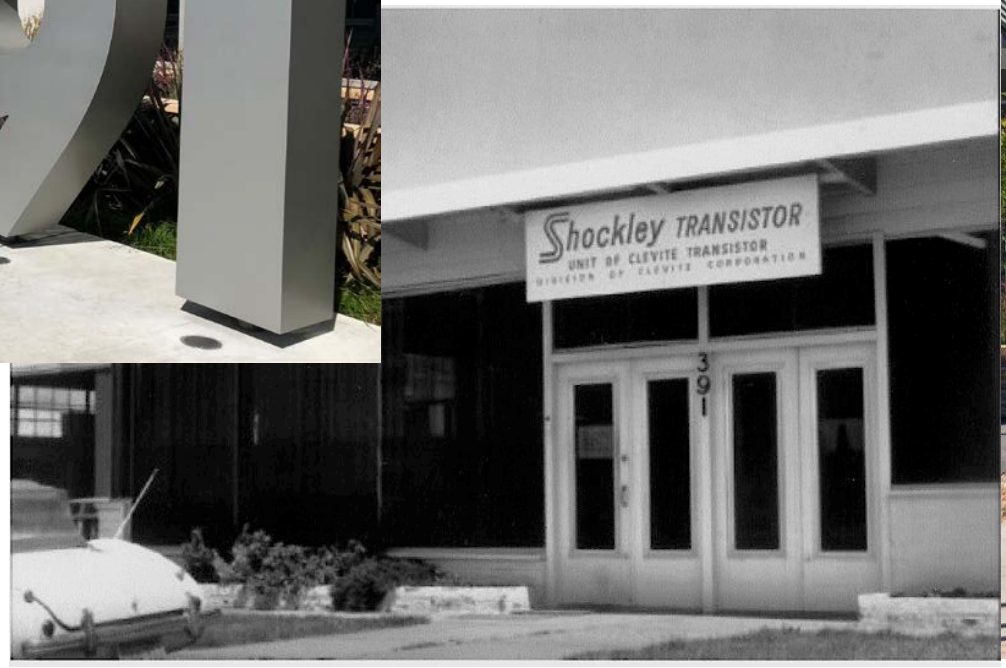
IEEE Milestone: Moore's Law, 1965



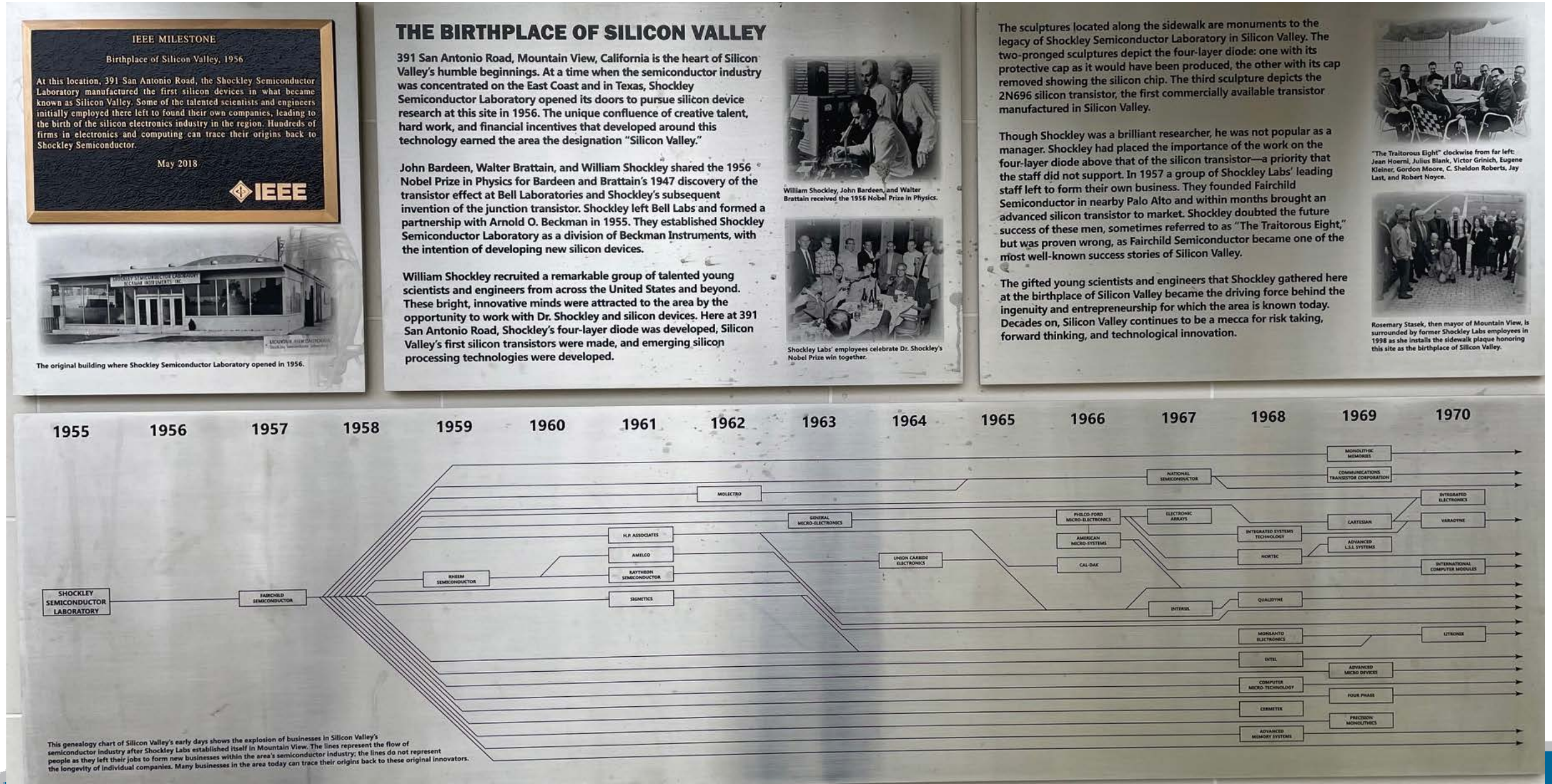
This is the 6th duplicate plaque

Milestone: Birthplace of Silicon Valley, 1956

- At Shockley Labs site: corner of San Antonio Rd and California Ave, Mountain View
- *This is the 7th duplicate plaque*



Milestone: Birthplace of Silicon Valley, 1956



IEEE MILESTONE

Birthplace of Silicon Valley, 1956

At this location, 391 San Antonio Road, the Shockley Semiconductor Laboratory manufactured the first silicon devices in what became known as Silicon Valley. Some of the talented scientists and engineers initially employed there left to found their own companies, leading to the birth of the silicon electronics industry in the region. Hundreds of firms in electronics and computing can trace their origins back to Shockley Semiconductor.

May 2018

IEEE

The original building where Shockley Semiconductor Laboratory opened in 1956.

THE BIRTHPLACE OF SILICON VALLEY

391 San Antonio Road, Mountain View, California is the heart of Silicon Valley's humble beginnings. At a time when the semiconductor industry was concentrated on the East Coast and in Texas, Shockley Semiconductor Laboratory opened its doors to pursue silicon device research at this site in 1956. The unique confluence of creative talent, hard work, and financial incentives that developed around this technology earned the area the designation "Silicon Valley."

John Bardeen, Walter Brattain, and William Shockley shared the 1956 Nobel Prize in Physics for Bardeen and Brattain's 1947 discovery of the transistor effect at Bell Laboratories and Shockley's subsequent invention of the junction transistor. Shockley left Bell Labs and formed a partnership with Arnold O. Beckman in 1955. They established Shockley Semiconductor Laboratory as a division of Beckman Instruments, with the intention of developing new silicon devices.

William Shockley recruited a remarkable group of talented young scientists and engineers from across the United States and beyond. These bright, innovative minds were attracted to the area by the opportunity to work with Dr. Shockley and silicon devices. Here at 391 San Antonio Road, Shockley's four-layer diode was developed, Silicon Valley's first silicon transistors were made, and emerging silicon processing technologies were developed.

William Shockley, John Bardeen, and Walter Brattain received the 1956 Nobel Prize in Physics.

Shockley Labs' employees celebrate Dr. Shockley's Nobel Prize win together.

The sculptures located along the sidewalk are monuments to the legacy of Shockley Semiconductor Laboratory in Silicon Valley. The two-pronged sculptures depict the four-layer diode: one with its protective cap as it would have been produced, the other with its cap removed showing the silicon chip. The third sculpture depicts the 2N696 silicon transistor, the first commercially available transistor manufactured in Silicon Valley.

Though Shockley was a brilliant researcher, he was not popular as a manager. Shockley had placed the importance of the work on the four-layer diode above that of the silicon transistor—a priority that the staff did not support. In 1957 a group of Shockley Labs' leading staff left to form their own business. They founded Fairchild Semiconductor in nearby Palo Alto and within months brought an advanced silicon transistor to market. Shockley doubted the future success of these men, sometimes referred to as "The Traitorous Eight," but was proven wrong, as Fairchild Semiconductor became one of the most well-known success stories of Silicon Valley.

The gifted young scientists and engineers that Shockley gathered here at the birthplace of Silicon Valley became the driving force behind the ingenuity and entrepreneurship for which the area is known today. Decades on, Silicon Valley continues to be a mecca for risk taking, forward thinking, and technological innovation.

"The Traitorous Eight" clockwise from far left: Jean Hoerni, Julius Blank, Victor Grinich, Eugene Kleiner, Gordon Moore, C. Sheldon Roberts, Jay Last, and Robert Noyce.

Rosemary Stasek, then mayor of Mountain View, is surrounded by former Shockley Labs employees in 1998 as she installs the sidewalk plaque honoring this site as the birthplace of Silicon Valley.

1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970

SHOCKLEY SEMICONDUCTOR LABORATORY
FAIRCHILD SEMICONDUCTOR
RHEEM SEMICONDUCTOR
MOLECTRO
H.P. ASSOCIATES
AMELCO
RAYTHEON SEMICONDUCTOR
SIGNETICS
GENERAL MICRO-ELECTRONICS
UNION CARBIDE ELECTRONICS
PHILCO-FORD MICRO-ELECTRONICS
AMERICAN MICRO-SYSTEMS
CAL-DAK
NATIONAL SEMICONDUCTOR
ELECTRONIC ARRAYS
INTERSIL
INTEGRATED SYSTEMS TECHNOLOGY
NORTEC
QUALIDYNE
MONSANTO ELECTRONICS
INTEL
COMPUTER MICRO-TECHNOLOGY
CERMETEK
ADVANCED MEMORY SYSTEMS
MONOLITHIC MEMORIES
COMMUNICATIONS TRANSISTOR CORPORATION
CARTESIAN
ADVANCED L.S.I. SYSTEMS
INTEGRATED ELECTRONICS
VARADYNE
INTERNATIONAL COMPUTER MODULES
LITRONIX
ADVANCED MICRO DEVICES
FOUR PHASE
PRECISION MONOLITHICS

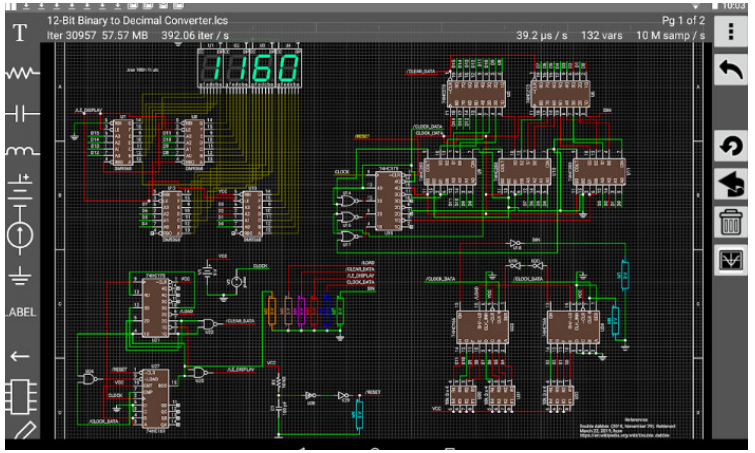
This genealogy chart of Silicon Valley's early days shows the explosion of businesses in Silicon Valley's semiconductor industry after Shockley Labs established itself in Mountain View. The lines represent the flow of people as they left their jobs to form new businesses within the area's semiconductor industry; the lines do not represent the longevity of individual companies. Many businesses in the area today can trace their origins back to these original innovators.

DIALOG Online Search System, 1966

- Roger Summit is here today
- Initiated by Lockheed in Stanford's Research Park
- Used initially by NASA and the European Space Agency
- Preceded modern search engines ***by over 2 decades***
  - "Archie" started in 1989
- Still **in use today** as a paid service as "ProQuest Dialog"
- *This is the 8th duplicate plaque*

SPICE (Simulation Program with Integrated Circuit Emphasis), 1969-1970

- Larry Nagel is watching online
- Larry wrote the earliest versions of SPICE while earning his BS, MS, and PhD at UC Berkeley
- SPICE: quite possibly the world's first Open Source software
- UCB shipped 9-track mag tapes containing Larry's source code worldwide starting around 1972
- *This is the 9th duplicate plaque*

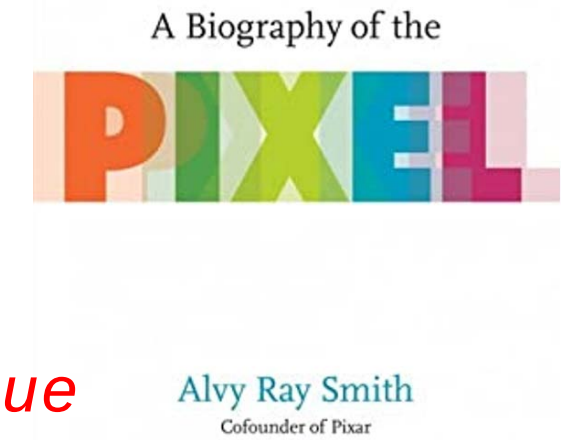


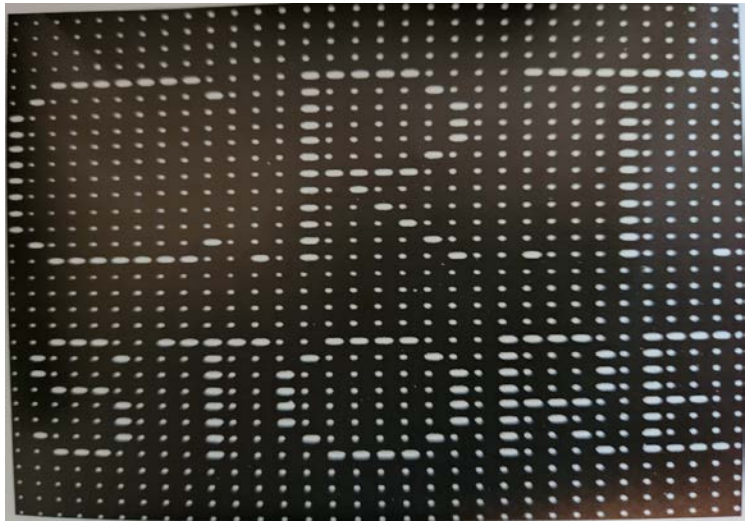
IEEE Milestone in Manchester, UK / First Pixel

- 1948: The “Manchester Baby” was the first computer to execute a program stored in addressable read-write electronic memory
- That memory used a CRT!
- During Alvy Ray Smith’s Manchester visit to research his book, he discovered that it produced the first displayed pixel in 1947:

***IEEE Milestone**:*
Manchester University "Baby" Computer and its Derivatives, 1948-1951

This is the 15th duplicate plaque





IEEE Standard 754 for Binary Floating-Point Arithmetic, 1985

- Jerome Coonen is here today
  - Milestone co-proposer
  - His UC Berkeley PhD thesis under Prof. Kahan contains early 754 std. papers
- The problem: no 2 computers performed floating point the same
- The solution: an industry standard
  - Intel/UCB together fixed this: IEEE 754
  - First implementation: 8087 co-processor
- *This is the 16th duplicate plaque*

Jerome Coonen

Prof. Kahan

Utah Computer Graphics and Visualization, 1965-78

See www.UtahMilestone.com

Like for Shakey the Robot and the ARPANET, the University of Utah received ARPA funding. This was used to set up a Center of Excellence for computer graphics research

ARPA

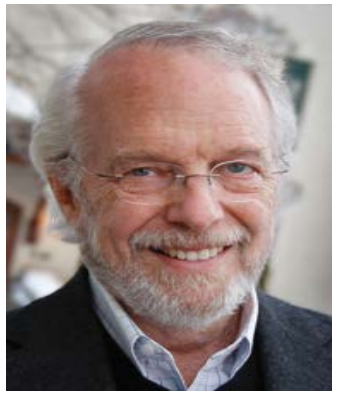
THE UNIVERSITY OF UTAH

E&S

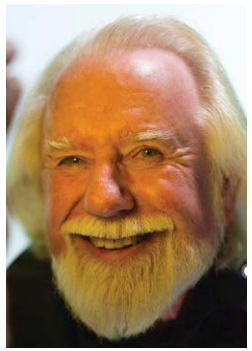
EVANS & SUTHERLAND

The "Utah Illuminati"

Warnock Algorithm

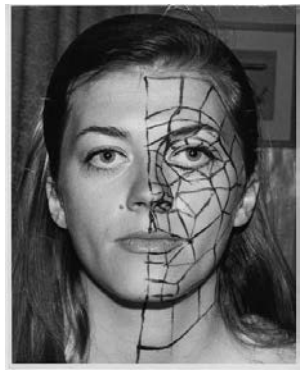


Adobe



Gouraud Shading

Henri Gouraud



Sylvie Gouraud

This is the 17th duplicate plaque

Catmull-Clark Surface Patch

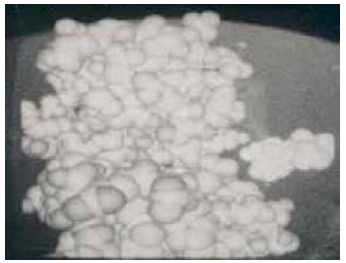
Ed Catmull

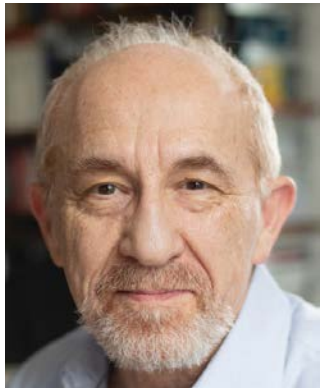
PIXAR

Jim Clark

SiliconGraphics Computer Systems

Netscape





Henry Fuchs

Blinn-Phong Reflection Model

Newell Teapot

Jim Blinn

Martin Newell

Alan Kay

Alvy Ray Smith led panel discussion – likely John Warnock's last public appearance

The Development of RenderMan for Photorealistic Graphics, 1981-88

INDUSTRIAL LIGHT & MAGIC

LUCASFILM Ltd

PIXAR

TOY STORY

The Development of RenderMan for Photorealistic Graphics, 1981-88

The Development of RenderMan for Photorealistic Graphics, 1981-88

At the entrance to Pixar in Emeryville are 2 plaques:

- ***Pixar's RenderMan***
- ***Duplicate of Univ. of Utah plaque, which cites Pixar***

This is the 18th duplicate plaque

Milestone “Wall of Fame” at Computer History Museum in Mountain View, CA

26 bronze plaques on the exterior wall

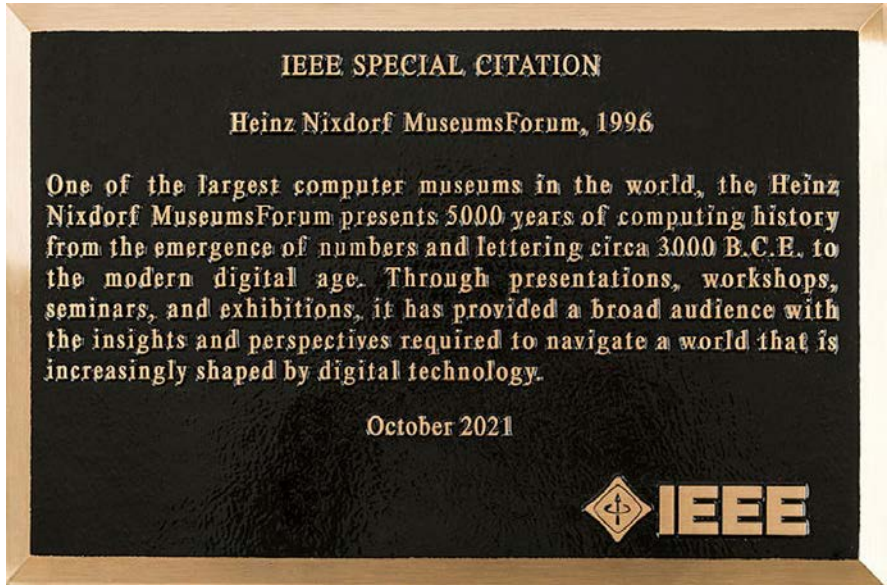
Largest collection of IEEE plaques in the world

Duplicates of the 3 plaques dedicated today, and the 3 that were dedicated at SRI / PARC on Friday, are on this wall

CHM Computer History Museum

Welcome to Jochen Viehoff, Managing Director of the *Heinz Nixdorf Museum* in Paderborn, Germany

Like the Computer History Museum, the Heinz Nixdorf Museum has an IEEE Special Citation Plaque



IEEE Milestones Have Become My “Hobby”

Computer History Museum

If you have an interest in a new Milestone, I can assist you

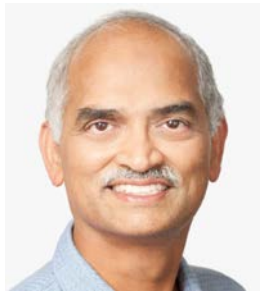
Brian Berg / b.berg@ieee.org

How Google's PageRank Algorithm Shaped Our Access to Digital Content

Moderator: Parthasarathy Ranganathan,
Vice President & Engineering Fellow

Benedict Gomes,
Senior Vice President for Learning & Sustainability

Krishna Bharat, Distinguished Research Scientist

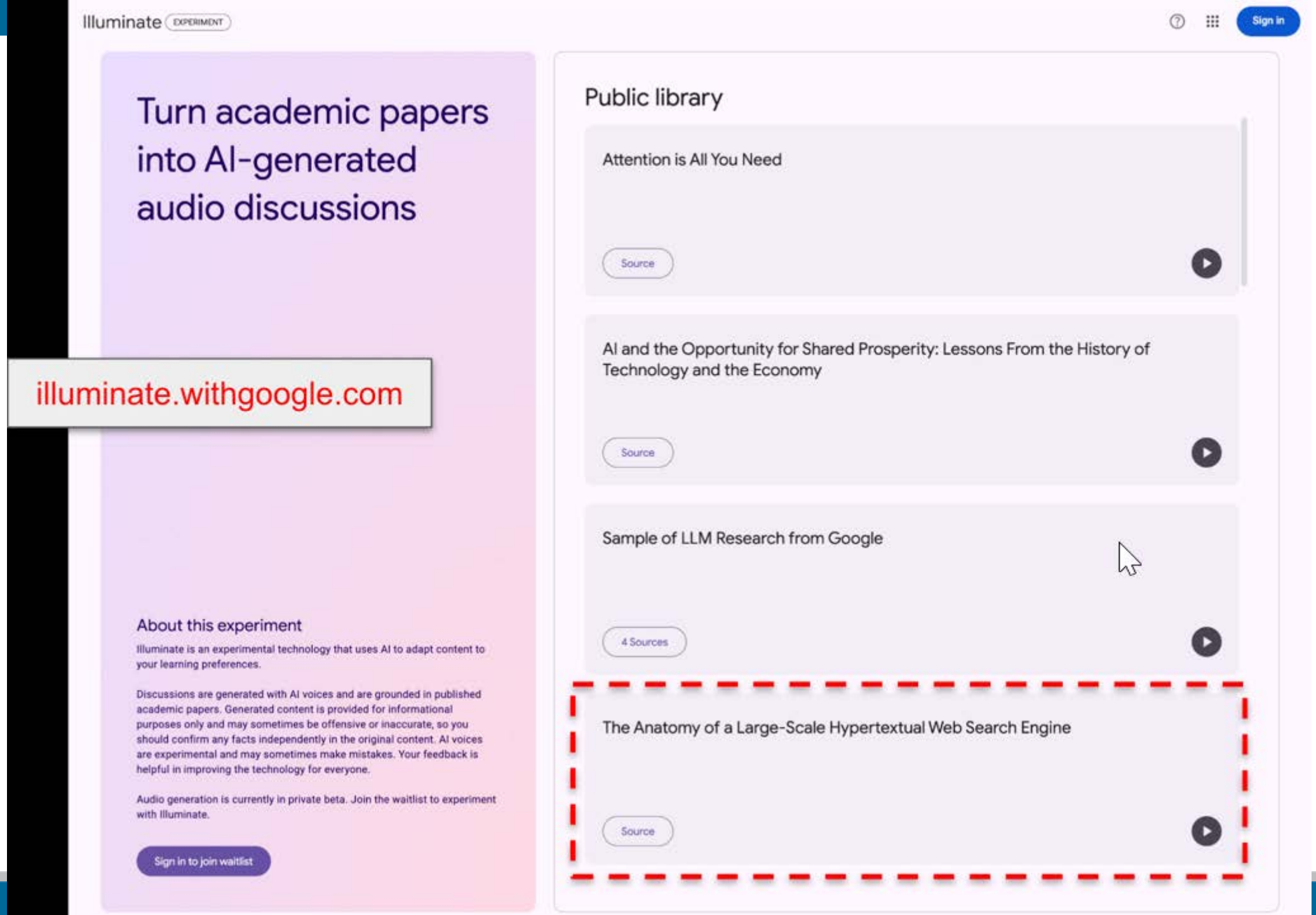


Pandu Nayak, Vice President of Search

Milestone Dedication: PageRank and the Birth of Google, 1996-1998

Illuminate Demo

illuminate.withgoogle.com




IEEE MILESTONE
PageRank and the Birth of Google, 1996-1998
Invented in 1996, the PageRank citation algorithm was the basis of the search engine that launched Google's founding in 1998. PageRank interpreted hyperlinks as referrals, posited that a high-quality page should have high-quality pages providing referrals, and recursively produced useful ranking scores for all indexed pages. This recursive quality evaluation technique became widely adopted by other search engines, as well as social networks, peer-to-peer systems, and numerous other services.
May 2024
IEEE

Locations of Google / PageRank Plaques

Site 1: By Café in Google Visitor Experience, in the Gradient Canopy, opposite side from "The Orb"

Plaque will be installed by early June

Site 2: New Exhibit Area on 4th Floor of Stanford's Gates Computer Science Bldg. (not yet ready)

Duplicate: CHM Front Brick Wall (in place now)

Milestone Dedication: PageRank and the Birth of Google, 1996-1998

With the Internet Society @ the 50th Anniversary of the Internet

***Sally Wentworth*:**

Managing Director & Incoming CEO, The Internet Society

Internet Society

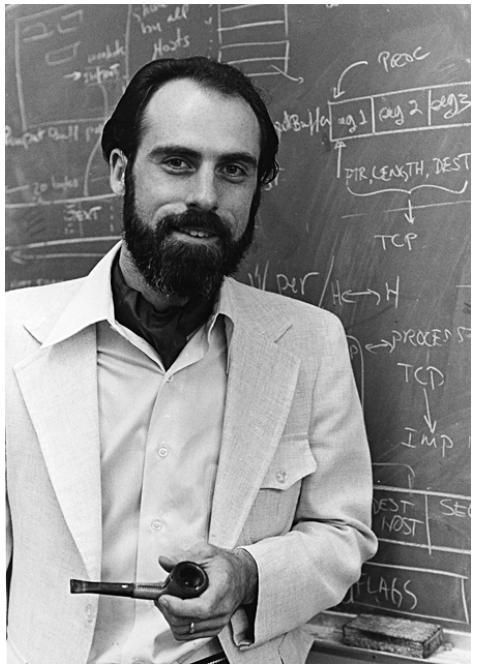
The Internet Society: founded in 1992 to promote the open development, evolution, and use of the Internet for the benefit of all people throughout the world

***Vint Cerf*:**

Vice President and Chief Internet Evangelist for Google

Vint Cerf: TCP Paper's 50th Anniversary

A Network of Networks



Vint at Stanford: mid 70s

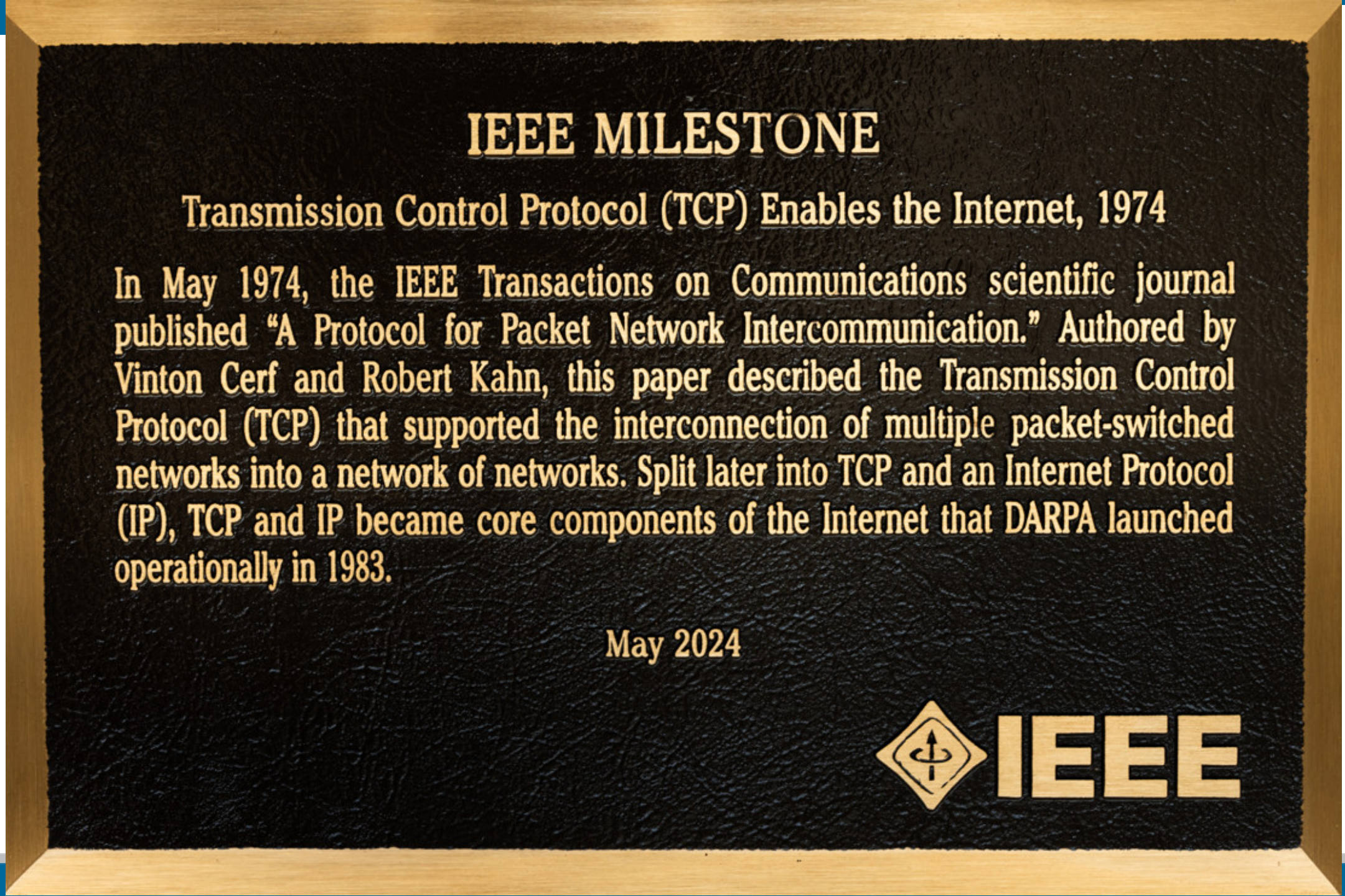
A Protocol for Packet Network Intercommunication

VINTON G. CERF AND ROBERT E. KAHN,
MEMBER, IEEE

Bob Kahn

1997: National Medal of Technology and Innovation

Milestone Dedication: Transmission Control Protocol (TCP) Enables the Internet, 1974


IEEE MILESTONE
Transmission Control Protocol (TCP) Enables the Internet, 1974
In May 1974, the IEEE Transactions on Communications scientific journal published "A Protocol for Packet Network Intercommunication." Authored by Vinton Cerf and Robert Kahn, this paper described the Transmission Control Protocol (TCP) that supported the interconnection of multiple packet-switched networks into a network of networks. Split later into TCP and an Internet Protocol (IP), TCP and IP became core components of the Internet that DARPA launched operationally in 1983.
May 2024
IEEE

Locations of “Transmission Control Protocol (TCP) Enables the Internet, 1974” Plaques

New Exhibit Area on 4th Floor of Stanford’s Gates Computer Science Bldg. (not yet ready)

Duplicate: CHM Front Brick Wall (in place now)

New Exhibit Area will showcase the rich history of the CS Department

The Success of the IEEE 802 Standards Committee

***Geoff Thompson**, IEEE 802 Executive Committee Emeritus; 802 Milestone proposer*

***James Gilb**, IEEE 802 Executive Committee Chair*

***Clint Powell**, IEEE 802.15 Working Group Chair*

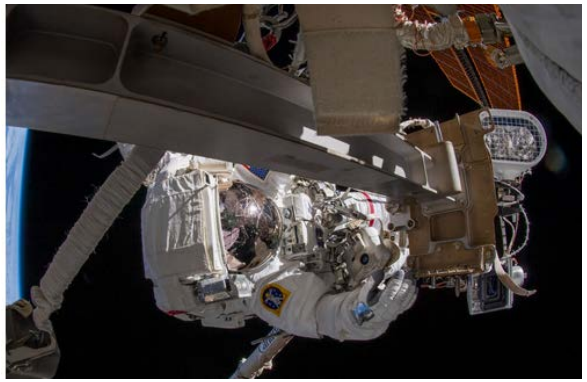
Milestone Dedication: Origin of the IEEE 802 Family of Networking Standards, 1980-1999

IEEE 802 Standards Cover the Universe

IEEE 802.3 Connects

Ever faster internet speeds, including Ethernet

IEEE 802.11 on the ISS



2008: First Wi-Fi network in space: International Space Station

IEEE 802.1 Architects the Internet

The foundation of the world's networks!

IEEE 802.15 on Mars

Perseverance Rover / Ingenuity Mars Helicopter

IEEE 802.18 helps Regulate

Supports regulatory agencies


IEEE MILESTONE
Origin of the IEEE 802 Family of Networking Standards, 1980-1999
The necessity to standardize computer Local Area Networks (LANs) resulted in the IEEE Computer Society sponsoring LAN Standard Project 802 in 1980. Four 802 Working Groups formed by 1999 proved particularly successful and transformative: IEEE 802.1 (Bridging), IEEE 802.3 (Ethernet), IEEE 802.11 (Wi-Fi®), and IEEE 802.15 (Wireless Personal Area Networks). IEEE 802 standards defined ever-expanding networking speeds and features, thus enabling the seamless interconnection of computing devices worldwide.
May 2024
IEEE

3 Milestones Were Dedicated this past Friday

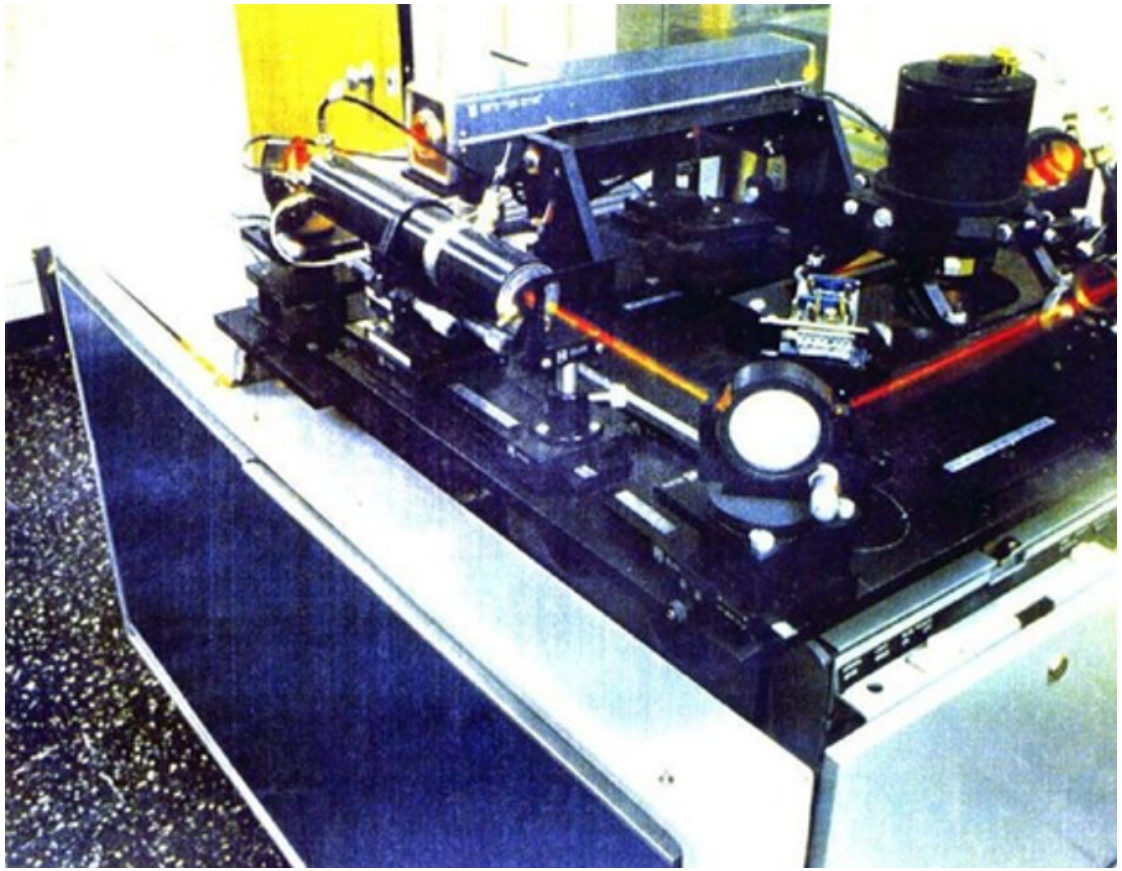
- Groundbreaking inventions from Xerox Palo Alto Research Center (PARC) in the 1970s
  - PARC is now part of SRI
- 3 plaques dedicated on Fri, May 17:
  - ***Laser Printer***
  - ***Alto Personal Networked Computer***
  - ***Ethernet (Led to IEEE 802.3 standard)***
- Together these formed “The Office of the Future”

Development of the Commercial Laser Printer, 1971-1977

The Laser Printer Milestone was dedicated at PARC on Friday. A duplicate here at the CHM is the 23rd duplicate plaque.

- *Ron Rider*
  - *Joined PARC in 1972*
  - *1977: designed and prototyped a complete **laser printing system**, which became the Xerox 9700*
  - *Invented the first instance of the **ball mouse***
  - *Held various Vice President positions at Xerox*
  - *Retired from Xerox in 2003*

Development of the Commercial Laser Printer, 1971-1977



Gary Starkweather's Scanned Laser Output Terminal (SLOT) head on a Xerox 7000 copier, that became the EARS printing system

Development of the Commercial Laser Printer, 1971-1977

Bob Metcalfe and Ron Rider debugging EARS printing system software on one of the first Altos

The Xerox Alto Establishes Personal Networked Computing, 1972-1983

The Alto Milestone was dedicated at PARC on Friday.
A duplicate here at the CHM is the 22nd duplicate plaque.

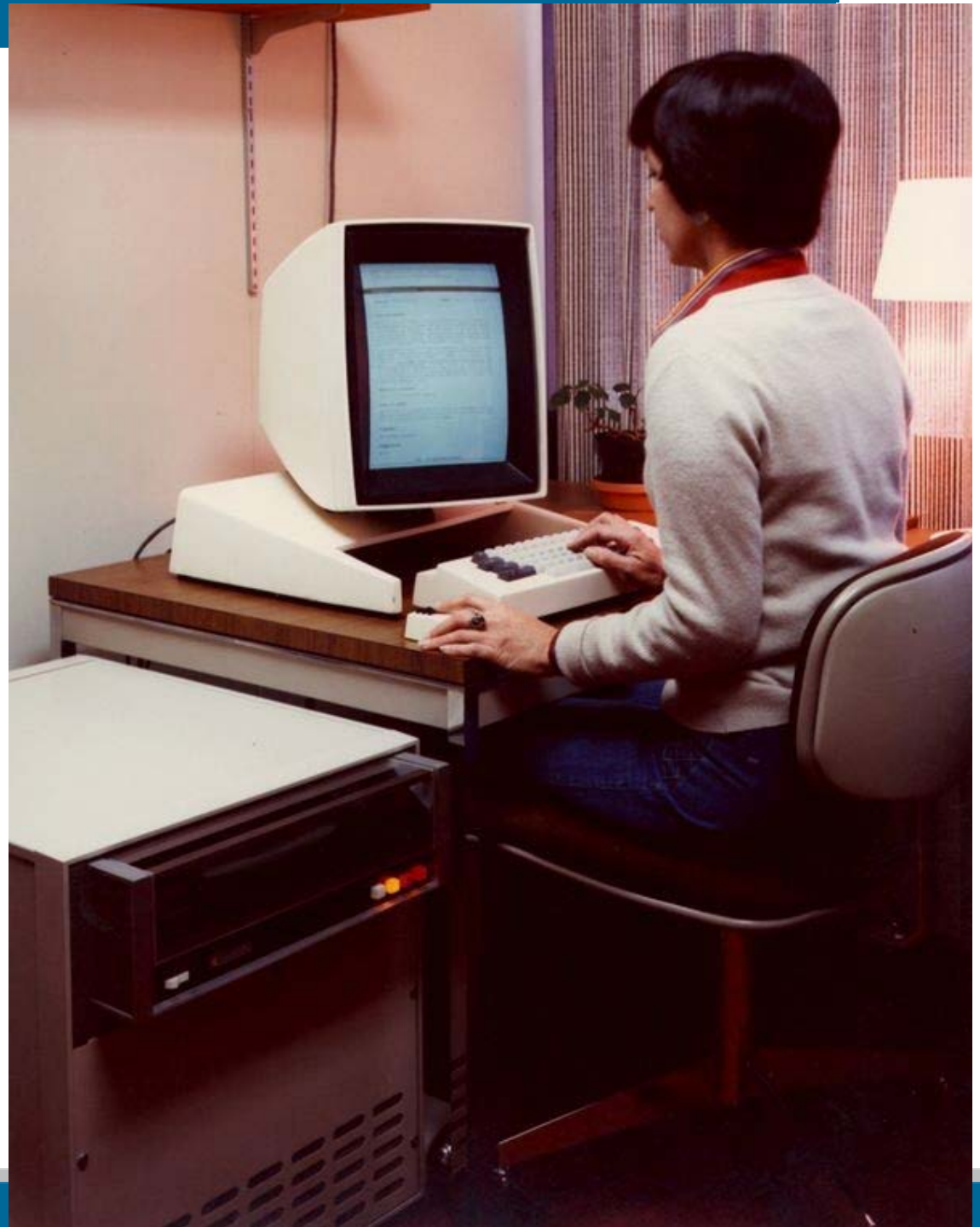
- *John Shoch*
  - *14 years at PARC and Xerox*
    - *Developed workstations and networking products*
  - *30 years as a Venture Capital investor*
  - *Past Trustee of the Computer History Museum*

The Xerox Alto Establishes Personal Networked Computing, 1972-1983

- *Larry Clark, Chuck Thacker, Alan Kay, and Ed McCreight with prototype Alto*
- *Cookie Monster drawn by Alan Kay: very early Alto image made with Steve Purcell drawing software*

The Xerox Alto Establishes Personal Networked Computing, 1972-1983

Jan Murphy, using the Bravo WYSIWYG editor on an Alto

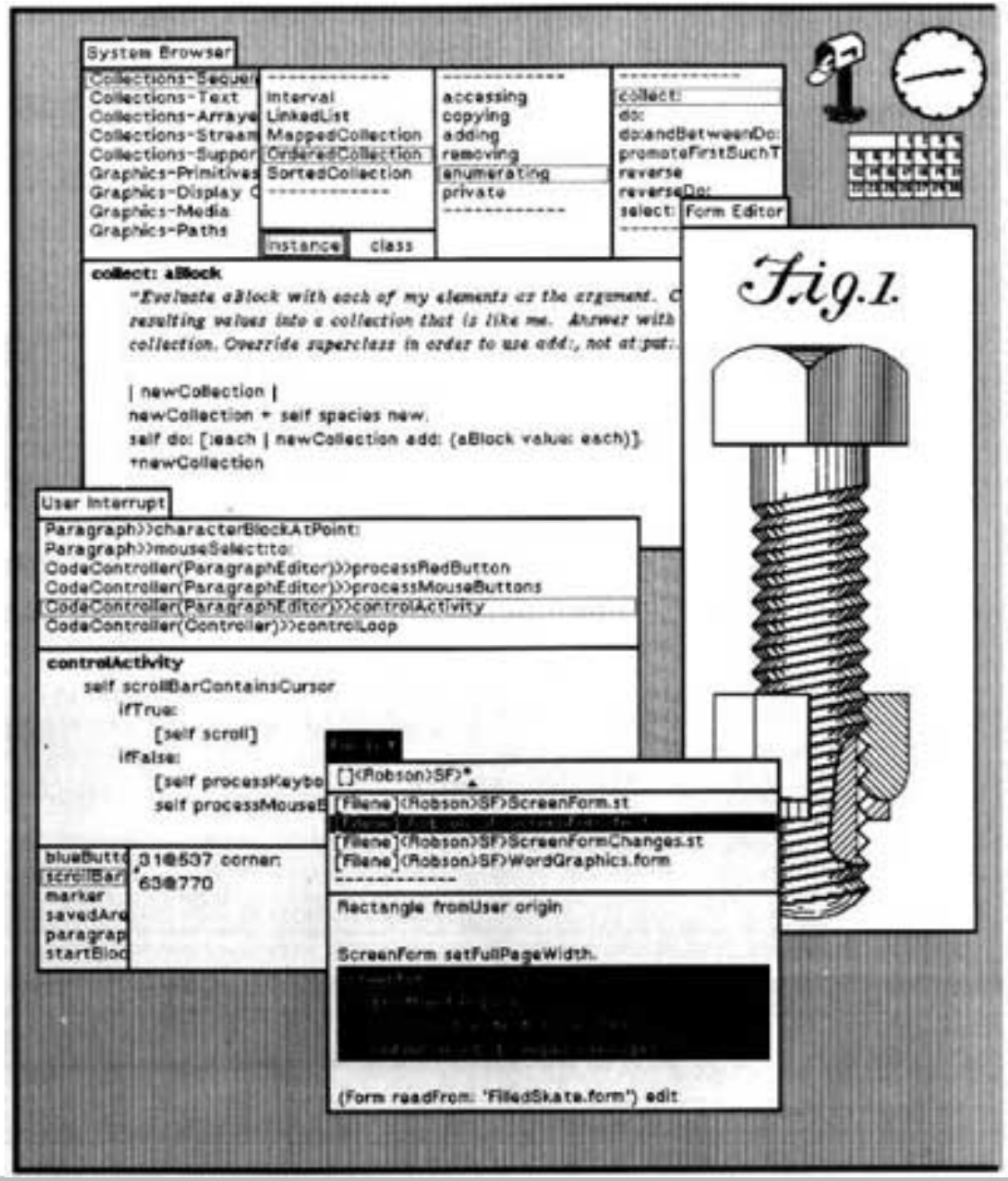


The Xerox Alto Establishes Personal Networked Computing, 1972-1983

A fleet of production Altos being prepared for a major demonstration

The Xerox Alto Establishes Personal Networked Computing, 1972-1983

- *Smalltalk is a purely object-oriented programming (OOP) language*
- ***Smalltalk environment on an Alto:*** *multiple overlapping windows with text, graphics and icons*

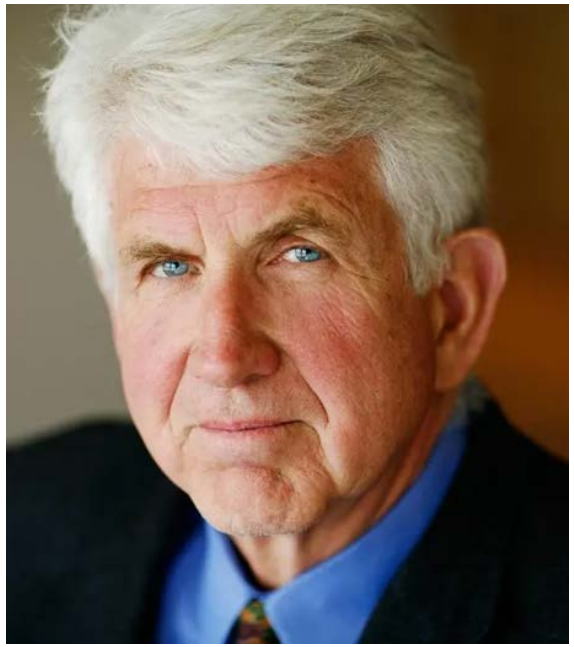


The Xerox Alto Establishes Personal Networked Computing, 1972-1983

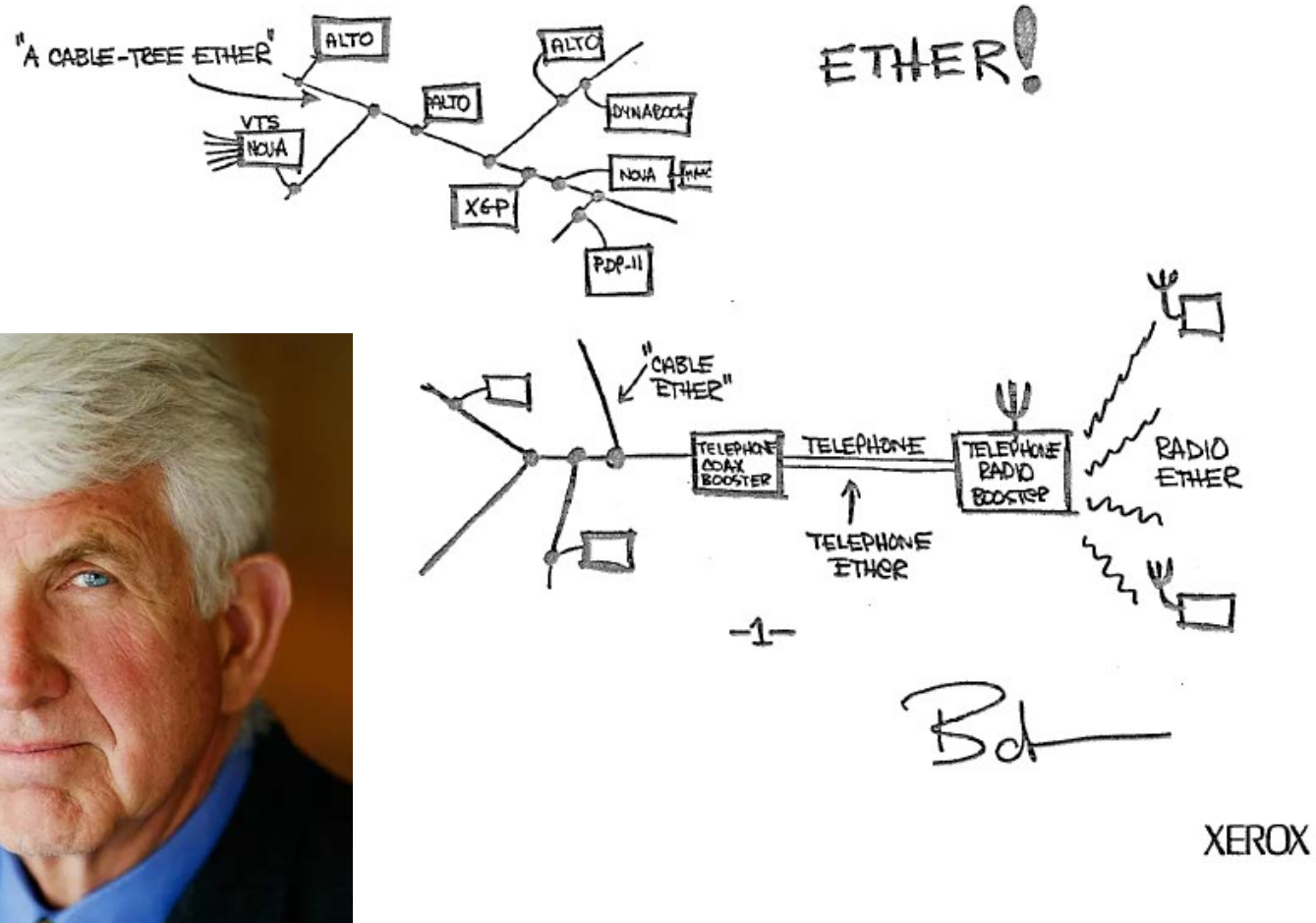
Chuck Thacker and Ron Cude, years later with an Alto

Ethernet Local Area Network (LAN), 1973-1985

The Ethernet Milestone was dedicated at PARC on Friday. A duplicate here at the CHM is the 21st duplicate plaque.



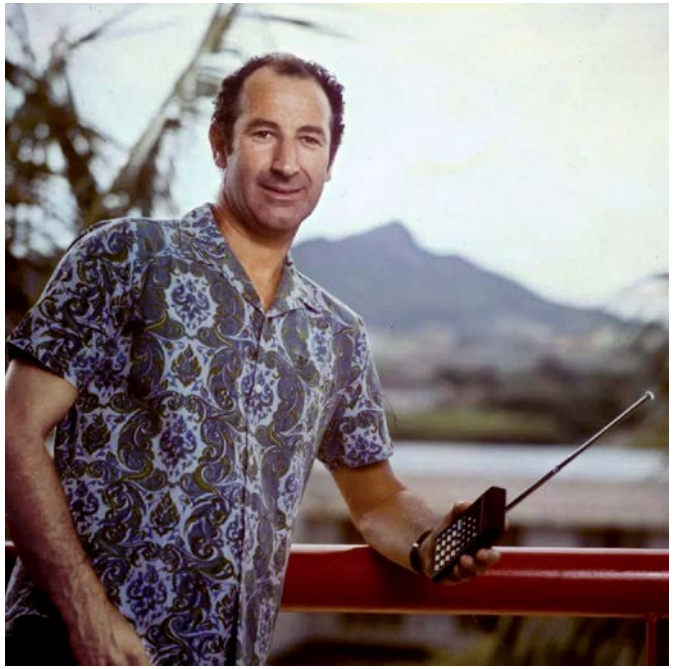
Bob Metcalfe is co-inventor of Ethernet with David Boggs at Xerox PARC in 1973



ALOHAnet and the Random Access Protocols

- *1966: Frank Kuo became Professor at Univ. of Hawaii*
- *1968-71: Kuo and Norm Abramson were key developers of the ALOHA packet radio network, also called ALOHAnet*
- *ALOHAnet featured random access protocols*
  - *Later used by Ethernet, Wi-Fi, cell phones, and satellite networks*

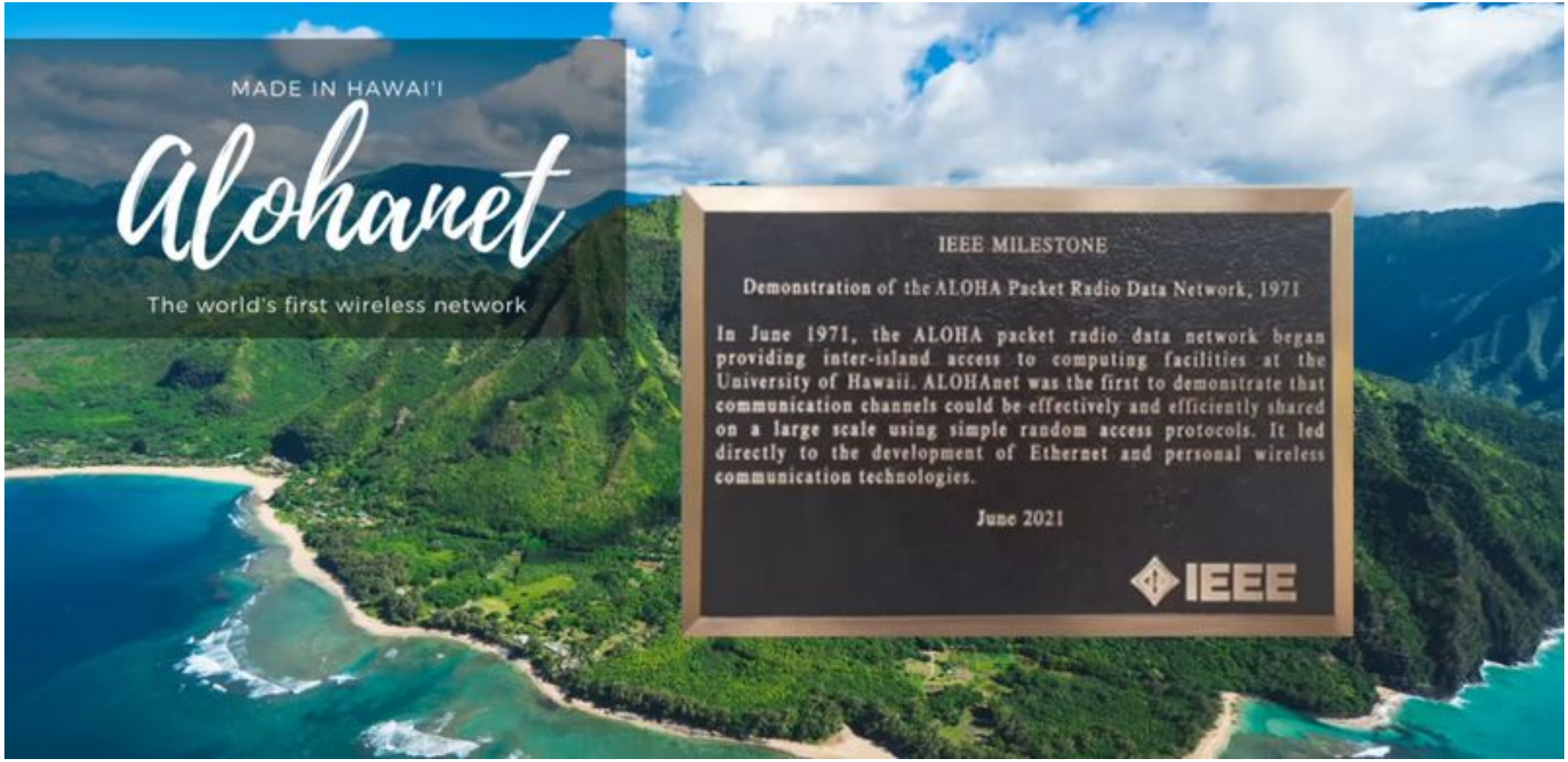
Frank Kuo



Norm Abramson

Demonstration of the ALOHA Packet Radio Data Network, 1971

This is the 19th duplicate plaque



From the Past 50 Years to the Next 50

CHM Computer History Museum

Dan'l Lewin: President, Computer History Museum

Marc Weber: Curatorial Director, Internet History Program

The Imagination Workshops:
A Future Where All Can Participate

Mei Lin: Co-Founder (with Vint Cerf):
People-Centered Internet

People-Centered Internet

Jascha Stein:
Executive Chair, People-Centered Internet





IEEE MegaTrends – Their Impacts for Humanity

Closing Remarks - Tim Lee

Boeing Technical Fellow

IEEE-USA President-Elect

Computer History Museum

ieee.org

IEEE
Advancing Technology for Humanity

Timothy Lee

Boeing

Timothy Lee, a Boeing Technical Fellow based in Southern CA, leads the development of disruptive microelectronics technologies for advanced communications networks and sensor systems for airborne and space applications. His current research interests include silicon Application Specific Integrated Circuits (ASICs), gallium nitride Monolithic Microwave Integrated Circuits (MMICs), and 3DIC technologies for vertical integration of digital Si chiplets and analog/RF devices. He led the development of hardware for satellite communications and has built phased-array antenna electronics for commercial and US government customers. He is the 2024 IEEE-USA President-Elect and is seeking collaboration on semiconductor Work Force Development.

#ConnectivityMatters

IEEE

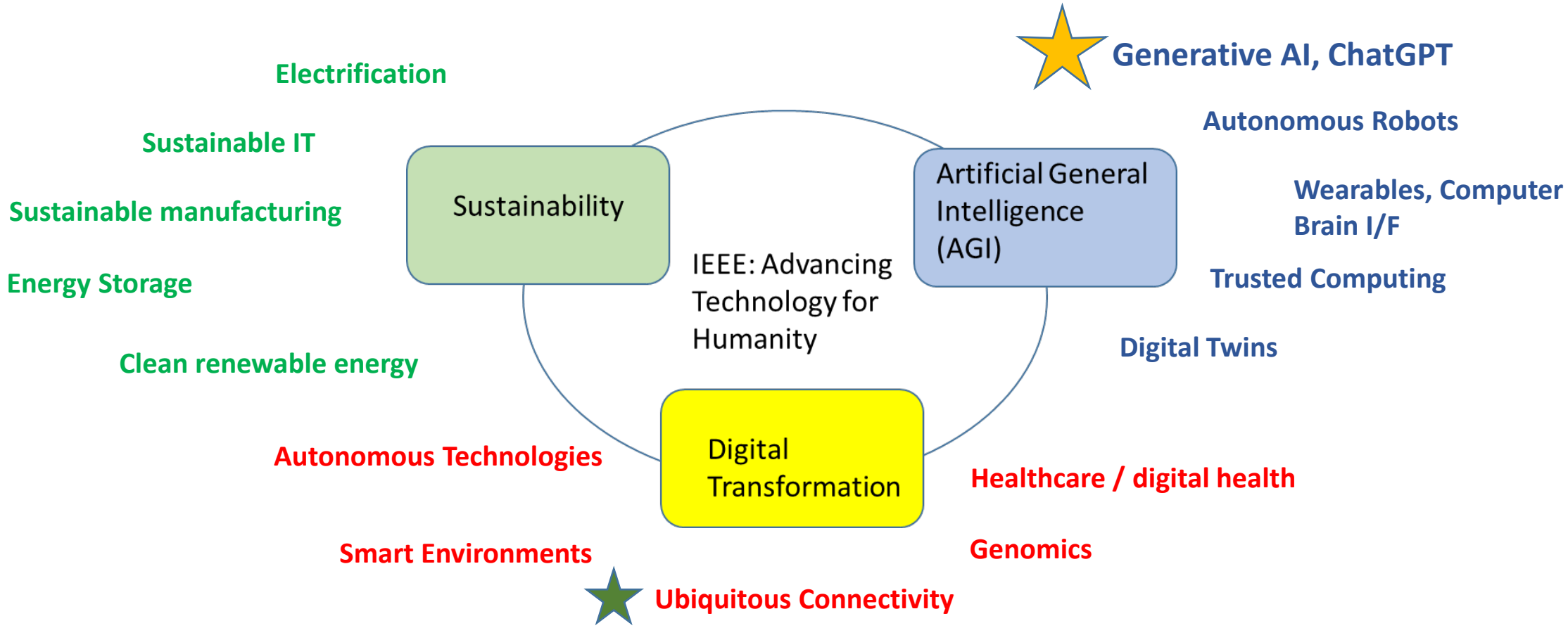
Summary

IEEE MegaTrends – where is technology headed? Which ones will have greatest impact for humanity?

- Outline
- IEEE MegaTrends – where is technology headed? Which ones will have greatest impact for humanity?
  - Artificial Intelligence
  - Sustainability
  - Digital Transformation
- AGI is the dominant MegaTrend
- Ask the question: Humanity's Downturn or Unlimited Prosperity?

IEEE MegaTrends 2024

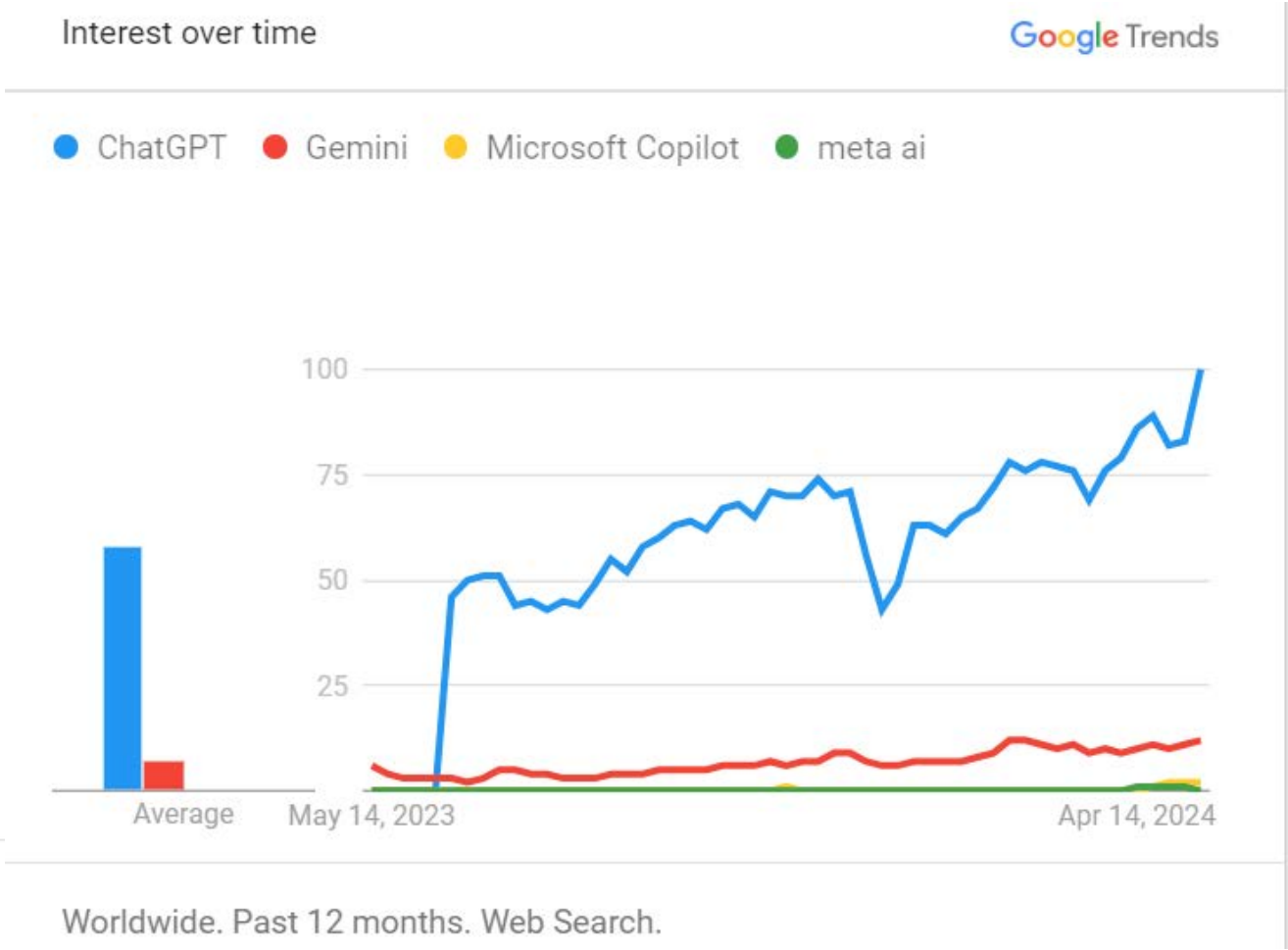
What are the Impacts on Society and Probability of Technology Success?



https://www.computer.org/resources/2024-top-technology-predictions

Megatrends vs Google Trends (Worldwide)

Inquiry made 16 May 2024



- Dominant Trend is Artificial Intelligence (100)
- Sustainability distant second (10)
- Digital Transformation (1)

Chatpgpt-4o: any combination of text, audio, image, and video

Gemini

Copilot

Your everyday AI companion

Meta AI

Artificial General Intelligence: Humanity's Downturn or Unlimited Prosperity

- Generative artificial intelligence (AI), exemplified by foundation models such as large language models, has become a focus of the technical and nontechnical communities alike. The results delivered by Generative AI have given the impression that we are now very close to an Artificial General Intelligence, AGI. The world seems to be split among those who foresee big opportunities and those who anticipate big threats.
- **IEEE's tagline is "advancing technology for the benefit of humanity**
- Will artificial general intelligence (AGI) lead to an optimistic vision of a future mostly free of human labor, with a more sustainable environment and ample resources distributed equitably? On the other end, pessimists warn of a future where humans are ruled or eliminated by machines.
- Sam Altman, the chief executive officer of OpenAI, the company behind the wildly successful ChatGPT, recently warned that AGI may be only a decade away and "cause grievous harm to the world."

AI is a powerful tool that, for the first time in human evolution, provides the means to improve analyses, thinking, decision capabilities, and, arguably, creativity.

https://www.computer.org/csdl/magazine/co/2023/10/10255223/1QzypCsRrgs

AGI as a Megatrend

Technology Must Serve Humanity!

		How megatrend benefits		
		Digital transformation	Sustainability	AGI
How megatrend contributes	Digital transformation		• More control points • Clear separation and models • Opportunity to automate	• Broader set of applications • Edge-to-cloud integration
	Sustainability	• More incentives to transform • Cheaper transformation		• More powerful AGI • Broader adoption • Stretching limits
	AGI	• More effective transformation • New ways of transformation	• Novel ways to improve • Improved anomaly detection	

https://www.computer.org/csdl/magazine/co/2023/10/10255223/1QzypCsRrgs

Bridging the Global AI Gap: Navigating Generative AI in Developing Regions

- At the 9th Multi-Stakeholder Forum on Science, Technology and Innovation for the SDGs (STI Forum), ITU held a side event together with IEEE and Uganda on **Bridging the Global AI Gap** to address the challenges and opportunities of AI. Need to build a trusted standardization process via collaboration with IEEE and other standards bodies is crucial as we strive to bridge the global AI gap. (10 May 2024, UN)
- Participants:
- **H.E. Mr. Godfrey Kwoba, Ambassador, Deputy Permanent Representative of the Republic of Uganda to the United Nations in New York**
- **Ms. Doreen Bogdan-Martin, Secretary-General, ITU**
- **Ms. Kathleen Kramer, IEEE President-elect**
- **Mr. Lwanga Herbert, Chair of IEEE Humanitarian Technologies Board (IEEE HTB)**
- **Ms. Karen McCabe, Senior Director Standards Association, IEEE**
- **Mr. Ryan Palmer - Global Digital Equity Strategist and Director Airband US, Microsoft**
- **Moderator: Ms. Mariela Machado Fantacchiotti, Senior Director Humanitarian Technologies, IEEE**

The emergence of Generative AI, the new wave of artificial intelligence, presents unique challenges to inclusivity, especially in regions with low bandwidth connectivity and limited digital literacy.

https://sdgs.un.org/tfm/STIForum2024

IEEE Humanitarian Technology Board

Advancing Technology for Humanity

- The **IEEE Humanitarian Technologies Board (HTB)** inspires and empowers IEEE volunteers around the world carrying out and supporting impactful humanitarian technology activities at the local level.
- The IEEE HTB mission is to support impactful and ethically informed volunteer-led initiatives, programs and projects, and mutually beneficial partnerships, as well as to inform policy formulation that harness technology and innovation to address societal challenges (including disaster recovery) in a responsive, effective, and sustainable way.
- The IEEE Tech4Good program offers funding opportunities to support grassroots technological projects, led by IEEE members, that address local challenges related to sustainable development.

#Tech4SDGs #AI4Good **#Tech4Good**

https://htb.ieee.org/funding-opportunities/tech4good/

https://htb.ieee.org/

Closing Remarks

Brian Berg, Your MC

Mei Lin Fung

Chair, i50 IEEE

Co-Founder with Vint Cerf:

People-Centered Internet

Reception and Photo Opportunities in the Front Courtyard