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PARC History

On January 4, 2002, the **Xerox Palo Alto Research Center becomes Palo Alto Research Center Incorporated**. As an independent company, PARC is poised to deliver research and innovation to industry leaders in many fields.

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2000

Gyricon Media Inc. (GMI) is spun out to commercialize PARC's "electronic reusable paper," a document display technology that is thin, flexible and portable like paper but can be connected to a network and reused thousands of times. When an electric charge is applied to it, the material displays and changes text and graphics, so the display can be updated with a click of a mouse. GMI will become a leading provider of SmartPaper™ innovations and signage solutions.

ContentGuard, a joint venture between Xerox and Microsoft, is spun-out to develop and license software for digital rights management. ContentGuard solutions offer content owners more control and flexibility over the distribution of their content. Its eXtensible rights Markup Language (XrML) digital rights-management software, developed at PARC, authorizes access to content or a network service in a language that multiple systems can read.

GroupFire is spun out to commercialize almost 70 PARC intellectual property claims covering information retrieval and data mining, natural language semantic analysis, and artificial intelligence. GroupFire enables personalized and simplified Internet searches by managing bookmarks and allowing access to them from any computer that is connected to the Internet. GroupFire will later become Outride, Inc. Its intellectual property assets and technology will be acquired by Google.

1999

The **ACM SIGMOBILE Award is given posthumously to PARC's Chief Technology Officer** in recognition of his numerous sustained contributions and visionary leadership in the field of ubiquitous computing.

Building on ubiquitous computing research from PARC and the Xerox Research Centre Europe, the **MobileDoc™ software and services solution is launched**. MobileDoc™ supports the work of mobile professionals by providing streamlined access to remote documents. Using a mobile browser with infrared or radio to communicate wirelessly, a user can access, print, fax and scan documents.

1998

Uppercase, Inc. is spun-out to commercialize a result of ubiquitous computing research: a lightweight, portable document reader (PDR) which includes a display, computer processor, battery and network connections for document access and viewing. Microsoft will acquire the company in the future.

1997

PARC enables Xerox to be the **first printing company to create a blue laser**. The

reduced wavelength of a blue laser may ultimately allow much higher-resolution printing than is possible with today's standard red and infrared lasers.

Initially led by a team of PARC researchers, the **HTTP-NG Internet protocol is developed**. The protocol is based on Inter-language Unification (ILU) from PARC.

1996

Inxight Software, Inc., is spun out. Inxight provides information visualization and knowledge extraction software to help users access and make sense of large amounts of information on the Internet. Its software commercializes the results of PARC's unique approach to the visualization of information that uses a hyperbolic browser and other focus-plus-context visualization techniques to give the user 3-D views of text databases.

Research on how a sense of place can create more meaningful interaction on the Internet results in a **spin-out company called Placeware**, in which Xerox holds a partial interest. PlaceWare provides users with a live, Web-based presentation solution for field and customer communication. It will become the largest Internet meeting solutions provider.

Built on early work on amorphous silicon (a-Si) thin-film transistors, **PARC spins off dpiX** to commercialize the world's highest resolution active matrix liquid crystal display (AMLCD) monitors, making a flat panel display that's as easy to read as paper; a digital x-ray system that replaces the film used on medical imaging; and a generation of "flash scanners," capable of scanning a document in a fraction of a second.

1995

A **PARC computer scientist** continues playing a lead role in designing the protocols that govern and define how the Internet works when he **collaborates** with an Australian computer scientist **in the design of IPv6** (Internet Protocol version 6).

PARC's multi-beam lasers are in use in Xerox's DocuTech, DocuPrint and Document Center product families as well as numerous products from Fuji Xerox. These lasers are a key component of achieving the high-speed, high-resolution print quality for which these product lines are known.

Mid-90s

Constraint-based scheduling technology is developed. This technology uses intelligent modeling to create real-time machine control, providing the planning software that enables Xerox's DocuCenter "plug and play" family of copiers. It gives Xerox a competitive hardware advantage by enabling very effective and efficient machine control at customers' sites. These reusable models also improve time to market and performance quality.

1994

Social scientists' and ethnographers' observations of customers using copiers and copier technicians repairing them provides tools for generating information systems that enable productivity and learning through lateral communication. One tool is the **Eureka** initiative, a database system for supporting collaboration and knowledge sharing in the Xerox field service community. The system **helps over 20,000 Xerox technicians worldwide improve the quality of their service** and dramatically increase customer satisfaction. It will enable Xerox to save approximately 5% of its field service cost and to win awards for its leadership in the realm of knowledge sharing.

1993

DocuPrint, the software used to drive Xerox's high-end network printing strategies, is created. Based on a legacy of knowledge in higher-level languages, integrated software for page description, and device-independent imaging, the **software is developed in less than six months as a tactical release**. It will become the cornerstone of Xerox's network printing strategy.

Beating out the Rolling Stones by twenty minutes, **PARC's Chief Technologist and his band are the first musical group to perform live on the Internet**. Two PARC researchers provide engineering for the event.

1992

Six **researchers receive an award from the Association of Computing Machinery (ACM) for their work on the Interlisp programming language.** The award is given to an institution or individual(s) recognized for developing a software system that has had a lasting influence, reflected in contributions to concepts, in commercial acceptance, or both.

Xerox PaperWorks software, which uses PARC's DataGlyph technology to link users with personal computers from remote locations through fax machines, **is released.** By faxing customized PaperWorks forms, users can instruct their PCs to retrieve, store, distribute and organize documents. The software bridges paper documents and computer-based technologies, turning the PaperWorks forms into a computer interface.

PARC plays a leading role in designing the protocols that govern and define how the Internet works. **The MBone, the multimedia multicast backbone of the Internet, is co-founded and first implemented at PARC** to deliver real-time audio and video over the Internet.

LiveBoards, shared electronic whiteboards for collaboration, are on display at Comdex and in operation at EXPO'92 in Seville, Spain. LiveWorks is spun out to bring LiveBoards to the marketplace.

Fully interconnected versions of the **LiveBoard** (an electronic whiteboard), **PARCPad** (a notebook-sized device) and **PARCTab** (a pager-sized device) **communicate wirelessly using infrared signals.** This research on ubiquitous computing will, in the future, lead to the formation of three Xerox entities: Mobile-Doc™, LiveWorks and UpperCase.

1991

The **Xerox 5100 copier**, which makes 66 11x17-inch copies per minute (the industry's fastest) and 100 letter-size copies per minute, is released. The copier **utilizes amorphous silicon thin-film transistor technology** developed at PARC.

1990

PARC's first x-ray imager using amorphous silicon is built. Research on digital x-ray imaging and document scanning using flat panel, print-quality display technology will result in the formation of a Xerox New Enterprise Company, dpiX.

Semaphore Communications is spun-out to bring advanced encryption systems for networks technology to the marketplace. A distinguishing feature of this technology is that it performs encryption in the hardware, which makes it faster than most software-based products. Within the first year, sales reach \$1million.

Documentum is spun-out to commercialize document management solutions. Documentum software enables a change made in one place in a document to be automatically replaced in all appropriate places in a document. This software greatly improves document management processes for Xerox customers, particularly in the document-intensive pharmaceutical, insurance, and automotive industries.

A **PARC computer scientist creates LambdaMOO, a multi-user domain (MUD)**, as an experiment in collective programming and creation to see how a sense of place can create more meaningful interaction on the Internet. This research will later result in the formation of a spin-out company, Placeware, and the technology will become the foundation for a collaborative computing systems for the U.S. Dept. of Defense. LambdaMOO will become one of the oldest continuously operating MUDs.

Xerox DocuBuild publishing software, which enables workgroups to collectively manage and contribute to the publishing process, is released. The software **provides industry-first high-speed pagination and compound document WYSIWYG support of the Standard Generalized Markup Language.**

Xerox ViewCards, a multi-purpose hypertext software tool that organizes and shows relationships among large amount of computerized textual and graphical information, **is**

released. The product uses Notecard technologies, originally invented at PARC as an idea-processing tool for information analysts.

The **National Security Agency endorses the Xerox Encryption Unit**, an electronic device that mathematically encodes computer signals so they may travel in top security on ordinary local-area networks. The device is built on encryption research done at PARC.

A LiveBoard is installed in PARC's Colab, an experimental meeting room created to enhance collaboration during meetings. **The LiveBoard** is a blackboard-sized touch-sensitive screen capable of displaying an image of approximately a million pixel with a stand-up keyboard and an electronic "pen." This **collaborative tool enables colleagues both locally and in remote locations to work together using real-time, multi-media documents.** It will later spawn the LiveWorks business unit.

1989

Five **PARC computer scientists receive the ACM Software Systems Award for their work on PostScript.** The Award is given to an institution or individual(s) in recognition for developing a system software that has had a lasting influence, reflected in contributions to concepts, in commercial acceptance, or both.

PARC develops a unique approach to the visualization of information that uses people's perceptual and cognitive capacities to help them deal with large amounts of information. The approach is used in 3-D Rooms and is an integral technique used in the Xerox product Visual Recall. It results in the invention of the hyperbolic browser and other focus-plus-context visualization techniques that give the user three-dimensional views of text databases. These visualization techniques offer a revolutionary way for people to access information on the Internet and will later result in the formation of a PARC spin out, Inxight Software, Inc.

The Xerox Encryption Unit, an electronic device that **mathematically encodes computer signals so they may travel in top security on ordinary local-area networks is released.** The device, built on encryption research done at PARC, will be endorsed by the National Security Agency within a year.

PARC becomes a world leader in the development of embedded data schemes.

Glyphs, which transform paper into a user interface, are used in many applications including data verification and finishing applications. DataGlyph technology to link users with personal computers from remote locations through fax machines, will later be released in the Xerox PaperWorks software product.

Research on amorphous silicon (a-Si) will lead PARC scientists to develop a-Si thin film transistors and sensors that will become the backbone for several technologies commercialized in a spin out to manufacture computer displays that are as easy to read as paper.

Late '80s

Text support in the Xerox 8010 STAR Information System using a 16-bit coding system designed to represent any of the world's scripts in documents, user names, file names and network services **is completed.** They are representable in any combination with a single encoding. This multilingual technology is the origin of the ISO/IEC 10646 and correlated Unicode text encoding standards that will become the default representation of text worldwide on the Internet and in globalized operating systems.

1988

Revolutionary work begins in building fundamental mobile devices (the palm-sized PARCTabs and the book-sized PARCPads) and a flexible computational infrastructure to create an environment of embedded computation. This work will substantially precede many of the wireless infrastructures, devices and applications in today's marketplace. The term "ubiquitous computing," coined at PARC to describe this work, will become industry-standard terminology to refer to an environment in which portable, connected computational tools are pervasive. Three Xerox businesses will later be formed from this research: Mobile-Doc, LiveWorks and Uppercase.

The **Smalltalk-80 object-oriented programming language is commercialized** through

the formation of ParcPlace Systems. First deployed in 1972, Smalltalk was the first object-oriented programming language with an integrated user interface, overlapping windows, integrated documents, and cut & paste editor. The business, formed to market products based on the Smalltalk-80 programming environment and to further develop and support Smalltalk-80 standards, will later become ObjectShare.

The Xerox 8836 engineering laser plotter, **the first wide-format engineering laser plotter, is released**. The plotter uses amorphous silicon high-voltage transistors for print heads developed at PARC.

The **Xerox Pro Illustrator**, an application for the ViewPoint software, is licensed. The program **allows professional artists to create two-dimensional, vector illustrations and edit graphics**. One product enabler is PARC's research on page description languages.

1987

The **Colab, a PARC meeting room that provides computational support for collaboration in face-to-face meetings, is completed**. The room has a personal computer for each participant that is linked to each other via the Ethernet to support a distributed database. To promote shared viewing and access to what is written during meetings, Colab software uses a multi-user interface called WYSIWIS (What-You-See-Is-What-I-See), but it also supports private windows which correspond to personal notepads. This work on collaborative tools will result in the development of a product for document-based group collaboration and the spinning out of the LiveWorks business unit.

Three **PARC researchers receive the ACM Software Systems Award for their work on the Smalltalk programming environment**. The Award is given to an institution or individual(s) in recognition for developing a system software that has had a lasting influence, reflected in contributions to concepts, in commercial acceptance, or both.

1986

Xerox's printing business, made possible by PARC's invention of laser xerography, **reaches \$1billion per year**.

Xerox spin-off, **Microlytics, brings PARC's artificial intelligence spell-checking software, linguistic, and data compression technologies to market** through its release of TypeRight. TypeRight is an electronic accessory for Xerox's 600 Series Memorywriter typewriters to check spelling and correct typographical errors.

The **Xerox 4050 laser printer**, which incorporates the latest innovations in lasography, electronics and xerography, is released. The printer **produces typeset-quality text and graphics at 50 pages a minute, and can be linked to host computers or clusters of workstations**. In addition to employing the results of PARC's research on data transmission, storage, and laser imaging technologies, cognitive modeling systems were used in its design.

Three years after its founding, **Spectra Diode Labs (SDL) becomes the world leader in high-power solid-state lasers**. SDL is a Xerox and Spectra-Physics joint venture formed to exploit PARC's gallium arsenide-based solid-state laser research by manufacturing state-of-the-art laser diodes.

PARC is the home of the world's first multi-beam lasers. Because the laser emits two beams rather than a standard single beam, it prints twice as fast. These lasers will enable Xerox's fastest printing systems and will be used in Xerox's DocuTech, DocuPrint and Document Center product families as well as numerous Fuji Xerox products. The multi-beam lasers are a key component of achieving the high-speed, high-resolution print quality for which these product lines are known.

1985

Synoptics Communications, Inc. is spun-out to commercialize fiber optic media for the Ethernet. Within three years Synoptics will have its original public offering. It will later become Bay Networks, and then be acquired by Nortel.

Xerox spins out Microlytics to commercialize PARC's early compression technology

research by bringing artificial intelligence spell-checking software, linguistic and data compression technologies to market. Based on an understanding of the deep structure and mathematical properties of language, linguistic compression technology is used for visual recall, intelligent retrieval and data compression. This work has a major impact on the automatic processing of language structures and is one of the key research areas underpinning Xerox's multilingual suite of products.

The Xerox 1185 and 1186 **Artificial Intelligence (AI) Workstations**, intended for the design, use and delivery of AI software and expert systems, are released. These artificial intelligence machines **use the Interlisp-D programming environment and computer techniques developed at PARC** to duplicate the human cognitive process of problem solving.

The **Xerox 6085 Professional Computer System that runs PC programs and has advanced ViewPoint software document-processing capabilities, is released**. The product builds on a foundation of PARC's Alto personal workstation and has features and performance capabilities beyond that of the previously released 8010 STAR Information System.

1984

Three **PARC computer scientists receive the ACM Software Systems Award for their work on the Alto personal workstation**. The award is given to an institution or individual(s) in recognition for developing a system software that has had a lasting influence, reflected in contributions to concepts, in commercial acceptance, or both.

The **solid-state laser from Xerox and Spectra-Physic's joint venture, Spectra Diode Labs, Inc., is selected as the outstanding product of the year** by "Lasers and Applications" magazine.

Mid '80s

Using the Interlisp-D environment, **PARC researchers develop Trillium and Pride expert systems for artificial intelligence programming**. Trillium enables the quick simulation of new user interface designs. Pride captures engineers' experiences and "rules of thumb" for designing paper paths using pinch rollers.

Xerox markets Lisp workstations that use the Interlisp-D programming language to support artificial intelligence programming as well as applications utilized within Xerox. Developed as a computing environment for research in cognitive science, Interlisp-D combines ideas for rapid prototyping with explicit knowledge representation. With the Loops object-oriented extensions, it will be used to develop a number of valuable knowledge-based systems for Xerox.

1983

The **Superpaint frame buffer wins Xerox and its inventor an Emmy award**. The frame buffer enabled faster processing of memory intensive animation and graphics for the Alto and 8010 STAR's personal workstations' advanced graphical user interfaces.

PARC's gallium arsenide-based solid-state laser research results in hundreds of patents to date. To exploit this work, Spectra Diode Labs, Inc. (SDL), a joint venture between Xerox and Spectra Physics, Inc., is formed. SDL will develop, manufacture, and market high-power state-of-the-art solid-state semiconductor laser diodes and will become the industry's world leader.

A one-inch array of amorphous silicon thin-film transistors to drive a small corjet ionographic print head is made. This technology will have many applications in printing and input scanning, and will lead to an architecture to enable a low-end multifunction machine which can print, scan and copy.

1982

An **optical cable local area network is designed**. Fiber optic media for the Ethernet will later be commercialized through the spin out company Synoptics Communications, Inc.

The **100,000-square foot addition** to the 3333 Coyote Hill site **is completed**.

A **multiple-stripe principle for high continuous power for solid-state lasers is demonstrated**. One-watt optical power (up 20X) is achieved. This tiny solid-state laser device has a higher radiation power output than has been achieved anywhere else in the world. Higher output lasers will be incorporated in Xerox copiers and printers.

The **Xerox 8700 electronic printing system**, which produces and prints computer-generated text, business forms and other images at 70 pages per minute, is released. The system **includes high-speed electronic storage system, page description language, acousto-optical modulation, and Ethernet technologies from PARC**.

The Xerox 1075 copier/duplicator, which uses the Ethernet principal to facilitate varying the document handling and output sorting configurations, is released. **Xerox's 10 Series Marathon copiers are the first to use numerous built-in microcomputers with a low-bandwidth Ethernet as the communications interface**.

The IEEE adopts a standard that is almost pure Ethernet. The Ethernet standard spawned a series of increasingly sophisticated networking protocols that not only enabled distributed computing, but led to a re-architecting of the internal computer-to-computer communication within Xerox copiers and duplicators. The Ethernet will become the global standard for interconnecting computers on local-area networks.

1981

At a Chicago tradeshow, **Xerox unveils the 8010 STAR Information System. PARC's Alto personal workstation is the foundation for this product**. The 8010's features include all of the Alto's capabilities plus multilingual software, the Mesa programming language, and interim file servers. The system allows users to create complex documents by combining computing, text editing and graphics, and to access file servers and printers around the world through simple point-and-click actions, a functionality that has yet to be matched by today's computing systems.

1980

Optimem is spun out to commercialize non-erasable magneto-optical storage device technologies originally developed to enable high-speed access of information for the Alto. Optimem later becomes Cipher Data Products.

The **Xerox 8000 network system**, which allows the assembly of an integrated office network in which users can electronically create, process, file, print and distribute information, is released. The system **uses PARC's Cedar file system and Interim File System (IFS), Ethernet and electronic mail technologies**.

The **Xerox 5700 laser printer system** is released. The printer **combines, into one unit, copying capability with several PARC innovations**: acousto-optic modulation, word processing, electronic mail, and remote computer printing via Ethernet.

The **Interpress page description language (PDL), that allows workstations to communicate with multiple printers, is completed**.

Xerox, Intel and Digital Equipment Corporation jointly issue a formal specification for Ethernet, making it publicly available for a nominal licensing fee. Ethernet will become the global standard for interconnecting computers on local-area networks.

Software copyright for the **Smalltalk-80 object-oriented programming language** is filed. It **is one of only three software copyrights existing at the time**. The language is licensed to universities and commercial institutions. Smalltalk is the first object-oriented programming language with an integrated user interface, overlapping windows, integrated documents, and cut & paste editor. Smalltalk will later be commercialized when Xerox spins out ParcPlace Systems.

1979

Linguistic technology to enable spell checkers, a Thesaurus and reverse dictionary applications is developed. It will be employed in the future Xerox Memorywriter typewriters and 8010 STAR Information System

Xerox's Office Products Division announces that **all future Xerox products will communicate through Ethernet.**

Nearly 1,000 Alto personal workstations have been built and **are in use throughout Xerox, linked by Ethernet local area networks (LANs)** and gateways. **Another 500 are in use in universities and government offices.**

Late 1970s

The **Network Architecture IFS "interim file server" code is completed.** Along with the development of Ethernet, Alto and research prototypes of networking protocols for distributed computing, this leads to the development of XNS, Xerox's robust, leading-edge networking protocol. This technology will be incorporated in the future Xerox 8010 STAR Information System.

1978

A **"worm" program**, the term used for a computer program that searches out other computer hosts, then copies itself and self destructs after a programmed interval, **is invented by two PARC researchers.**

The **Dorado, a high-performance personal computer, and Notetaker, a suitcase-sized machine** that will become the forerunner of portable computers, **are completed.**

1977

The **Xerox 5400, the first Xerox copier/duplicator with a built-in diagnostic microcomputer, is released.** The machine connects to the Ethernet to enable computer-to-computer communications using protocols invented at PARC.

The Xerox 9700 Electronic Printing System, the first xerographic laser printer product, is released. The 9700, a direct descendent from the original PARC "EARS" printer which pioneered in laser scanning optics, character generation electronics, and page-formatting software, **is the first product on the market to be enabled by PARC research.** Electronic printing enables seamlessly transferring digital documents into the paper domain, and changes the entire notion of documents and document processing. Xerox's laser xerographic printing business will reach \$1billion per year by 1986.

A PARC Lab Manager and her colleague begin drafting the **"Introduction to VLSI Systems" textbook.** The book **is written and typeset on PARC's desktop publishing system.** Very large scale integration (VLSI) integrated circuit design will provide greater computing power in more compact machines, lead to a new generation of computer-aided design (CAD) tools and reduced design time, and make dramatic improvements in system functions.

1976

Personal distributed computing, client/server architecture, and laser printing is commercialized in Alto personal workstation probes at the White House and universities.

The **Dover-Alto software character generation laser raster output scanner (ROS) prototype printer is developed.** Electronic printing on laser printers will provide a means of seamlessly transferring digital documents into the paper domain.

1975

PARC's current site at 3333 Coyote Hill Road in Palo Alto, California is completed in February at a size of 100,000 square feet; the doors **officially open on March 1.**

Engineers demonstrate a graphical user interface for a personal computer, including icons and the first use of pop-up menus. This interface will be incorporated in future Xerox workstations and greatly influence the development of Windows and Macintosh interfaces.

1974

The first distributed feedback (solid state) laser using gallium arsenide (GaAs), a material of considerable electronic interest, **is demonstrated.** This work will later result in a joint venture between Xerox and Spectra Physics to manufacture high-power solid-state lasers.

A **software document architecture that enables device-dependent aspects of imaging to be cleanly separated from generic imaging operations** is designed. This printer-independent interface leads to Page Description Languages (PDLs) that enable the construction of documents from higher-level sources. They are the intermediaries between tools for creating documents and devices for displaying them. Press, the first PDL, is developed by PARC scientists and greatly influenced the design of Interpress and Postscript.

The **Bravo word-processing program is completed, and work on Gypsy, the first bitmap What-You-See-Is-What-You-Get (WYSIWYG) cut & paste editor, begins.** Bravo and Gypsy programs together represent the world's first user-friendly computer word-processing system.

BITBlit, an algorithm that enables programmers to manipulate images very rapidly without using special hardware, is invented. The computer command enables the quick manipulation of the pixels of an image and will make possible the development of such computer interfaces as overlapping screen windows and pop-up menus.

1973

Ground breaking for PARC's current site at 3333 Coyote Hill Road in Palo Alto, California **begins** in August.

The **Superpaint frame buffer records and stores its first video image:** its inventor holding a sign that reads "It works, sort of." The frame buffer enables faster processing of memory intensive animation and graphics for the anticipated advanced graphical user interface of the Alto. A decade later, Xerox and its inventor will win an Emmy award for the technology.

The first laser printer, called EARS (for Ethernet-Alto research character generator scanning laser output terminal) **is in service, printing documents at 1 page/second at 384 spots per inch (spi).** It will be the foundation for the Xerox 9700 Electronic Printing System and Xerox's printing business.

A patent memo describing a new networking system uses the term "Ethernet" for the first time. A few months later, an entry about Ethernet in a researcher's lab notebook reads: "It works!" This new protocol for multiple computers communicating over a single cable will spawn a series of sophisticated networking protocols enabling distributed computing and re-architecting of the internal computer-to-computer communication within Xerox copiers and duplicators. Ethernet will become a global standard for interconnecting computers on local-area networks.

The **Alto personal computer becomes operational.** As it evolves, the Alto will feature the world's first What-You-See-Is-What-You-Get (WYSIWYG) editor, a commercial mouse for input, a graphical user interface (GUI), and bit-mapped display, and will offer menus and icons, link to a local area network and store files simultaneously. The Alto will provide the foundation for Xerox's STAR 8010 Information System.

Client/server architecture is invented. This development makes the paradigm shift of moving the computer industry away from the hierarchical world of centralized mainframes - that download to dumb terminals - towards more distributed access to information resources.

Personal distributed computing is invented. PARC's vision of computers as tools that could help people work together will change the course of the computer industry and lead to new ways of organizing interactions to support both individual and collaborative work.

1972

Full electronic character generation is demonstrated with laser raster output

scanner (ROS) xerography. Electronic printing on laser printers will provide a means of seamlessly transferring digital documents into the paper domain.

The first version of Smalltalk is deployed. **Smalltalk is the first object-oriented programming language with an integrated user interface, overlapping windows, integrated documents, and cut & paste editor.** The concept that objects are described and addressed individually, and can be linked together with other objects without having to rewrite an entire program, will revolutionize the software industry. Smalltalk will later heavily influence C++ and Java programming systems.

1971

The concept of modulating a laser to create an electronic image on a copier's drum becomes reality when **the world's first laser computer printer demonstrates artificially generated laser raster output scanner (ROS) xerography at 500 spots per inch (spi).** This will become the basis of Xerox's xerographic printing business that will later generate \$1 billion per year.

1970

Xerox Corporation gathers together a team of world-class researchers in information sciences and physical sciences and gives them the mission **to create "the architecture of information."** The Xerox Palo Alto Research Center (PARC) officially opens its doors at 3180 Porter Drive in Palo Alto, California on July 1, 1970.



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