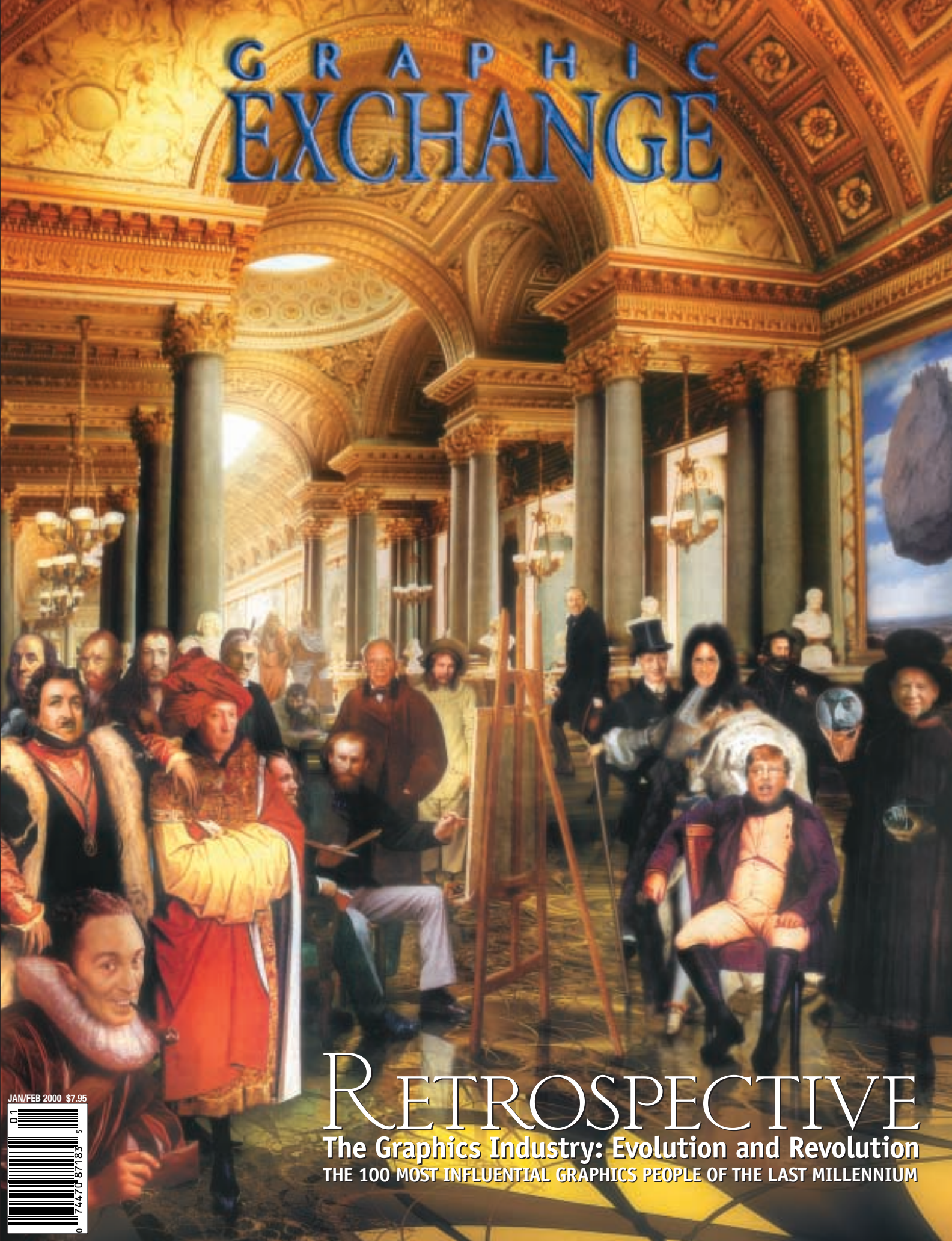


GRAPHIC EXCHANGE



RETROSPECTIVE

The Graphics Industry: Evolution and Revolution
THE 100 MOST INFLUENTIAL GRAPHICS PEOPLE OF THE LAST MILLENNIUM

JAN/FEB 2000 \$7.95



RETROS

THE GRAPHICS IN

Evolution and Revolution

THE STORY BEHIND THE 100 MOST INFLUENTIAL GRAPHICS PEOPLE OF THE LAST MILLENNIUM

BY DAN BRILL AND RON GIDDINGS



From MUNSEY'S MAGAZINE, January, 1894 — an early example of halftone printing. Frank Munsey gambled that this new technology would save his failing publication — and wound up setting off a publishing revolution.

IN THE EARLY 1890s, THE struggling publisher of a small American magazine desperately needed to find a way to increase his revenue in order to stay in business.

It was a period of technological innovation in printing and publishing. High speed rotary presses had revolutionized print productivity. A new machine for automating typesetting had just been introduced. And photography was now available to anyone through the recently introduced Kodak camera.

But news had also spread about a new technology for print preparation that promised to liberate publishers from the restrictions and cost of wood engravings for illustrations. The process was called the “crossline half-

tone”, devised by an ex-Cornell University photographer. According to what publisher Frank Munsey heard, this new halftoning method would make it possible to print not just in black and white but also with a multitude of shades of grey, achieving the same photorealistic effect from a press that photographic printing had offered for over half a century.

Frank Munsey had a vision. By gambling on this new though unproven technology, he saw an opportunity to set MUNSEY'S MAGAZINE apart from every other publication on the market.

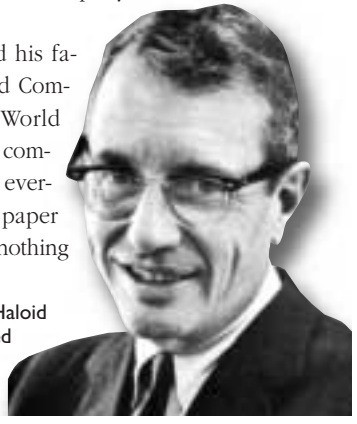
In 1893, the first magazine to be illustrated entirely using photomechanical reproduction hit the streets. It was an immediate success, and within only four months, advertisers were flocking to buy space and the circulation of MUNSEY'S MAGAZINE had grown from 20,000 to 200,000. By 1900, MUNSEY'S MAGAZINE had more readers than any publication in the world.

IN JULY, 1944, A PERIODICAL CALLED THE RADIO NEWS PUBLISHED an article on a new dry reproduction method, invented by a Queens, New York physicist. It was called “electrophotography”.

The issue came and went, drawing little attention, until two years later, when the research head of a small photographic supply house in Rochester, NY happened to run across it. John Dessauer read about this electrophotographic process with great interest, and decided to share it with the company president, Joseph Wilson.

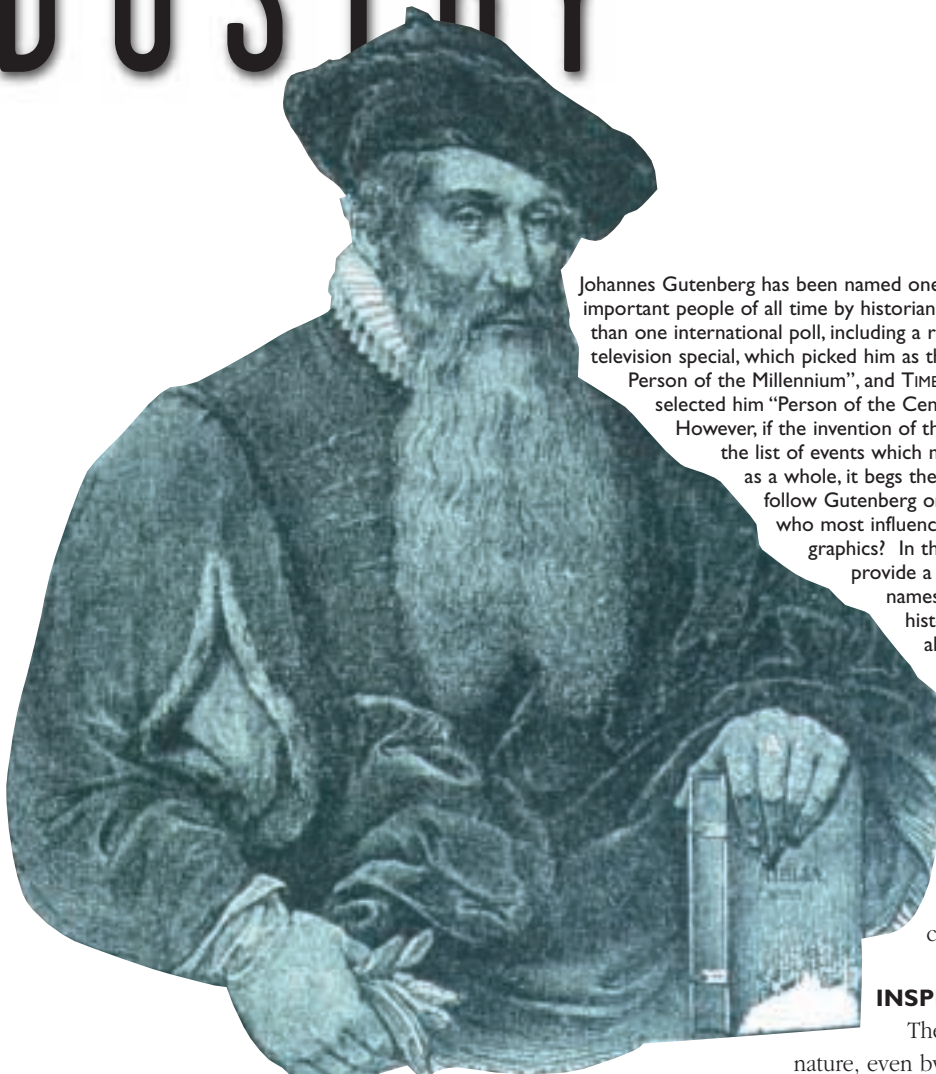
Wilson had just succeeded his father as president of the Haloid Company, founded in 1906. But World War II had just ended and the company now found itself with an ever-shrinking share of the photo paper market. Worse yet, there was nothing

Joseph Wilson, president of the Haloid Company of Rochester, NY, risked all his company's fortunes on a new printing technology called “electrophotography”.



DEFACTIVE

DUSTRY



Johannes Gutenberg has been named one of the most important people of all time by historians and experts in more than one international poll, including a recent BIOGRAPHY television special, which picked him as the “Most Influential Person of the Millennium”, and TIME Magazine, which selected him “Person of the Century”.

However, if the invention of the printing press leads the list of events which most influenced society as a whole, it begs the question: Who would follow Gutenberg on a list of individuals who most influenced the evolution of graphics? In this special feature, we provide a digest of important names and events in the history of graphics — along with our choices for the 100 people who we feel most influenced the evolution of the industry.

Haloid, this was literally make it or break it.

It would take another twelve years, and an additional \$12.5 million in development funds, but in 1959 the Haloid Company would finally introduce the 914 copier, the first office machine based on the revolutionary new process of electrophotography (better known under the name chosen by Wilson — “xerography”). The 914 copier would send company net profits soaring,

from \$2 million in 1959 to \$22.6 million in 1963.

And of course in 1961, with the hugely successful launch of its new product, Haloid would change its name to “Xerox”.

INSPIRATION AND ENABLEMENT

The evolutionary process may be changed by fate, by nature, even by divine intervention — but when human beings are involved, change is the product of two fundamental elements: inspiration and enablement.

Someone must have a concept, an idea they believe is so great that, if necessary, they're willing to risk everything they have and whatever time it takes to see it through to its fruition.

Often that's not enough, and someone else must make the concept a reality, to enable its completion — more often than not with money, sometimes through making the right connections, sometimes by providing one critical missing ingredient — a key piece of information, for instance — that nudges that concept from failure to success, from rejection to acceptance.

Evolutionary change happens in increments. Occasionally,

on the horizon to replace lost sales. Wilson knew it was time to find a new idea — or see Haloid dwindle away to nothing.

Electrophotography research and development had been underway at Batelle Memorial Institute since 1944 when Batelle had signed a royalty-sharing agreement with its inventor, Chester Carlson. However all attempts to interest the corporate world in marketing the product had failed. So when Joseph Wilson and John Dessauer came calling in 1946, Batelle was more than happy to offer them an exclusive licensing agreement.

For Wilson, it was a huge gamble. Haloid's total net earnings in 1946 would total only \$101,000 on sales of \$6.5 million. For

10

DAN BRICKLIN

20TH C AMERICAN SOFTWARE DEVELOPER

Dan Bricklin created VisiCalc, the world's first desktop spreadsheet software. Released in 1979 for the Apple II, it created hundreds of millions of dollars in revenue for both VisiCorp and Apple. But Bricklin never patented his application and failed to reap the full financial rewards which came with its success — ironic, considering that he was a Harvard MBA. In 1984 VisiCalc demonstrated its VisiOn operating system, the first GUI OS for PC, driving Gates into full scale development on Windows.



99

BENJAMIN FRANKLIN

18TH C AMERICAN PRINTER/STATESMAN

Statesman, philosopher, scientist, inventor — but before any of these, Benjamin Franklin was a printer and publisher, apprenticed in graphic arts from the age of 12. As the innovative publisher of the Pennsylvania Gazette and "Poor Richard's Almanack" (starting in 1728) prior to his groundbreaking experiments with electricity and leadership role in shaping the American Declaration of Independence, Franklin is also credited with publishing the first political cartoon ("Join or Die").



98

JULIA MARGARET CAMERON

19TH C BRITISH PHOTOGRAPHER

Unquestionably a pioneer in her field, Julia Margaret Cameron took up photography late in life as a hobby; by the time she died in 1879 she had established herself as one of the most respected portrait photographers of her day, capturing timeless studies of many well-known contemporaries such as John Herschel, Henry Taylor, Holman Hunt, Alfred Tennyson and Victor Hugo. She was also one of the first to experiment with soft focuses and dramatic portraiture.



97

WILLIAM BULLOCK

19TH C AMERICAN INVENTOR

The invention by William Bullock of Philadelphia in 1863 of the web-fed rotary printing press, a machine which could print from paper in rolls rather than sheets and capable of producing an astonishing 10,000 impressions per hour with only three pressmen, transformed newspaper mass production and distribution almost overnight.



96

KAI KRAUSE

20TH C GERMAN DIGITAL ARTIST

An acknowledged leader in digital art, Kai Krause has left his unmistakable signature on the interface designs of a wide range of desktop creative imaging applications, including Kai's PowerTools and Bryce, as well as being an early proponent of new imaging technologies such as LivePicture. It was also Krause more than any other who brought Mandelbrot's fractals into the mainstream consciousness and his influence on digital imaging continues to be felt today.



however, an invention or discovery is of such magnitude that it warrants the description "revolutionary". But, just as Johannes Gutenberg could never have predicted how the printing press would alter the fabric of society the way it did, so it is that inventors or agents of change rarely foresee the revolutionary effect that their contribution will have.

Frank Munsey fought for success as a magazine publisher until he conceived the idea of harnessing halftone technology to produce a publication that revolutionized the publishing industry. Joseph Wilson rescued his failing photo supply business by gambling on an unknown process called electrophotography to launch the Xerox copier. The graphics industry overflows with stories like these, not all of them as spectacular as Munsey's or Wilson's, but every one compelling nonetheless.

THE ARCHITECTURE OF MODERN GRAPHICS

There was a time when all of us in graphics lived in our own insulated vertical worlds. Printing, publishing, art, photography, design, science — each stood apart, each separate.

Digital technologies changed the machinery of each of these businesses; then the desktop revolution changed the business model itself.

When we discuss the graphics industry in these pages, it is with the underlying understanding that all these fields are now joined together under one single banner. Where once graphic arts — the commercial printing industry — was separated from graphic communications — commercial art, design, photography and publishing — now it is part of one unified business model that also includes the rising star of the Internet. (Did you know that, according to a recent TrendWatch survey in the U.S., the number one investment by graphic arts companies is in Macintosh computers?)

"GRAPHICS" AND THE MEASURE OF INFLUENCE

Sifting through hundreds of years worth of background information on printing, publishing, art, design, photography and computing to come up with a comprehensive and creditable list of the top 100 most influential graphics people is a daunting task.

We pored over a myriad of histories, biographies and industry resources, scouring for names and achievements we might have overlooked. We invited your response through our online survey at www.gxo.com. We e-mailed questionnaires to as many influen-

95

PAUL RAND

20TH C AMERICAN GRAPHIC DESIGNER

Throughout his long and distinguished career, Paul Rand remained at the forefront of the American graphic design scene, serving as art director for top magazines such as Esquire and Apparel Arts (later renamed Gentleman's Quarterly) and developing corporate identities for a long list of major U.S. corporations. The elegant simplicity of his designs may be seen still in the logos he created for Westinghouse, UPS, ABC, Next Computer, Yale University, Cummins Engine, and IBM.



tial industry people as we could find. In the end, we know our list is at best subjective, at worst biased; at best a fair representation, at worst incomplete.

We accumulated hundreds of nominees, sorting them by specific field, by general industry, and by era. The standard for gauging influence centred on our definition of graphics — the creation and production of pages using words and pictures in a commercial context, the product of graphic communications and graphic arts.

We took a generalized approach to appraising the names on our list. How broad is their influence? Is it industry-specific? If so, how dominant is it within that industry? Over what period of time? How relevant is it on the industry today? How different would graphics be without their contribution or achievement?

The overwhelmingly dominant form for the distribution of pages throughout most of history has been print, and our effective starting point was Gutenberg's invention of moveable type; thus printing and publishing is well-represented on our list.

The creative elements which make up the content from which graphics are produced — design, photography, art and illustration — are also represented, but we avoided getting immersed in debates about the greatest artists or photographers or designers of all time. Instead we focused on those who we felt were the prime movers in influencing either our general esthetic and artistic consciousness or styles and trends in commercial art.

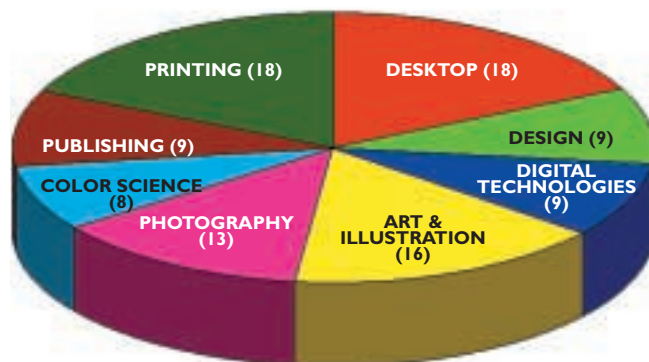
Current influence was very important. We looked first at how important an invention or achievement was in relation to the way graphics are produced today, and discounted the value of any which are now obsolete or of marginal use. This tended to skew our results slightly more in favour of digital technologies and current design trends. However we disregarded many important names in the history of computer development, unless their contribution had a direct bearing on the graphics industry or could be identified as a seminal event.

We looked for direct impact; influencing someone who had great influence was not necessarily enough to qualify for inclusion.

Our perspective also leaned heavily toward the evolution of graphics in Western Europe and North America.

WHAT ABOUT THE INFLUENCE OF THE INTERNET?

Inevitably we had to grapple with the question of web graphics and its impact on the graphics industry. Is there any doubt that the



The division of our Top 100 by field of endeavour ranged from 18 in both printing and desktop publishing to eight in color science. Almost half are from the United States; Germany, France, Great Britain and Italy accounted for 16, 15, 13 and three respectively, with six from other countries.

web has opened up a new dimension for graphic communications on a scale that potentially dwarfs even printing?

However the web is so new that it seemed almost presumptuous to think that we could make an intelligent comparison of its influence with over six hundred years of history going back to Gutenberg (or to put it into perspective, remember that the web has been a force to reckon with for barely half of one per cent of the last millennium). Also, its commercial value to the graphics industry, although growing exponentially, has yet to be accurately determined. The force of the Internet lies in its power as a technological phenomenon, but unlike traditional graphics, it is difficult to pinpoint its evolution through specific individuals (with the exception of number 21 on our list, Tim Berners-Lee).

Thus you will not find any web designers or web software developers in our top 100 (although such folks as Marc Andreessen, Eric Bina, Jim Clark, Steve Case, Lynda Weinman, Loerner and Bosack, Crocker, Kahn and Cerf, Taylor and Roberts, and Leonard Kleinrock were on our list of honourable mentions).

So let us take a whirlwind journey back through the last millennium as we count down the 100 individuals we have selected across our eight fields of commercial graphics and let's see whether we can play "connect the dots". (Numbers are color coded by the four major industry descriptions: **Graphic Arts**, **Computing**, **Art & Design**, and **Imaging & Science**).

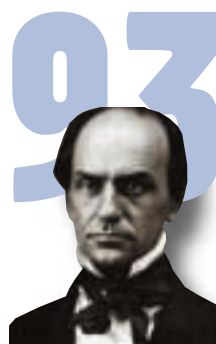
It all started with Gutenberg, a converted wine press, and an idea for making letter punches out of lead...



94 WILLIAM MORRIS

19TH C BRITISH PRINTER/PUBLISHER

A negative effect of the Industrial Revolution of the 19th century was the deterioration of production values in printing and publishing. William Morris, leader of the Arts and Crafts movement in Britain and founder of the Kelmscott Press, was a major force in the latter part of the century in proselytizing the restoration of high quality standards in the graphic arts industry.



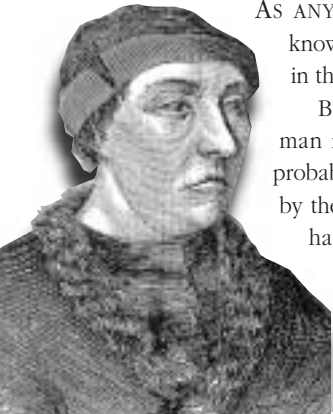
93 VOLNEY PALMER

19TH C AMERICAN ADVERTISING INDUSTRY LEADER

The advertising agency was the brainchild of Volney Palmer, who opened the first agency in the U.S. in 1842 and quickly built a near-monopoly on ad placement across the country. It was Palmer who first enabled advertisers to mount national advertising campaigns, at the same time winning the support of publishers by relieving them of the burden of individually selling ad space.

PRINTING

FROM MOVEABLE TYPE TO LASER BEAMS



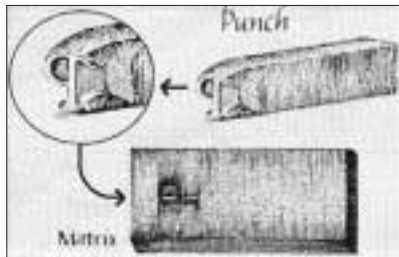
Lourens Coster of Holland) may have built a press several decades before Gutenberg, but Gutenberg beat him to the punch — of moveable type, that is.

AS ANYONE IN THE CIVILIZED WORLD PROBABLY knows, the printing press was invented in Europe in the 15th century.

But what not many people know is that the man responsible for building the first press was probably not Johannes Gutenberg, but a Dutchman by the name of Lourens Coster, who is reported to have constructed his machine several decades before Gutenberg. Unfortunately, Coster's press was somewhat crude, lacking the vital component which made Gutenberg famous, moveable metal type.

Even the invention of moveable type would not have guaranteed Gutenberg his place in history if not for the fact that Pi Sheng was born not in Europe but in China (where the first language was, not surprisingly, Chinese). Pi Sheng is credited

with having created moveable type around 1045 — but since the Chinese alphabet had thousands of characters, his invention did not prove to be terribly practical and was quickly forgotten (at least until 1313, when an ambitious fellow named Wang Chen printed his *Treatise of Agriculture* using over 60,000 Chinese hard-wood characters).



15th century punch and matrix

FROM MAYHEM TO MEZZOTINTS

So it was that printing sprung up in Mainz, Gutenberg's home town. And who knows how long it would have remained centred there if not for the Archbishop of Nassau, who decided that printing was not in the best interests of the Church. But by sending his soldiers into Mainz in 1462 to destroy the town, the Archbishop forced the printers to flee, taking their new-found skills with them and hastening the spread of printing throughout Europe.

Another of printing history's great untold stories is that of a masterful but unidentified English engraver whose superb decorative designs lifted late 15th century printing to an art, but who today is simply known as Master E.S.

However we do know that "Edelstein", the first illustrated book combining type and wood engravings, was printed in 1461 by one of Gutenberg's German contemporaries, Albrecht Pfister. We are

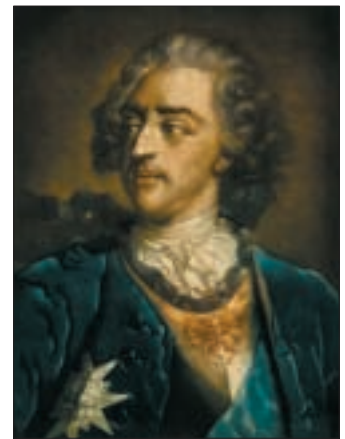
also familiar with the efforts of other 15th and 16th century master printers such as Italians Antonio Blado and Wendelin da Spira, as well as England's first printer, the entrepreneurial and talented William Caxton, who printed the first book in England in 1477.

Yet it wasn't until 1620 that another significant development in press technology occurred when Willem Blaeu of Holland came up with the idea of adapting a standard wooden press to accept a spring and suspended platen.

Meanwhile, in the United States, there was no printing industry at all until Stephen Daye was recruited to operate the first press in 1639 (although the first press in the New World was set up in Mexico City about 100 years earlier). Daye handed it off to Samuel Green, who became the first American master printer.

Just about the time Daye was starting up, a German soldier named Ludwig von Siegen invented mezzotint engraving, which almost 400 years later could be identified as the first variation on stochastic screening. Mezzotint engraving became immensely popular in England through its introduction by Prince Rupert, nephew of Charles I, a friend of von Siegen's.

Yet in the first 350 years of printing history, technological advances were few and far between, despite Jean-Baptiste Le Prince's invention of aquatints and Jacques-Christophe (Jakob) Le Blon's stupendous development of the three-color mezzotint in 1719. Gutenberg's letterpress remained essentially the same, and it wasn't until the early 1800s that the face of printing began to change dramatically.



This famous portrait of Louis XV was printed using the three-color mezzotint technique invented by Jakob Le Blon in 1719.

THE 19TH CENTURY — PRINTING POWERS UP

When in 1811 Frederich Koenig built the first steam-powered cylinder press, the graphic arts industry discovered the Industrial Revolution. About the same time, Henry and Sealy Fourdrinier perfected their "fourdrinier" paper roll machine (which had actually been invented by Nicholas-Louis Robert in 1798) — although credit for making the Fourdriniers' machine work properly should in truth go to their chief mechanical engineer, Bryan Donkin. Nonetheless, feeding paper through a press from rolls delivered a substantial increase in productivity over handling sheets.



In 1620, 170 years after Gutenberg, Willem Blaeu of Holland introduced the first major improvement to the original press design — adding a suspended platen and a spring.

William Bullock patented the rotary web-fed press in 1863. Richard Hoe patented his first rotary press in 1846 and perfected the continuous roll press in 1871. The printing process was transformed into a mass production process.

But one of the most important discoveries in printing was largely ignored for most of this century.

In 1796 a Bavarian named Alois Senefelder had, by chance, discovered the principles of lithography (literally “writing on stone”), based on the fact that water and grease don’t mix. This technological breakthrough provided the groundwork for modern offset printing.

Ironically, Senefelder’s invention was motivated by his difficulty in finding a publisher for his dramatic writings, prompting him to experiment with etchings and copper plates until he discovered that a greasy composition of soap, wax and lamp black on limestone eliminated the need to etch. Between 1796 and 1818 Senefelder refined his lithographic process. He published a complete description of lithography (which he called “chemical printing”) in 1818 (“Vollständiges Lehrbuch der Steindruckerei”), after which the technique quickly spread to England, Italy, and France.

Although artists were quick to capitalize on this new reproduction method for limited press runs using stones as imaging “plates”, it wasn’t until George Sigl of Vienna adapted his lithographic press in 1875 to allow offset printing on tin that lithography’s potential began to be realized. When in 1904 Ira Rubel figured out the mechanics of transferring an image from metal plates (which had just become widely available) to a rubber blanket to paper, modern offset printing was officially born.

Meanwhile, let us record a couple of other 19th century historical notes worth mentioning. In 1856, a fellow named Andreas Hamm teamed up with another German named Andreas Albert (who had just finished apprenticing with a press builder) and launched a small press manufacturing business in Frankenthal, Germany. After his death, the company would be sold, relocated a few miles away to a town called Heidelberg, and renamed Heidelberg Druckmaschinen.

In 1864, a pressman in the Western United States, anxious to



Senefelder built his original stone lithographic press from wood in 1797.



KONRAD ZUSE 20TH C GERMAN INVENTOR

If not for World War II, Konrad Zuse would have achieved worldwide recognition for his pioneering work in building one of the world’s first binary electromechanical computers, the Z1. Despite losing his early inventions in wartime bombing raids, Zuse persevered and by the end of the war had completed the Z4, a more sophisticated version of his pre-war prototype.



JONATHAN SEYBOLD 20TH C AMERICAN TECHNOLOGY INDUSTRY LEADER

From its humble beginnings in the late 1970s, Seybold Seminars and Exposition has grown to be the world’s largest and most prestigious event for the digital publishing market. Founder and digital publishing guru Jonathan Seybold has been influencing the developers of modern graphics technologies for the past thirty years; today the Seybold seminars and exposition are held twice a year, one in Boston and the other in San Francisco.



GASPARD-FELIX TOURNACHON (NADAR) 19TH C FRENCH PHOTOGRAPHER

In 1858 Nadar became the first to take pictures from the air, using his own specially constructed hot air balloon completely equipped with its own darkroom. Flamboyant, dramatic, creative, his photographs of famous people include Emile Zola, Rossini, Liszt, Balzac, and his friend Victor Hugo on his deathbed — as well as George Eastman (reproduced in this issue).



WILLIAM BERNBACH 20TH C AMERICAN ADVERTISING INDUSTRY LEADER

William Bernbach, co-founder of the Doyle, Dane, Bernbach advertising agency, left his mark on modern commercial design in the 1950s and 1960s with his brilliant graphic treatments in ads for numerous major accounts, beginning with Orbach’s department stores and continuing with Volkswagen (including the famous *Think Small.* and *Lemon.* ads), Avis (*When You’re Only No.2, You Try Harder.*) and Calvert’s. Bernbach demonstrated above all else that with judicious use of white space, less is more.



MICHAEL COWPLAND 20TH C CANADIAN TECHNOLOGY DEVELOPER

Page layout in the Wintel world was revolutionized in 1989 by the introduction of CorelDRAW, an all-in-one layout and illustration package that gave PC users the ability to create type and manipulate graphics like no application before it. Corel Corporation, founded in 1985 by Michael Cowpland, continues to set the standard for PC-based page assembly and design. Over the years the company has added imaging and word processing software to its portfolio.

secure his sons' employment, started up a printing company which he named after himself. The firm that Richard Robert Donnelley began, R. R. Donnelley and Sons, would grow to become the world's largest printer.

And in 1884, Albert Dick, with help from Thomas Edison, developed a machine for making copies which he labelled the mimeograph. The A.B. Dick Company would be a leader in the post-WWII introduction of small offset printing.

TYPEFOUNDERS MAKE THEIR POINT

Developments in standardizing type followed their own course. In 1737 French typefounder Pierre-Simon Fournier was the first to propose standardizing type sizes with a point system, followed barely twenty years later by Ambroise Didot and his concept of typographical point measurements.



Fournier's *Manuel Typographique*, published in 1737, was the first proposal for systemizing type and type point sizes.

But in the end, the standard point was set by neither Fournier nor Didot, but by a little known American named Nelson Hawks. Hawks managed the Pacific Type Foundry, which was owned by John Marder and A.P. Luse,

and over a period of years in the 1860s and 1870s he lobbied various companies to switch over to the point system which he had designed. Hawks' American typographic point was set at 0.0138", very close to Fournier's point of 0.0137" and not far off the Didot point measurement of 0.0148".

Hawks finally managed to convince his employers to support his system, and in 1879 the "American System of Interchangeable Type Bodies" was announced.

The American printing trade liked having its own standard and adopted it wholesale. The American point was officially sanctioned as the national standard by the Association of Typefounders of the United States in 1886, and is today the point system used by all major desktop page layout applications.

AND TYPESETTERS GET IT

But beyond a point system, what the world really needed was a way to speed up the business of making and setting type. William Church of Britain was credited with building the first "typesetting machine" in 1822; James Paige patented his own version in the U.S. in 1872 (and eventually bankrupted his major investor, Samuel Clemens, also known as Mark Twain).

However it was Ottmar Mergenthaler's "linotype" composing machine, introduced in 1886, which forever eliminated compositing by hand. Tolbert Lanston followed right on his heels in Europe

with the monotype typesetter. This technology would be state of the art for more than fifty years, until two Frenchmen, Moyroud and Higgonet, announced their invention in 1946, the Lumitype phototypesetter (which was further refined and re-named the Photon in 1948). In 1953 *The Wonderful World of Insects* was printed, the first book to be composed using the Photon, and soon after composing machines would fade into history.

In 1885 Linn Boyd Benton brought out the Benton punch cutting machine which revolutionized typefounding, seven years after Frederick Wicks had invented a typecasting machine. But these advances threatened to destroy the typefounding industry. Through the efforts of Henry Lewis Bullen, typefounders in the United States were amalgamated under one banner in 1892, the American Type Founders Company.

INTRODUCING THE HALFTONE

Yes, the 19th century was a busy period in the history of printing — and the greatest irony of all is that most of the technologies developed during this century are now obsolete.

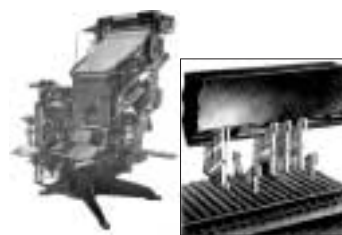
One enormous exception is a process developed in the 1880s by a photographer named Frederick Ives.

For many years the holy grail of printing had been the search for an inexpensive way to reproduce photographs on a press. Woodburytype, a variation of William Talbot's photogravure process which had been invented in 1866 by Walter Woodbury, was an effective but costly procedure for reproducing photography. It required the use of plates coated with potassium bichromate gelatin emulsion, a hydraulic press to make lead printing plates, and special inks and papers — and in the end, because of the soft lead plates, was only good for press runs of a few hundred sheets, and only on a gravure press.

For the longer runs associated with commercial printing and publishing using relief printing methods, this was no help. For the printing of images, printers were still dependent on labour-intensive and expensive wood engraving techniques which had been around since the Middle Ages.

Ives' solution was to break up the continuous tones of a photograph into a pattern of small dots — smaller dots for lighter shades of gray, larger dots for darker shades.

The "Ives Process" — better known as the halftone — was first shown in 1883 in Harper's magazine. By 1887, Ives had perfected his halftone process through the use of a "crossline" screen which, when inserted into a copy camera above a photosensitive plate, acted as a diffusion grating to break up the continuous tone image into an array of tiny points of light and produced varying dot sizes



(left) Ottmar Mergenthaler's linotype composing machine, 1886; (right) the linotype's type composing system



One of the earliest halftone reproductions, from Harper's Magazine, 1883

on the plate. This advance made the production of plates more than ten times faster than before.

Unfortunately, following the poor advice of his employers, Crosscup & West, Frederick Ives never patented his crossline halftone method. Instead, details of his technique leaked out through various apprentices and ex-employees of the firm and his secrets were soon spread throughout the industry. Within ten years, wood engraving was obsolete.

The halftone process continues to be a cornerstone of commercial print reproduction, surviving and in fact thriving in the digital environment, even as we move into the computer-to-plate era, and Frederick Ives' invention must be ranked as one of the most influential events in the history of modern graphics.

PRINTERS GROW AND PREPRESS GETS AN IDENTITY

The 20th century saw many refinements in traditional printing, but few which could approach the dramatic developments of the previous hundred years. The century just past saw the rise of global printing empires, on a scale never possible before.

In 1954 Canadian Pierre Peladeau bought a press, and in the process founded Quebecor Printing, which, following its recent merger with World Color, is now the world's largest printing and publishing company (usurping the position held for many years by R.R. Donnelley & Sons).

Meanwhile prepress became a high tech science, in large part due to the inventive genius of Rudolph Hell, father of the color scanner. His first innovation came in 1929 with the invention of the Hell recorder, which twenty years later would provide the basis for his creation of the Chromagraph analog color scanner. This in turn triggered the growth of scanning technology that would eventually lead to the current generation of small low cost desktop scanners.

"Prepress" became "digital prepress" and in 1979 an ingenious Israeli named Efi Arazi founded a prepress systems company called Scitex. Arazi's genius was to capitalize on burgeoning digital technologies to build a specialized system for prepress production employing a unique approach to imaging and type processing. The Scitex system relied on existing technologies for color scanning and phototypesetting, but merged this data in a proprietary format as continuous tone images and linework, which was then output to film for printing plates without the need to strip pieces of separate film. It wasn't long before "Scitex" became synonymous with "state-of-the-art" within the graphic arts industry. By 1989, Arazi, having left Scitex behind, started Electronics for Imaging (EFI), which today is a world leader in RIP technologies for color printers and plotters.

PRINT IN THE PRESENT — AND THE FUTURE?

One 20th century invention in particular may prove to be the definitive event in shaping the future of printing and publishing. The value of Chester Carlson's 1937 discovery of xerography — photocopying, as we commonly call it — assumes even greater

CONTINUED ON PAGE 34



STANLEY MORISON

20TH C AMERICAN FONT DESIGNER

Stanley Morison is remembered as one of the outstanding names in 20th century typography, the designer of Times New Roman and the man who conceived "systems level typographical abstraction". He was a founding member of The Fleuron, a respected typography journal of the 1920s, as well as for many years an advisor to the Monotype Corporation.



THOMAS KNOLL

20TH C AMERICAN SOFTWARE DEVELOPER

Originally conceived for a university thesis, Photoshop is today the de facto standard for desktop imaging applications. It was written in 1987 by Thomas Knoll, marketed first in 1988 as scanner software by BarneyScan, and acquired by Adobe in 1989, for whom Knoll continued to develop the product with his brother John until 1995. The contribution of Photoshop to today's suite of desktop tools gives Knoll "cornerstone" status among desktop software developers.



OTTMAR MERGENTHALER

19TH C GERMAN INVENTOR

In 1886, the world of printing was stunned by the news that, 450 years after Gutenberg conceived of moveable type, typesetting had finally been automated with the invention of the linotype composing machine by German inventor Ottmar Mergenthaler. The Linotype machine (and the similar Monotype machine invented by Tolston Lambert) influenced the graphic arts industry for over 70 years until the introduction of phototypesetting in the 1950s and early 1960s.



RICHARD DONNELLEY

19TH C AMERICAN PRINTER

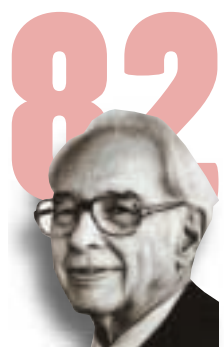
Richard Robert Donnelley founded R.R. Donnelley and Sons in 1864. The company he launched would expand to become the world's largest printer, with plants and offices around the world and annual sales of over \$5 billion. The Donnelley company's influence on the development of graphic arts technologies can be summed up quite simply; for vendors of new products the litmus test was that if they could interest Donnelley's, the rest of the graphic arts market would be compelled to give it a look.



MAURITS ESCHER

20TH C DUTCH ILLUSTRATOR

Possibly the most skilful woodcutter since Durer and a master of lithographic art, Maurits Escher's drawings containing spatial illusions and repetitive geometric patterns (called tessellations) continue to fascinate adults and children alike. His impossible architectural illustrations and complex perspectives have been studied extensively by both artists and mathematicians and his unique work must be recognized for how it has permeated the consciousness of the general public.



JOHN ATANASOFF

20TH C AMERICAN INVENTOR

Although it took more than thirty years before it was resolved in a court of law, John Atanasoff and his assistant Cliff Berry are today recognized as the inventors of the first electronic digital computer, the Atanasoff-Berry Computer (ABC), built in 1940. It was their work which triggered Eckert and Mauchly's development of the ENIAC and UNIVAC mainframes in the mid-1940s. Sadly, although greatly honoured, Atanasoff never received any direct compensation for his contribution to the evolution of computers.



ANDY WARHOL

20TH C AMERICAN PAINTER/GRAPHIC ARTIST

Andy Warhol broke all the rules of art, usurping content from anywhere and everywhere and unabashedly merging original art with photography as he saw fit. He was the father of Pop art, redefining art for a late 20th century mass audience. He also took serigraphy (or silk screening) to new levels, and was one of the earliest to capitalize on new technologies like the Polaroid camera to provide new sources of artistic content.



ROBERT DENNARD

20TH C AMERICAN COMPUTER ENGINEER

Without dynamic random access memory, better known as RAM, there would have been no desktop revolution. IBM computer engineer Robert Dennard's invention was patented in 1968 and first produced commercially in the early 1970s. It has been reported that there have been more RAM cells manufactured than any other man-made object on the planet.



BILL HEWLETT & DAVID PACKARD

20TH C AMERICAN TECHNOLOGY DEVELOPERS

Beginning in a garage in Palo Alto in 1939 with an initial capitalization of \$538, William Hewlett and David Packard founded Hewlett-Packard, the company which has become a dominant force in the consumer personal computing market with annual revenue of over \$50 billion. In 1984, Hewlett-Packard launched the first commercially successful laser printer, the LaserJet, and subsequently pioneered inkjet printing technologies.



NORMAN ROCKWELL

20TH C AMERICAN ARTIST

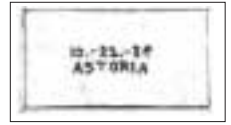
Despite being underrated for his success as a commercial artist, Norman Rockwell captured the character of ordinary American life like no artist before or since. He set a standard for realistic illustration that influenced not only illustrators but also photographers. Through his prolific output for publications such as the Saturday Evening Post and books like Huckleberry Finn, Rockwell subtly communicated his personal sense of idealism and created a "feel-good" reaction in anyone who saw his work.

CONTINUED FROM PAGE 31

significance in the light of developments in desktop publishing.

However if, in the midst of the Great Depression, Carlson hadn't been forced to take a low paying job in the P.R. Mallory patent department, the photocopier might never have been invented at all. Nearsighted and hampered by arthritis, he became increasingly annoyed when he found that there were never enough copies of patents around. Making more copies meant either sending them out to be photographed or typing out new ones, neither option being inexpensive or quick.

So Carlson began researching alternatives, finally focusing on the principles of photoconductivity as a potential solution. In the kitchen of his apartment in Jackson Heights, Queens, he and his assistant Otto Kornei began experiments with sulfur-coated zinc plates that would ultimately lead to the discovery of "electrophotography" in October, 1938.



The first "electrophotographic" image, created by Chester Carlson and his assistant Otto Kornei in October, 1938 in Astoria, New York

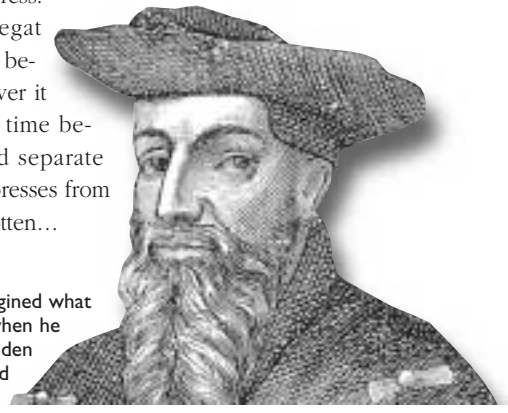
It was a great idea (or so Carlson thought) — but not great enough to convince more than twenty large corporations to whom he presented his discovery between 1939 and 1944 (including IBM, Kodak, General Electric, and RCA). It took a chance meeting in the Mallory patent offices with a fellow named Russell Dayton to arrange an introduction to the Battelle Corporation — and with three more years of research and development, the Xerox machine was born.

It still remained for Joseph Wilson and the Haloid Company to see the future value in Carlson's discovery, but by 1968 when Carlson died, Xerox annual sales had passed \$600 million.

Not only did the photocopier represent the first truly new printing technology since the printing press, but xerography gave birth to today's laser printing and digital printing technologies.

It is fitting, then, that we give recognition to the tremendous amount of research and development accomplished with Xerox money at its Palo Alto Research Center in the 1970s. The legacy begun by Carlson and the technologies fueled by the deep pockets of Xerox may turn out to have as great a long term effect on the printing and publishing industry as Johann Fust's original investment in Gutenberg's press.

Moveable type begat printing, and printing begat publishing. However it was an awfully long time before publishers could separate themselves from the presses from which they were begotten...



Johann Fust never imagined what he was starting when he agreed to loan 800 gulden to Gutenberg to build a printing press.

PAGE 35
METACREATIONS
AD
RPT FILM
OCT/NOV P. 35

PUBLISHING

FEEDING THE DEMAND FOR INFORMATION AND PRODUCTS

TODAY'S HIGH TECH SECTOR IS A HOTBED OF HIGH RISK FINANCING, stock swaps and public offerings. But in the event that we dwell in the misconception that this is a recent phenomenon, it's interesting to note that the champions of new technologies have relied on funding by venture capitalists for hundreds of years.

Gutenberg had his backing from Johann Fust. And the first great print publisher in history, Teobaldo Mannuci, set up the Aldine Press in Venice in 1490 with money supplied by the Prince of Carpi, Alberto Pio, whose only condition was that the new venture should promote Greek scholarship. Accordingly, Teobaldo fulfilled his end of the bargain by recruiting a staff of Greek scholars and compositors, making Greek the official language of both his business and household — and changing his name to Aldus Manutius.

The Aldine Press under the direction of Aldus published a slew of Greek classics, including the works of Aristotle, Aristophanes, Thucydides, Sophocles, Herodotus, Xenophon, Euripides, Demosthenes, Plutarch, Plato, Pindar, Hesychius and Athenaeus.

However, beyond setting a high standard of excellence for both print quality and content, Manutius contributed two extremely important innovations to the world of printing and publishing. First was his invention of the portable book; before Aldus Manutius, books were large unwieldy codexes which were not scaled for the needs of the scholar in transit. The Aldine Press produced books which were not only beautifully printed but also small enough to be packed into the travelling coffers which were becoming fashionable at that time.

Second was the introduction of italic type, which he began using extensively in 1500. Credit for this invention was shared with Aldus' punchcutter, Francesco Griffo, a former goldsmith, who helped to advance typeface design beyond the simple imitation of hand-drawn characters and elevate it to a higher art.

Until 1517, the press was simply an instrument for reproduction. But the role of the press was forever changed when Martin Luther capitalized on the power of print to carry his attack on the Church to the people of Germany. No longer would publishing be simply a static process of transferring old writing to ink and paper. In fact, it's not an exaggeration to say that the press made the Reformation possible.

THE FIGHT FOR INDEPENDENT THOUGHT

For the next 200 years or more, publishing and printing remained united as one industry. Moreover, the repercussions of Luther's actions were to be felt for even longer. Reprisals by religious and government authorities in Europe through various restrictive regulations (especially in Germany) drove many printers and publishers to emigrate to England or even the New World. In

self-defense, printers organized themselves into guilds in order to maintain control over the output of print and thereby assuage the Church and state. Throughout the 16th and 17th centuries, publishing was governed by strict monopolistic government licenses.

It wasn't until England passed the Copyright Act of 1710 that the public's right to the distribution of literature without monopoly was finally recognized. In 1793 France passed its own copyright law, allowing the printing and publishing industry to publish and print without restrictions.

Christophe Plantin, who fled France in 1548 to escape religious persecution, was one of the most famous early publishers. Plantin published the Polyglot Bible in Belgium in 1573, a monumental work produced in eight volumes and five languages. King James I organized one of the world's largest publishing projects to date when he financed the production of the English Bible that bears his name. It kept 48 translators employed and was published in 1604. In Germany in 1609, Johan Carolus began publishing the world's first newspaper, the AVISA RELATION ODER ZEITUNG. In March, 1702, the world's first woman newspaper publisher, Elizabeth Mallet, started England's first daily journal, the DAILY COURANT.

Publishing also owes much to innovations in binding by such noteworthy figures as John Bale, the 16th century English bibliographer, and Jakob Krause, the 16th century German bookbinder.

HOW ADVERTISING CHANGED PUBLISHING

With the loosening of state control over printing and publishing, the rise of the middle classes, and an increase in literacy, publishing in the 18th century began to take on the form which we know today.

In the United States the first newspaper, John Campbell's BOSTON NEWS-LETTER, appeared in 1704 (after a false start in 1690, when Benjamin Harris printed one issue of PUBLICK OCCURENCES, BOTH FOREIGN AND DOMESTICK, only to be shut down by Boston's governor). Benjamin Franklin played a vital role in jumpstarting his country's publishing industry when he took over as the publisher of the PENNSYLVANIA GAZETTE in 1728, as well as moonlighting as the author of POOR RICHARD'S ALMANACK.

With the introduction of high speed presses in the 19th century, the publishing industry began to bloom. Along with the rise of publications for mass consumption, a new dimension



The first political cartoon, "Join or Die", published by Benjamin Franklin in the Pennsylvania Gazette, circa 1730



A 19th century bookmaking machine

expanded the publishing model — a feature called “advertising”.

What we accept now as a necessary but often intrusive

part of publishing was decried at first as an unwanted, declassé corruption of the publishing form. But publishers knew a good thing when they saw it. The extra revenue that advertising provided was a welcome hedge against unpredictable copy sales.

When Volney Palmer started the first advertising agency in 1842, buying and reselling space in various publications, it was an immediate success. Acting as a jobber, Palmer not only relieved publishers of the expense of selling ads individually but also facilitated the first national advertising campaigns by being able to take an advertiser’s ad and place it in publications all over the country. His approach worked so well that by 1849 he had opened offices in Philadelphia, New York, Boston and Baltimore, and his agency was sole advertising representative for about two-thirds of the country’s estimated 2,000 newspapers and magazines.



Francis Wayland Ayer created today’s model for advertising agencies when in 1875 he adopted a system based on open disclosure of commission to both publishers and clients and a “full service” agency which offered design, production and placement, all under one roof.

Over the next thirty years, advertising agents wheeled and dealt as middlemen between advertisers and publishers with no consistent standards.

Finally, in 1875, Francis Wayland Ayer decided it was time to put the role of the agency on the table. Ayer introduced the “open contract” commission system, whereby an agency’s remuneration would be established up front according to an agreed upon formula, and both advertisers and publishers would know exactly how much the agency was collecting for its service. Along with that he also launched the

concept of a “full service” advertising agency, allowing an advertiser to delegate the job of creating, executing and placing the client’s promotion materials. What we accept as standard practice today was a radical notion 125 years ago.

It wasn’t long after that when publishers twigged to the idea that advertising could be more than just supplemental income to their bookstand sales. In the 1880s, Cyrus Curtis of Philadelphia became the first American publisher to adopt the advertising-based publishing model when, in 1883, he and his wife, Louisa Knapp Curtis, spun off Louisa’s popular women’s column that appeared in their TRIBUNE AND FARMER periodical into a brand new magazine devoted solely to women’s interests.



RICHARD HOE 19TH C AMERICAN PRESS BUILDER

In 1871 Richard March Hoe perfected William Bullock’s continuous roll press, a device which produced as many as 18,000 newspapers in an hour. The Hoe press was quickly adopted by major newspaper publishers across the United States.



GARY STARKWEATHER 20TH C AMERICAN INVENTOR

The rich legacy of Xerox PARC includes the development of the laser printer, which Gary Starkweather created in 1969 employing the principles of xerography. Starkweather holds over 30 patents in the fields of imaging, color, and hardcopy devices. He went on to become a senior developer in publishing and color imaging at Apple and is currently an imaging architect for Microsoft.



MATHEW BRADY 19TH C AMERICAN PHOTOGRAPHER

Mathew Brady ranks as one of the great American photographers of the 19th century. Renowned for his stark shots of American Civil War carnage, he predated modern photorealism in journalism by 100 years with his shocking 1862 images of battlefield corpses from Antietam. But he went bankrupt after the war when war-weary Americans lost interest in buying pictures of the bloody conflict. His collection of negatives was purchased in 1875 by the U.S. Congress for \$25,000.



HENRY & SEALY FOURDRINIER 19TH C FRENCH INVENTORS

Modern web presses still depend on the technology for making rolls of paper developed in the early 1800s by the Fourdrinier brothers, Henry and Sealy, who bought the patent for paper roll production from Nicholas Robert in 1804. The Fourdriniers (under the guidance of their chief engineer, Bryan Donkin) improved its design so significantly that by 1838 over 100 of their machines were in use in Europe.



ERICH SALOMON 20TH C GERMAN PHOTOGRAPHER

The original “candid camera” belonged to Erich Salomon, a German photographer who in the late 1920s seized the opportunity presented by Barnack’s introduction of the 35mm miniature camera. Salomon may justifiably lay claim to being the world’s first “papparazzi”, inaugurating the concept of taking pictures of famous people when they were least expecting it. Sadly, he died in a Nazi concentration camp in 1945.



RENÉ MAGRITTE

20TH C FRENCH ARTIST

René Magritte's style of pure and captivating surrealism, where unrelated objects could be found strangely juxtaposed, was untainted by commercialism, even though ultimately his work influenced creative in modern advertising. Beginning his career as a wallpaper designer, Magritte became a leading member of the newly formed Belgian Surrealist group in 1924. Warhol, among others, owes much to Magritte and his dreamy incongruous art; in fact, many regard Magritte as the original icon of 1960s Pop art.



BENOIT MANDELBROT

20TH C FRENCH MATHEMATICIAN

The field of fractal geometry owes its existence to Benoit Mandelbrot's 1975 paper on the subject. Many of today's desktop painting programs (particularly any software development by Krause) employ principles expounded in his subsequent book "The Fractal Geometry of Nature" in which he described how fractals (i.e. what Mandelbrot called "fractional dimensions" where, for instance, a one-dimensional line might curve around to cover a two-dimensional plane) could be applied to computer imagery.



PIERRE-SIMON FOURNIER

18TH C FRENCH TYPEFOUNDER

In 1737 Pierre-Simon Fournier published a booklet called "Tables des Proportions qu'il faut observer entre les caractères" which introduced the concept of a "point system" for type and which would become the basis for setting type in various standardized sizes. The following year he published a type specimen book based on his "cicero" type size system.



JOHANN GOETHE

19TH C GERMAN COLOR SCIENTIST

While the rest of the world knows Johann Wolfgang von Goethe for his literary genius ("Faust" being the most famous), it is in the realm of color that his name must be counted as one of the giants of graphics evolution. His lifelong study of color which culminated in the treatise called "Farbenlehre" [Color Theory] in 1810 was a landmark exploration of color harmony and contrast.



ANSEL ADAMS

20TH C AMERICAN PHOTOGRAPHER

Ansel Adams' influence on modern photography can be recognized right through to the present day. His visionary images of the wild outdoors and particularly western American landscapes with a special ability to capture the subtleties of light and shadows have inspired generations of photographers after him. Adams also invented the "zone" method of photography, which is still used by photographers today.

Initially Curtis began offering full page ads for \$200; ten years later he was charging \$4,000 per page. THE LADIES' HOME JOURNAL became one of the most successful publications in American publishing history and made Mr. and Mrs. Curtis one of the richest couples in the United States.

The Curtis Publishing Company would later pioneer the science of demographics when it created its Commercial Research Department in 1911, developing the first system to measure readers' social, cultural and economic profiles through surveys, reader response cards and circulation audits.

MUNSEY AND THE TEN CENT MAGAZINE

But it was a publisher named Frank Munsey, desperate to keep his small publication MUNSEY'S MAGAZINE afloat, who would lead the industry into the twentieth century.

Not only was Munsey the first to adopt photo-mechanical reproduction and the use of halftones on a full scale basis, giving his book a look that transcended all the competition (and in the process saving his publishing career), but it was MUNSEY'S MAGAZINE that set off the "Ten Cent Magazine Revolution". Up until then, magazine publishers had settled upon a standard bookstand price of 25 cents per copy. But when Munsey relaunched his "new look" magazine in 1893 with the unheard-of cover price of 10 cents, he quickly captured a huge readership, forcing publishers across the nation to meet the new lower price.



Munsey's Magazine was relaunched in 1893 using revolutionary new halftone technology and the low cover price of 10 cents (above, February, 1894 issue).



IVAN SUTHERLAND

20TH C AMERICAN COMPUTER SCIENTIST

The evolution of Computer-Aided Design (CAD) began with Ivan Sutherland's 1963 Ph.D. thesis at MIT called "Sketchpad: A Man-machine Graphical Communications System". What Sketchpad provided was the ability for engineers to draw geometric figures on a screen and manipulate them in real time without any computer programming knowledge, using the very first graphical user interface. Sutherland also co-developed "virtual reality"; his company was eventually absorbed by Sun Microsystems.

QWERTY TAKES OVER THE KEYS

The publishing business model was undoubtedly reshaped by publishers' acceptance of advertising as a core source of revenue, and distribution gains and production improvements closely followed enhancements in press technologies.

But one invention above all cemented the connection between publisher and printer.

In 1829 an American inventor patented a machine he called the typographer. William Burt's invention, the first workable type writing device, allowed the user to print one letter at a time by pushing down on a lever, which brought the type against the paper.

William Burt's "typographer", the first working typewriter, 1830



The principal architect of the first successful typewriter was Christopher Sholes of Milwaukee, assisted by Carlos Glidden. Sholes built his first machine in 1868, but it took him six years to line up a manufacturing contract for his invention.

Finally the Remington Company agreed to take a piece of the action in return for manufacturing the Sholes-Glidden Type-Writer. But it wasn't until 1878, when the typewriter was revamped to include both upper and lower case letters, controlled by a shift key, that sales really took off.

There may be those who view the typewriter as only a peripheral to graphic

Although in the ensuing years many attempts were made to design a machine capable of generating type on paper, it wasn't until 1874 that a commercial typewriter appeared on the market.



The world's first typist — Lillian Sholes, Christopher's daughter, using the all-new Sholes-Glidden Type-Writer in 1874.

communications, but since its inception it's unlikely that many jobs in publishing, advertising or design have not started with fingers tapping on a keyboard — and this holds truer still since the advent of the personal computer. Throughout this time frame, one thing has remained constant: Christopher Sholes' QWERTY keyboard arrangement, patented in 1878 in order to alleviate the problem of clashes and jams with the original typewriter's typebars of commonly paired letters (such as "th").

A final addendum to the story of the typewriter: Sholes received technical assistance in perfecting his invention from one other source — not surprisingly, the ubiquitous Thomas Edison.

THE MODERN PUBLISHING ERA

In the late 19th and 20th centuries, publishing finally gained its independence from the printing industry.

Succeeding Cyrus Curtis, was the infamous William Randolph Hearst, a dominant figure in the 1920s and 1930s in an era before the age of corporate publishing when individuals could single-handedly control huge publishing empires. Although globally-bound publishing magnates like Rupert Murdoch and Conrad Black still threaten to corner the modern publishing market today, the wave of desktop technologies which began to appear in the late 1980s and 1990s may once again return the power of the press to independent publishers.

If one had to choose one individual who has been more influential in disseminating information about new publishing technologies in North America than any other, that figure is arguably Jonathan Seybold, founder of Seybold Seminars and Exposition and the show's charismatic figurehead from its inception in the late 1970s until 1996. The Seybold name is still synonymous with the most prestigious event in the publishing industry; Seybold conference sessions became legendary for the discussion and outright battles they engendered.

Publishing was built first on the printed word, and later with images and words designed to work together on a page. But who put the creative energy into designing the pages that made up those publications, and the fonts that formed those words?

Without content creators — the people who created the designs for both type and pages — neither printers nor publishers would ever have stayed in business...

66



CHARLES SIMONYI 20TH C HUNGARIAN COMPUTER SCIENTIST

Together with Butler Lampson, Charles Simonyi developed the first WYSIWYG (What You See Is What You Get) text editor on a personal computer when he wrote Bravo at Xerox PARC in 1976. This piece of programming would become a cornerstone of the Macintosh's WYSIWYG display technology when it was introduced in 1984. Simonyi now toils for Microsoft.

65



JOHN HERSCHEL 19TH C BRITISH ASTRONOMER/PHOTOGRAPHER

The term "photography", as well as "negative", "positive" and "snapshot" all sprung from use in Sir John Herschel's doctorate presented to the Royal Society in London in March, 1839. This British astronomer and photographer also introduced the "cyanotype" or blueprint in 1842, which still remains a fixture in architects' and commercial printers' production environments. His 1839 discovery of a method to fix photographs using hyposulphite of soda completed Talbot's calotype photography process.

DESIGN

CREATIVE CONTENT EVOLVES FROM FONT DESIGN TO PAGE LAYOUT

“GRAPHIC DESIGN” IS VERY MUCH A 20TH CENTURY CONCEPT. In fact, the term itself wasn’t coined until 1922 by the famous American designer William Dwiggins.

However the history of type is as old as printing itself, so perhaps we should start there.

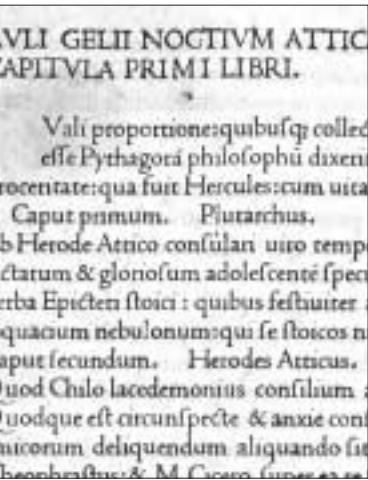
TYPE GETS A STYLE

In October, 1458, Charles II, king of France, having heard about a radical new device called a “printing press”, dispatched his Master of the Royal Mint to Mainz, Germany to find out more about this miraculous invention.

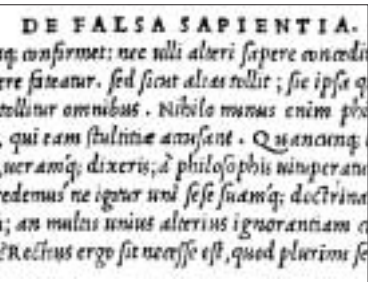
Nicolaus Jenson spent two years in Mainz, learning the art of printing from the master, Johannes Gutenberg. However, when he returned in 1461, he discovered that Charles had died and his son had no interest in new technologies.

Emigrating to Venice, Italy, Jenson soon began refining his skills in printing, punchcutting and engraving. At this time type was created by copying the handwritten letters of the scribes.

In 1470 Jenson published *De Evangelica Praeparatione of Eusebius*, which permanently distinguished him as arguably the most significant figure in the history of type. For it was this volume which introduced his majestically proportioned classic roman font which, along with the italics invented by Aldus Manutius (described under Publishing) represent the foundation of all type. Jenson’s Roman remains one of the greatest typefaces ever designed. And with its arrival the art of type design was born.



Jenson’s Roman type, created in 1470



Italic type, invented by Aldus Manutius in 1501

THE TYPE SPECIALISTS

It took over 100 years, but roman type was finally introduced into England in 1572 by John Day, although samples of his work demonstrate that he never quite achieved a level of quality to compare with Jenson.

The first true type specialist was Claude Garamond, whose first roman font in 1530 was inspired by Jenson. Before Garamond, printers had to be

multi-faceted artisans, executing everything from font design and punchcutting to printing and book-binding. The German printer and typographer Erhard Ratdolt had been the first to print a type specimen sheet in 1486, today a standard reference tool in any graphic designer’s suite of accessories.

Throughout the late 16th and 17th centuries, political persecution had a detrimental effect on the quality of both type and printing. But with the revival of printing and publishing came a renewed level of artistic typography.

Three names stand out for their restoration of the standards set by Jenson, Manutius, Garamond, Conrad Sweynheym, Francesco Griffo and other early type artisans.

First is William Caslon of Britain, master of simple yet elegant type, skilled craftsman and astute businessman. Caslon opened his type foundry in 1720; in 1734 he issued his first type sheets consisting of 38 samples, 35 of which he designed himself. He is recognized as the premier typefounder and font designer of his century (and, indeed, the American Declaration of Independence would be printed using a Caslon font).

After Caslon comes his countryman John Baskerville. By the age of 34, Baskerville was already the well-to-do owner of a varnishing business, as well as a skilful engraver — of gravestones. It wasn’t until after 1750, in the last third of his life, that he began experimenting with papermaking, inks, typefounding and printing. After his death his font designs fell out of favour for over 150 years until they were finally repopularized in the 1920s by type vendors Monotype and Linotype.

Finally, there is Giambattista Bodoni, an Italian printer and font designer of the late 18th and early 19th century, who is regarded as the father of the modern roman type-



Content creation in the mid-18th century



Bodoni’s “Manuale Tipografico” containing 291 alphabets, published in 1788.

face. Bodoni refined the Baskerville style (which he greatly admired) to create a unique appearance distinctively his own, bringing in the thin straight contemporary serifs and bold vertical strokes with which we are familiar today.

Alas, with the Industrial Revolution came another decline in graphic arts standards which would not be reversed until British printer and publisher William Morris, leader of the Arts and Crafts movement, founded the Kelmscott Press and energetically lobbied the trade for the revival of quality printing and typography.

TWENTIETH CENTURY TYPE AND DESIGN

Over the last hundred years many excellent type designers have contributed to the development of the rich and diverse library of typefaces we enjoy today, including Theodore De Vinne, Frederic Goudy, Stanley Morison, Morris Benton, Adrian Frutiger, Robert Middleton, Matthew Carter (founder of Bitstream), Neville Brody, Paul Renner, Herman Zapf and Eric Gill.

Let us also acknowledge Swiss designer Max Miedinger for providing us with the font which is more commonly seen today than any other: Helvetica.

In the relatively new field of graphic design, trends are less directly attributable to individuals, but certainly such modern creative luminaries as Kyle Cooper, James Earle Frazer, Saul Bass, David Carson, and Massimo Vignelli deserve mention, as well as Bauhaus master Herbert Bayer and John Heartfield, the pre-war German innovator of montage.

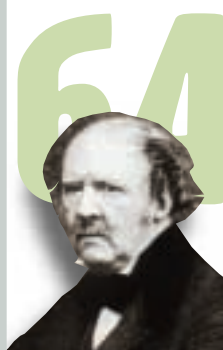
Twentieth century design also owes a great deal to the influence of American designer and art director Paul Rand, who was responsible for the corporate identities of such big names as IBM, Westinghouse, UPS, ABC, NeXT Computer, and Yale University.

And who in the advertising industry will ever forget the inspired genius of William Bernbach (co-founder of DDB Needham, née Doyle, Dane, Bernbach Advertising), creator of Volkswagen's groundbreaking ads of the 1960s and 1970s with their stunning use of white space?

But perhaps it's fitting that the final word on design should go to the woman who first demonstrated the concept of combining type, illustration and photography in advertising. Chicago-based photographer Beatrice Tonnesen pioneered this style of promotion back in the early 1890s with tremendous success — and over one hundred years later, print advertising still hasn't found a better way to sell product.

Which goes to prove once again that a picture really *is* worth a thousand words — or even a thousand fonts.

However, without compelling art and illustration, effective graphic communication would be a great deal more challenging...



FOX TALBOT 19TH C BRITISH INVENTOR

William Henry Talbot (who disliked his more common tag of Fox Talbot) is remembered for his invention of calotype photography (patented in 1841) and photogravure (1852). His first paper negative was made in 1835; he tried to extract excessive licensing fees for its use but Daguerre had already given his daguerreotype process to the world and Talbot's marketing attempts were a failure.



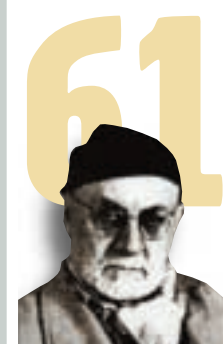
JOHN BASKERVILLE 18TH C BRITISH PRINTER/TYPE DESIGNER

John Baskerville never realized his personal goal of improving upon the typefaces of the great Caslon, but nonetheless is ranked as one of the great names in typography, the creator of many "transitional" typefaces. He produced his first typeface in 1754, and proved himself to be as expert at printing as he was at type design.



JOHN AUDUBON 19TH C AMERICAN ILLUSTRATOR

John James Audubon was the illegitimate son of a French naval captain and one of the captain's French hands on his sugar plantation in Haiti. He married his love of animals and birds in their natural habitat with his talent for illustration, and between 1826 and 1838 created an enduring body of 435 engravings still enjoyed by nature lovers today. It was by travelling to England that he found both the support and the color printing expertise to publish his collection of drawings for an appreciative base of subscribers.



HENRI MATISSE 20TH C FRENCH ARTIST

In 1906 an art critic viewed a roomful of work by Henri Matisse and others of his clique, and dubbed it "la cage aux fauves" ("cage of wild beasts"). The label stuck and Matisse assumed a leading role in the Fauvist movement. He was heavily influenced by Cézanne, though his career would evolve through several phases. His use of bright colors and his experimentation with new papers and pigments set the style for modern use of color. Matisse is regarded as one of the most important painters of his century.



PHILIPP RUNGE 19TH C GERMAN ARTIST

Philipp Otto Runge was a painter of expressive and lyrical imagery. However his legacy to the world of graphics is in his contribution to our understanding of color, for Runge was the first to construct an explicitly three-dimensional color wheel, demonstrating the concepts of hue, lightness and saturation almost a century before Munsell.

ART & ILLUSTRATION

**“DRAWING IS NOT THE FORM;
IT IS THE WAY OF SEEING THE FORM.” ~ Degas**

IN A RETROSPECTIVE OF GRAPHICS PEOPLE, PAINTERS HAVE THEIR place as the interpreters of new technologies as much as they do for their ‘styles’. From our vantage point in the 21st century, it is difficult to imagine the shock that each new way of painting and printing had upon viewers. But the history of art is full of stories about the violent reactions of both critics and the public upon confronting “new ways of seeing the form”.

THE EXQUISITE MASTERY OF THE RENAISSANCE

We probably have to go right back to Jan van Eyck in the 15th century to find a genuinely revolutionary technique that would change how people read imagery. Whether or not van Eyck invented oil painting is not crucial; the important point is the way he used this new medium in thin glazes to build up his painting to such astonishing richness of detail.

Other artists would make the pilgrimage to the Netherlands for centuries afterwards to see his brilliant works. In his own day people would have been exposed largely to religious icons with their flat gold-leaf backgrounds. Unless they travelled to Italy, they would rarely see anything but these two-dimensional images; van Eyck suddenly thrusts the viewer into a world that has depth, with

distant landscapes outside the windows, and deep reflections in the mirrors. In his paintings we find the meeting place of technique and visual vocabulary that lasts throughout the Renaissance.

One man who did travel to Italy at this time was Albrecht Durer. To his amazement, the Italians treated artists with respect, unlike his native Germany, where they were simply craftsmen. Durer was *the* master print maker of his (or anyone’s) day, and carried his art all over Europe. The extremely fine detail of his engravings carried over into his paintings, prompting Italian painter Giovanni Bellini to ask Durer to make him a present of the brush he used to do hair with. He expected to see a brush that could paint several hairs in one stroke, not suspecting that Durer drew each hair

one at a time. Durer’s artistry still astonishes today.

The maturing of the new visual vocabulary peaked with the man who virtually represents the Renaissance, Leonardo da Vinci. The painter of the most famous painting in history also gave us the notion of “sweet light”, the hour or so just before sunset when everything seems to glow. Photographers and film makers still try to achieve that luminescence in their lighting. Leonardo captured it in his painting with a revolutionary blending of shadows into obscurity, and gradations that made the highlights seem to emerge from the shadows. It came to be called *chiaroscuro*, and remains the fundamental tool we use to understand form in a 2D image. But it is also inherently a way to create mood in a picture; da Vinci’s language of Light and Shadow would eventually evolve into regarding light itself as the real subject of art.

IMPRESSIONISM — BREAKING WITH TRADITION

When the Impressionists erupted on the art world, they were using the very latest technologies and theories of their day. French chemist Chevreul’s work pointed to the optical effects of placing pure colors next to each other; using the new ‘tubes’ of paint on a white canvas, the Impressionists undid half a century of tradition. Since Leonardo, painters had started a painting on a brown or grey background and added both shadows and highlights to built up the modelling. We are so familiar with inks and pigments on a white ground that earlier painting actually looks dark to us.

Honoré Daumier, himself a celebrated political cartoonist and painter, is said to have remarked, “I’m not a very great admirer of Manet’s work, but I find it has this important quality: it is helping to bring art back to the simplicity of playing-cards.” Perhaps because Édouard Manet was honestly trying to get his ‘playing cards’ accepted at the French Salon, he became a hero for every young artist in Paris. They saw modern subjects treated in a completely modern way and carried this vision into the twentieth century.

We all know about Toulouse-Lautrec mixing his own printing inks to create the posters he is perhaps best known for, but what he was doing, in fact, was introducing drawn outlines filled with flat areas of color to everyone on the boulevards of Paris. It was Japanese — it was like a stained glass window, but on paper. It was a visual tool, a way of economically representing things on paper that has survived all the way to our digital world in the form of *Illustrator* and *Freehand* art.

As the twentieth century approached, painters encountered a technology that created a very real identity crisis: photography. Was there any point in painting objects when Monsieur Daguerre’s invention could capture them so much more faithfully? Quite a few artists used the camera to “take notes” for future reference, a prac-



The depth and detail of Jan van Eyck’s work jumpstarted Renaissance art; observe the reflection in the convex mirror above. (The Arnolfini Marriage, 1434, oil on panel, National Gallery at London)

tice that decades later would reach its peak in the highly “photographic” stylings of Norman Rockwell. However a unique few decided that painting would have to distinguish itself entirely with even bolder use of color and style.

Considered the father of modern art, Paul Cézanne embodied the ideal of the man who lived solely for his art. He lived like some modern hermit in the south of France and created for himself art theories that bypassed all previous rules of representation. The results sent a shockwave through the art world.

FROM “WILD BEASTS” TO THE MAGIC KINGDOM

Two giants now strode on the scene, taking Cézanne’s cue in two very different directions. Henri Matisse and Pablo Picasso dragged painting, kicking and screaming, into the twentieth century; the former with his use (or abuse) of electric color and Fauvism, and the latter with the bewildering range of styles and experiments he commanded, including Cubism. Color and form had now become the whole point of painting and their pursuit would pave the way for painters to eventually escape the tyranny of “objects” altogether.

Not everyone deserted the “object” for abstraction, but objects were now being put to quite a different use. René Magritte is easily the most imitated of the Surrealist painters. One finds his ideas emulated repeatedly by photographers and digital artists alike. Maurits Escher, an extraordinary printmaker, also employed objects in solving (or creating) intellectual puzzles. His enigmatic illustrations still produce a sense of wonder and surprise. But perhaps the biggest “consumer” of objects to be used in his art was Andy Warhol. Equally comfortable in painting and serigraphy, Warhol used everyday objects as something to be experimented with.

Through the 60s, ever-increasing minimalism brought greater attention to white space on the canvas and the page. Collage and kinetic art came off the wall; performance art led to political art, and the more provocative revolutionary art of the 1980s and 90s.

The use of photography as a pretext to artistic distortions finds its digital messiah at the end of the 20th century in Thomas Knoll, creator of *Photoshop*. This software proved to be such a flexible image manipulating tool that programmer/artists like Kai Krause were able to create worlds within the program itself. With Kai’s plug-ins, the mathematical musings of Benoit Mandelbrot became fractal art that computers could generate with ease.

But we can’t leave the 20th century without acknowledging its greatest icon creator, Walt Disney. His use of every new technological innovation that presented itself (sound, color film, stereo) allowed him, through his army of artists, to create some of the century’s most memorable and powerful imagery...

59 HENRI TOULOUSE-LAUTREC

19TH C FRENCH ARTIST

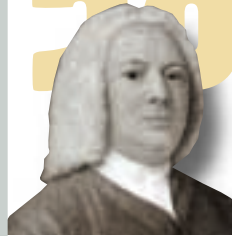
Despite being hampered throughout his life by ill health, alcoholism and mental instability, Toulouse-Lautrec made a lasting impression on modern art with his colorful posters of the 1880s and 1890s, particularly his famous “At the Moulin Rouge” of 1892, in which he depicted the prostitutes, barmaids, clowns, and actors of Montmartre. His experimentation with inks lent a distinctive appearance to his work; his use of lithography showed artists how to reach a wider audience.



58 WILLIAM CASLON

18TH C BRITISH TYPEFOUNDER

By combining his skills as an engraver and craftsman with his talents in art and design, William Caslon rose to become the premier typefounder and font designer of his century. The popularity of his masterful yet simple type designs spread across England and to the U.S. throughout the 18th century (in fact, the Declaration of Independence was set in Caslon type) and his work continues to influence font designers to this day.



57 LUDWIG VON SIEGEN

17TH C GERMAN ENGRAVER

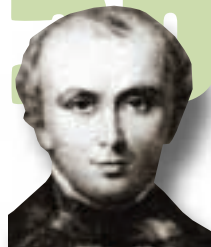
Ludwig von Siegen was a German soldier, artist and engraver who, aside from his colossal invention of mezzotint engraving around 1640, is a fairly unknown figure. He was friends with Prince Rupert, nephew of Charles I, who was responsible for carrying mezzotinting to England, where it enjoyed great popularity. The earliest date that can be attached to mezzotint is 1642 in Von Siegen’s portrait of the Landravine Amelia Elizabeth. Mezzotint was the forerunner of what today’s FM screening.



56 LOUIS DUCOS DU HAURON

19TH C FRENCH COLOR SCIENTIST

The principles of subtractive color theory which form the basis of producing both color photography and process color printing can be traced back to a proposal put forward in 1869 by French scientist Louis Ducos du Hauron in his book “Les Couleurs en Photographie”. He also patented the trichrome color photo process in 1868, and later, in 1891, the anaglyph method of stereoscopic photography.



55 WILLIAM CAXTON

15TH C ENGLISH PRINTER

After building a personal fortune as a shrewd merchant between 1446 and 1453, William Caxton saw the potential of the newly invented printing press. Probably learning his craft in Cologne, Caxton introduced printing to England, setting up the first press in England in 1476. He primarily wanted to support demand for his literary endeavours, especially his popular “History of Troy”, completed in 1471. In the next fifteen years his masterful printing output would be both prolific and wide spread.



PHOTOGRAPHY

CAMERA OBSCURA LEADS TO THE FIXED IMAGE

IN JANUARY, 1839, BRITISH ASTRONOMER SIR JOHN HERSCHEL (the man who discovered the planet Uranus) saw samples of Louis Daguerre's just-announced daguerreotype photography process for the first time. He wrote to his friend Fox Talbot, "It is hardly too much to call them miraculous. Certainly they surpass anything I could have conceived as within the bounds of reasonable expectation...Every gradation of light and shade is given with a softness and fidelity which sets all painting at an immeasurable distance...If you have a few days at your disposition...come and see!"

It should be noted that Herschel's assessment of Daguerre's remarkable invention bore more weight than most since it was, in fact, in his paper on the subject presented to the Royal Society in March, 1839 that he coined the term "photography" — along with the terms "negative", "positive", and "snapshot". But Talbot was undoubtedly quite annoyed by Herschel's letter since he considered himself the originator of photography, having produced his first paper negative photographic image four years earlier.

Despite the fact that Talbot's process still wasn't great (the sensitivity of his papers was rather poor), he started publicizing it heavily, beginning with a presentation at the Royal Institution on what he called "photogenic drawing". Then in 1840, he discovered

by accident that by resensitizing his paper, he could lower exposure times drastically — from an hour or so to just a few minutes. With this new and improved version in hand, which he named the calotype, he set out to sell it to the world, patenting it in February, 1841.

Unfortunately, this

proved to be the wrong strategy, since Daguerre had made a deal with the French government to give away the daguerreotype process freely. It was made worse by the fact that Talbot was demanding exorbitant licensing fees for the rights to use calotype. When Scott Archer introduced his faster, better wet collodion method in 1851, Talbot took him to court for patent infringement — and lost. That effectively put an end to calotype.

So it is that Louis Daguerre received the lion's share of recognition for inventing photography.

But, in truth, if Daguerre had not been shown the secrets of "heliographic" photography by its inventor, Joseph Nicéphore Niépce, after they became partners in 1829, one wonders whether he would have ever pursued perfecting the daguerreotype (which he succeeded in doing in 1837 when he developed a method for being able to fix images). For it was Niépce who produced the world's first known photograph in 1827, and who might have gained the fame which accrued to Daguerre — if only he hadn't died four years after the partnership was formed.

CAMERA OBSCURA

Photography in its current incarnation began in the nineteenth century — but long before its invention, the theory of the camera was known and utilized.

The principles of camera obscura — light projecting through a small hole to produce an inverted image in a dark enclosure — can be traced back at least as far as Aristotle.

Camera obscura was described by Arabian scholar Hassan Ibn Hassan in the 11th century, by 13th and 14th century scholars such as Roger Bacon, John Peckham, Arnaud de Villeneuve, and Levi ben Gershon, and il-



This 1657 diagram by Gaspar Schott demonstrates the setup for camera obscura.



One of Fox Talbot's early calotype photos, a bookshelf in his study.



54 NELSON HAWKS 19TH C AMERICAN TYPEFOUNDER

Although both Fournier and Didot had established point systems for type long before Nelson Hawks began championing the "American System of Interchangeable Type Bodies" in the late 1860s, it was Hawks who succeeded in convincing the American printing trade to adopt his standard. It was accepted almost immediately after it was announced in 1879, officially recognized in 1886, and it is his system of point measurement to which we adhere today, even with the evolution to desktop technologies.



53 JAMES MAXWELL 19TH C ENGLISH COLOR SCIENTIST

In 1861, James Maxwell demonstrated that by taking three pictures through primary colored filters, overlaying them, and projecting the three using corresponding filters, it was possible to produce full color photographic images, an enormous leap ahead in enabling the invention of color photography. Maxwell also laid out the electromagnetic spectrum theory, in itself a notable achievement.

PHY

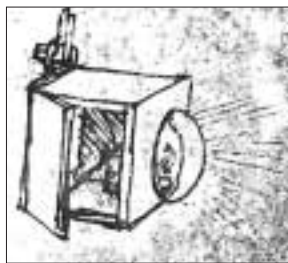


Collodion
photography by
Julia Margaret
Cameron, 1875

illustrated for the first time by Johannes de Fontana in 1420.

It was Leonardo da Vinci who wrote the first detailed description of camera obscura in the 16th century (although, since he wrote everything backwards, it was another three hundred years before J. B. Venturi deciphered it in 1797). In the same time frame Venetian nobleman Daniel Barbaro wrote of employing camera obscura for drawing, one of the first references to it as an artist's tool for projecting and tracing an image. It is probably no accident that the realistic perspective of Renaissance paintings and illustrations coincided with a broader awareness of this technique.

In 1652 "La Perspective Curieuse" was published, a posthumous detailed account of the process written by artist Jean-Francois Niceron, who had also written extensively during his lifetime on perspective, lenses



Leonardo da Vinci's 16th century sketches included what looks suspiciously like a camera.

51

ANDREAS HAMM

19TH C GERMAN PRESS BUILDER

In 1850, 26 year old Andreas Hamm took an interest in his brother's bell foundry and machine business in Frankenthal, Germany. By 1858 he and his partner, Andreas Albert, were manufacturing high speed presses, and within six years his tiny company had grown to become one of Germany's leading manufacturers of printing presses. Today the business Hamm started is known as Heidelberg, the world's largest press manufacturer.



PHOTO COURTESY HEIDELBERG

50

ROGER BACON

13TH C ENGLISH MATHEMATICIAN

Building on the work of his mentor, Robert Grosseteste, the English monk Roger Bacon made advances in the science of optics far beyond any level of knowledge enjoyed by his thirteenth century contemporaries, despite the fact that his work was violently opposed by his superiors in the Order of Friars Minor. His observations concerning the behaviour of light and mirrors and his application of geometry to optics provided later Renaissance artists and scientists with an invaluable foundation.



49

FRIEDRICH KOENIG

19TH C GERMAN PRESS BUILDER

In 1811 Frederick Koenig built the first steam-powered twin cylinder printing press (actually his third version — Koenig scrapped the first two), which was adopted into use by The Times newspaper in London two years later. This new "power press" provided a tremendous boost to print production, raising daily output of printed sheets from hundreds to many thousands. Koenig's invention ushered the graphic arts industry into the Industrial Revolution.



48

VANNEVAR BUSH

20TH C AMERICAN SCIENTIST/WRITER

When we use the expression "desktop", we can thank Vannevar Bush. Bush proposed the desktop metaphor to illustrate his "Memex" concept of information storage and retrieval in a July, 1945 article in Atlantic Monthly called "As We May Think". Among the many future scientists who were inspired by Bush's vision was Doug Engelbart. Bush also invented the Differential Analyzer in 1930; his primary blind spot was an inability to foresee the role of digital technologies.

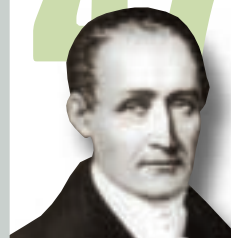


47

JOSEPH NIEPCE

19TH C FRENCH INVENTOR

The world's first successful "fixed" photograph was produced by Joseph Nicéphore Niepce in 1827. Unable to enlist support from England's Royal Society, Niepce partnered with Daguerre on the development of his invention, "heliographic" photography, until his death in 1833. There can be little doubt that Daguerre and the evolution of the daguerreotype benefited greatly from Niepce's influence and knowledge.



52

STEVE WOZNIAK

20TH C AMERICAN COMPUTER ENGINEER

With a natural flair for tinkering and an innate understanding of electronics, Steve Wozniak built the first Apple Computer in 1975 and co-founded Apple Computer with Steve Jobs. Wozniak's second generation machine, the Apple II, held the position of Apple's flagship product from its introduction in 1976 until 1985, and fueled Apple's tremendous growth through this period.



PHOTO COURTESY STEVE WOZNIAK

46

ALBERT DICK

19TH C AMERICAN GRAPHIC ARTS INDUSTRY LEADER

Graphic arts owes much to experiments performed by Albert Dick in 1884 with wax paper and a file. Dick enlisted the aid of Thomas Edison to invent the mimeograph, introduced in 1887. Eventually the A.B. Dick Company would lead a mini-revolution in the printing industry with the introduction of the small offset press in the early 1950s, a technology that provided the masses with access to affordable short run printing.



PHOTO COURTESY AB DICK COMPANY

45

JACQUES CHRISTOPHE LE BLON

18TH C GERMAN ENGRAVER/PAINTER

Modern color printing was begun through the efforts of German-born Jacques Christophe Le Blon, a painter and engraver born in 1667. Le Blon, who settled in France, devised the first three-color process printing method around 1710 — even before the first systematic theory of color had been worked out.



44

ALBRECHT DURER

15TH C GERMAN ENGRAVER/ARTIST

Master of the woodcut, printer and publisher, mathematics scholar, prolific writer — Albrecht Durer was the most important figure of the German Renaissance. A talented engraver who invented the cross-hatching technique of shading, he studied geometry in drawing and devised a method of etching squares onto panes of glass to view and map perspective. In oils, water colors or wood engravings, his art set a new standard in optical realism. In 1525 he wrote and published the first German mathematics book.



43

EDOUARD MANET

19TH C FRENCH PAINTER

In the 1860s, a group of young French artists had grown tired of traditional academic painting, seeking instead to develop a new more lively style to express their vision of truth in art. It was natural that Edouard Manet would assume a leadership role in this new Impressionist movement. Manet dispensed with the old method of building on a dark background and went back to da Vinci's technique of starting from white. His colors displayed a shocking intensity, aided by his use of pure pigments in tubes, just newly introduced.



42

ROBERT METCALFE

20TH C AMERICAN INVENTOR

The true power of personal computing was genuinely unleashed with the ability to connect personal computers together in a local area network. This invention was Ethernet, the product of Robert Metcalfe while working at Xerox PARC in 1973, and was driven at first by the need to connect a computer with another new invention, the laser printer. Metcalfe went on to found networking giant 3Com Corporation (which lists Palm Computing among its holdings) in 1979.



Canaletto used camera obscura extensively for preliminary sketches before painting.

and mirrors. Descriptions of camera obscura by numerous writers began to appear with great frequency.

By the 18th and 19th centuries, use of camera obscura was commonplace among artists and illustrators. The Italian painter Giovanni Canale (Canaletto) was one in particular who relied extensively on this method for preparing a sketch before painting. Indeed, both Talbot and Niepce were wishful but mediocre artists who turned to this device to improve their drawing techniques. Daguerre, on the other hand, was an artist with some ability, who employed it to produce large scale paintings which he displayed in his diorama theatre in Paris, the first of its kind. The objective of all three was to find a way to “fix” the images they were projecting.

THE FIX IS IN AND PHOTOGRAPHERS FLOURISH

The very first paper negative was produced not by Talbot or Daguerre or Niepce, but by an 18th century German academic named Johann Heinrich Schulze. In 1727, Schulze concocted a mixture of silver nitrate and chalk on paper on which he scribbled some letters and left it exposed in sunlight. After several hours, a white on black image appeared. Unfortunately, Schulze had no way to fix his images.

Finding a permanent fix was the biggest challenge for the early pioneers of photography. Daguerre found his fix in 1837; Talbot got his two years later with the help of his friend John Herschel, who, after twenty years of experimentation, had finally uncovered a method using hyposulphite of soda.

But once the daguerreotype was available, photography found “photographers”. The Bisson brothers, Louis and Auguste, opened a photo studio in Paris in 1841, quickly gaining fame for their mastery of the new technology. Gaspard-Felix Tournachon — better known as Nadar (derived from his nickname “tourne a dard”, meaning “bitter sting”) — set up shop in 1853.

Samuel Morse (inventor of Morse code), who had befriended Daguerre in 1838, introduced the daguerreotype into the United States right after its release in France. One of his protegés was Mathew Brady, who would start his own studio in 1856 and who gained fame both for his historic shots of famous Americans and his gritty pictures of the Civil War. In 1840 Alexander Wolcott opened the world's first portrait studio in the U.S. Another American, Felice Beato, became the first to photograph Korea, covering the Opium War in 1870.

However in Britain, Fox Talbot's litigious behaviour served to impede the spread of photography (although since he never took out patents in Scotland, Scottish photographers were generating fine work earlier than their counterparts in England and Wales). Richard Beard became the first portrait photographer in Britain in 1841, purchasing the rights from Wolcott.

Roger Fenton took up photography after a visit to France in 1851. His pictures of Russia, taken the next year, were some of the

first to be seen in England, guaranteeing him instant notoriety. He started what would become the Royal Photographic Society in 1853, whose first patron was Queen Victoria, who was greatly enamored with the new art of photography.

One of the most progressive and noteworthy portrait photographers of the time was Julia Margaret Cameron, who captured portraits of many famous people of her generation, and who was one of the first to experiment with soft focus.

In October, 1843 Anna Atkins became the first to publish a photographically illustrated book, "British Algae: Cyanotype Impressions", using the "blueprint" imaging technique which Herschel had invented in 1842. And in 1860, Francis Frith began his tour of the United Kingdom, photographing every town, village and historical sight he could find, which he printed as postcards. Within a few years Frith was running one of the largest photographic postcard companies in the world.

EASTMAN CREATES AN INDUSTRY

Photographic technologies evolved steadily in the fifty years following Daguerre's historic 1839 announcement. However the daguerreotype would only enjoy a short lifespan of popularity; Archer's collodion quickly became photographers' choice once it was released in 1851.

In September, 1871, the British Journal of Photography published an article written by Richard Maxwell, an English physician and hobby photographer, which proposed a "dry" collodion process, whereby the sensitizing chemicals could be coated on a glass plate in a gelatin emulsion, instead of wet collodion. His idea sparked others to put this theory into production. This represented a revolutionary step in the development of photography, and by the end of the decade dry plates were the standard. Alas, Maxwell never patented his idea, and died in poverty.

But in America, an ambitious young bank clerk had taken an interest in photography around 1877, purchasing his first photographic outfit for \$49. Like all photographers, he found the wet collodion process messy, cumbersome and limiting, since it required working close to a darkroom. After reading about the experimental dry plate process, he started thinking about a way to automate the manufacturing of these plates.

Two years later George Eastman had invented an emulsion-coating machine for mass producing dry plates; the next year he was manufacturing and marketing them commercially. By 1881, the Eastman Dry Plate Company was a roaring success.

In 1882 Eastman began experimenting with different emulsion support bases other than glass. Before long he had created flexible film, a machine to produce the film, and a roll film holder. The first transparent film negative, Eastman American Film, was launched in 1885, another milestone in photography.

But the single most important event in the history of photography would occur three years later, in 1888. The introduction of the famous Eastman "Kodak" camera — inexpensive, simple to use, with photo development included — suddenly made photography available to anyone.

With the Kodak, and the \$1 Brownie camera that followed in 1900, the modern photography industry was born.



Erich Salomon gained notoriety for his candid shots of events and dignitaries, using his tiny new 35mm Ermanox camera.

PHOTOGRAPHERS AND THEIR CAMERAS

The late 19th and 20 centuries produced a wealth of talented photographers who influenced the art, from Peter Emerson, Henry Robinson, Martin LaRoche and Nancy Ford Cones to Man Ray, Victor Skrebneski, Eduard Steichen, Francisco Scudalio, Yousuf Karsh, Pulitzer Prize winner Nagao

Yasushi, Richard Avedon and Erich Salomon (who may lay claim to the title of the first "papparazzi").

But we must single out German-American photographer Alfred Stieglitz, who, from 1890 on, probably did more than any other individual to promote photography as an art on the same level as other arts; and likewise the great American photographer Ansel Adams should be recognized not only for his magnificent landscape images but also for his invention of the "zone" system.

Over the years, cameras have been produced in almost every imaginable shape, size and format, from the "detective" cameras of the 1890s (shaped like bowties, hats and purses) to the monstrous horizontal copy cameras used by the printing trade. Space only permits us to mention a few of the more significant innovators and their inventions here, including:

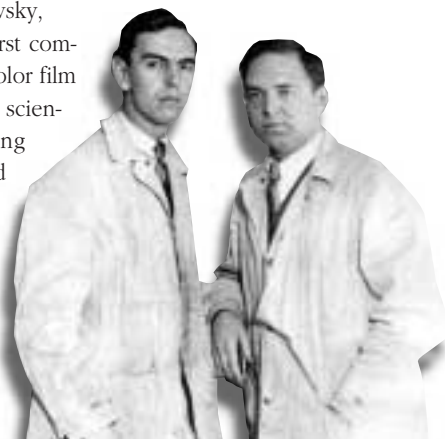
- Thomas Sutton, for his single-lens reflex camera (1861)
- Sam McKellen, a lightweight rack and pinion camera (1884)
- halftone inventor Frederick Ives, for the first complete system for natural color photography (1892)
- Oscar Barnack, for the Leica, the first commercially available 35mm miniature camera (1924)
- Victor Hasselblad, for the first camera with interchangeable lenses, film magazines and viewfinders (1948)

And photographers will be forever indebted to the work of Leopold Mannes and Leopold Godowsky,

who in 1935 invented the first commercially successful 35mm color film for Eastman Kodak. But the scientific achievement of devising Kodachrome film depended on knowledge accumulated over many centuries concerning the nature of the visible spectrum itself.

Which is to say, it necessitated the investigation and study of the fundamental science of color...

Commercial color photography was invented in 1935 with the development of Kodachrome 35mm film for Eastman Kodak by Mannes and Godowsky.



COLOR SCIENCE

COLOR IS IN THE EYE OF THE BEHOLDER

THE YEAR WAS 1266, AND AN ENGLISH MONK NAMED ROGER Bacon had a big problem. He had written a letter to Pope Clement IV in which he had proposed that the Church sponsor the undertaking of a collaborative effort to gather all the scientific and mathematical knowledge available at the time and assemble this data into an encyclopedia.

The trouble was that the Pope wasn't accustomed to receiving requests of this nature, and he misunderstood what Bacon was suggesting. He thought this work existed already, and naturally he wanted to see it.

Obedient to a fault, Bacon knew he couldn't disobey His Holiness, so he quickly started writing *Opus maius* (Great Work), *Opus minus* (Smaller Work), and *Opus tertium* (Third Work). There was only one other minor impediment — Bacon's superiors at the Order of Friars Minor took a very dim view of his ideas, so he was forced to carry out his project in secret, which he proceeded to do for the next two years.

As bad luck would have it, the Pope died in 1268, putting a damper on Roger Bacon's grand plan. Nonetheless, expanding on the teachings of his mentor Roger Grosseteste, Bacon's observations on light, optics, astronomy and geometry laid the groundwork for scientists in succeeding centuries.

COLOR SCIENCE FINDS ITS FATHERS

One doesn't usually equate graphics with scientific matters. But there can be little doubt that the evolution of color science began with that famous scientist and intellectual giant of the 17th century, Isaac Newton.

For the graphics world, Newton's most important discovery came when he split light through a prism, revealing the visible spectrum — and more important, demonstrated through the use of a second prism that the spectrum could be recombined into white light. Newton deserves credit for being the father of modern color

science, but it should be noted in passing that he was not the first to describe the phenomenon of light being separated by a prism. That honour probably goes to a Jesuit priest by the name of Marco Antonio de Dominis who wrote about this effect in 1611.

The famous German writer Johann Wolfgang von Goethe took exception to Newton's seven-color interpretation of the color wheel and spent twenty years fine tuning his own theories on color, which he published in 1810 under the title *Farbenlehre* (*Color Theory*). Goethe focused on the effects of different light sources and the way the eye responded to color under various conditions, striving to define the perfect balance of color harmony and contrast; his color wheel was constructed of only six colors. Yet even as Goethe was publishing what he considered to be his greatest work, another German was postulating what would be the first modern model for color.

Philipp Runge was an artist who was fascinated with the perception of color. In 1810 he developed the first three-dimensional color wheel, the forerunner to today's color system. Runge's efforts would be reconstructed in the 1930s by Bauhaus master Johannes Itten, who contributed the concepts of "color chords" and the "Seven Contrasts".

Meanwhile in America, Moses Harris, the 18th century engraver, had defined the concepts of primary colors (red-blue-yellow) and secondary colors (orange-green-purple) even before the Europeans. In 1776, Harris produced his *Natural System of Colors*, in which he showed an 18-hue color wheel.

COLORIMETRY BY OBSERVATION

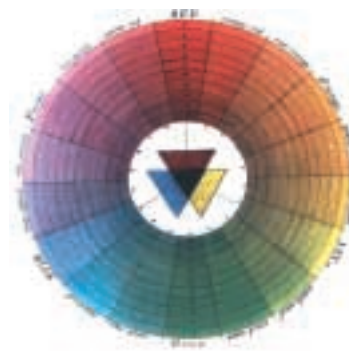
In 1839 in France, Michel-Eugene Chevreul, director of the Gobelin's tapestry works in Paris, published his famous *Law of Simultaneous Contrast of Colors*, in which he showed how the perception of colors changed, depending on their juxtaposition. This theory had a monumental effect not only on the way yarns were dyed



Isaac Newton's seven-color model, 1666

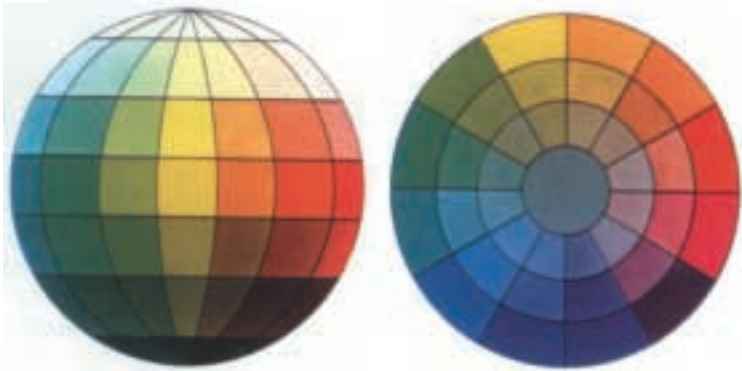


Johanne Goethe's six-hue color wheel (Farbenlehre, 1810)



The 18-color wheel by Moses Harris (Natural Spectrum of Colors, 1776)

NICE



In 1810, German artist Phillip Runge devised the first three-dimensional color model, shown above.

and woven from that time forward but also on theories of art, and particularly the Impressionist movement that followed later that century.

Thirty years after Chevreul, Louis Ducos du Hauron proposed the fundamental principles of the subtractive color theory. At first his work would affect the evolution of color photography (and in fact du Hauron produced one of the very first color photographic images); later it would be instrumental in the development of process color printing.

It is James Clerk Maxwell who is credited by most historians with the first color photo in 1861; however Maxwell's shining achievement is his theory of the electromagnetic spectrum, in which he set out the order of light waves by wavelength.

But as the 19th century drew to a close, colorimetry — the quantitative and objective measurement of color — was still very much a compilation of individual and subjective observations, lacking one unifying methodology to bind it together.

COLOR — HUE, VALUE AND CHROMA

The first step toward creating a system for color measurement came in 1880, when Joseph Lovibond, a British brewer, devised the first colorimetry scale in order to find a formula for maintaining a consistent color in the beer he produced.

In 1879 Ogden Rood published *Modern Chromatics*, which in Europe quickly became the Bible of color. A copy of this book found its way into the hands of an American artist and art professor at the Massachusetts Normal Art School named Albert Munsell, who became so interested in the subject that he began devoting his attention to the formulation of a wholly scientific approach to the nature and constructs of color. A visit to the Gobelins and a review of Chevreul's papers in the library of the Beaux Arts in 1887 immersed Munsell further in his subject.

The more he studied the nature of color, the more Munsell concluded that it was necessary to find a way to define color in more precise terms. By 1898 he had formulated a new theoretical model which he felt would finally express a comprehensive method to describe, catalogue and communicate the essence of all visible color.



FRANK MUNSEY

19TH C AMERICAN COMMERCIAL PUBLISHER

In 1893 Frank Munsey produced the first magazine illustrated entirely with photomechanical techniques using halftone technology. At the same time he set off the "Ten-Cent Magazine Revolution" by lowering the newstand cover price of his magazine to 10 cents, 60% below the standard 25 cents. By the turn of the century Munsey's Magazine had more readers than any other magazine in the world; it was published continuously until 1957.



JAMES RUSSELL

20TH C AMERICAN INVENTOR

In 1965 James Russell, frustrated with vinyl records' lack of durability, decided to find a better solution. Russell devised a method of recording binary data onto a photosensitive disc which could be read by a laser. It took twenty years to convince the recording industry that the compact disc was commercially viable, but today CD-ROMs are used extensively for common graphics utilities like data archiving and data delivery. The compact disc also paved the way for the development of DVD.



CYRUS CURTIS

19TH C AMERICAN PUBLISHER

The modern publishing model based on income centred on advertising revenue began with the success of the Ladies' Home Journal, launched in 1883 and built into a powerhouse publication by Cyrus Curtis and his wife Louisa Knapp Curtis. Curtis Publishing became a giant in its field through the acquisition of such periodicals and newspapers as the Saturday Evening Post, the Philadelphia Press, the New York Evening Post, and the Philadelphia Inquirer.



MARTIN LUTHER

16TH C GERMAN RELIGIOUS ACTIVIST

When in 1517 Martin Luther decided to take his objections to the Church's indulgence system to the people, he used the press to spread his thoughts, thus becoming the first person to exploit the power of the press for political ends. Luther also capitalized on the printing press by publishing his German translation of the Bible, which served to solidify his break with Rome and launch the Reformation.



EDWIN LAND

20TH C AMERICAN COLOR SCIENTIST

Famous for founding Polaroid Corporation, the application of the principles of polarized light to sunglasses and other products, and especially the invention of instant photography with the Polaroid Land camera, Edwin Land's most important contribution to graphics is arguably his study of perceptual color, summarized in the retinex theory for the mechanism of color perception.

36

GEORGE BOOLE 19TH C BRITISH MATHEMATICIAN

The fundamental construction of computer programming owes much to the work of mathematician George Boole, who invented mathematical logic and the use of logical operators which bears his name. It was Boole who conceived of separating mathematical symbols from operations; Boolean algebra, which Boole developed in 1854 in a paper entitled "Laws of Thought", can be found in almost any piece of software code.



35

ALAN SHUGART 20TH C AMERICAN INVENTOR

Personal computer systems would be useless without digital storage technologies such as the floppy and the external hard drive. The clear king of digital storage innovations is Alan Shugart, a developer of disk drives for IBM in the 1960s who was the inventor of the floppy disk (in 1972) and the first external hard drive (the Winchester, 1980). The iconoclastic Shugart founded Seagate Technologies in 1979.



34

BILL GATES 20TH C AMERICAN SOFTWARE DEVELOPER

Bill Gates' influence on graphics can be measured not by his contribution to BASIC programming, or his application software development (Word, Excel, Office, Publisher, etc.), or even his role in building and leading the world's richest corporation, Microsoft, but by his implementation of the graphical user interface into the PC-based world of computing through Windows. Love him or hate him, Gates has been and will continue to be a dominant force in shaping the tools of graphic communications.



PHOTO COURTESY MICROSOFT

33

ALVY RAY SMITH 20TH C AMERICAN SOFTWARE DEVELOPER

Co-founder of Pixar, founder of Altamira Software in 1991, Academy Award winner Alvy Ray Smith wrote the first 24-bit color paint program in 1977, after assisting Richard Shoup with the development of SuperPaint in 1974. In 1994 Altamira was absorbed by Microsoft, where Smith is now employed as a graphics software architect.



32

LOUIS DAGUERRE 19TH C FRENCH INVENTOR

Although the work of Niepce and Talbot preceded Louis Daguerre's invention of the daguerreotype, in 1839 a deal was struck between Daguerre and the French government to release his new technology to the world at no cost. Thus Daguerre's fame was secured and he was hailed as the inventor of photography (although mysteriously, the process was patented in England just five days before the official public announcement in France).



Munsell's three-dimensional system would become the basis of how we now define color. It revolved around specifying the visible spectrum in terms of hue, chroma (saturation) and value (lightness). In April, 1905, he presented his theory to the New England Cotton Manufacturers Association, and that same year he published his preliminary concepts in a paper called *A Color Notation*.

Over the next few years, interest in Munsell's color theories grew and by 1911 he was engaged in discussions of his system and tests of his photometer (which he had patented in 1901) with the Bureau of Standards in Washington, D.C. In 1915 Munsell published the *Munsell Atlas of Color*. Later that year the Bureau created a new division for colorimetry, headed by Irwin Priest.

Although Albert Munsell died in 1918 (just a few months after the incorporation of the A. H. Munsell Color Company), both the pursuit of a scientific system for color measurement which he had spearheaded and the Munsell Color System which he had created began gathering steam, propelled in large part by Priest's continuing studies at the Bureau of Standards.

It would take another thirteen years but finally, in 1931, the International Commission on Illumination (better known by its French acronym, CIE) approved the first international standards for colorimetry, standard light sources A, B and C, a standard observer, and standard conditions for illuminating and viewing color samples. Munsell's contribution to the establishment of these standards was incalculable; at last the graphics industry had a scientific basis for determining and measuring color.

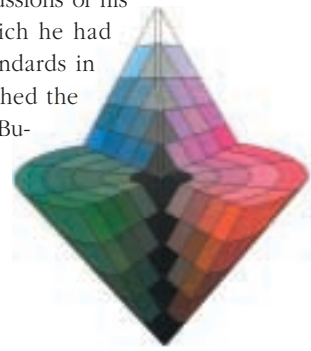
The desktop color model (CIELAB), the concept of hue, saturation and lightness to describe colors of the visible spectrum, the spectrophotometer — for all these we must thank Albert Munsell for his pioneering efforts in the field of modern color science. There is an irony in the fact that, in the end, color measurement was standardized not by a scientist, but by an artist.

LAND PROVES THAT COLOR IS IN THE BRAIN

A final note to color perception was added by Edwin Land.

Although best-known for his invention of the Polaroid camera, Land demonstrated in 1959 that color is not entirely dependent on the classic Newtonian interpretation of wavelengths, and that the human brain can re-interpret what the eye sees to "assign" colors which are not actually there. When the eye "sees", it also transmits information to the brain's visual system concerning shape, depth, texture, etc. The brain reads clues provided by the eye and can reconstruct the full gamut of color of an image, even if many of those colors are absent. This is known as the retinex theory.

Having finally gained an understanding of color perception and reproduction, and bolstered by sophisticated machinery for capturing, manipulating and manufacturing words and images, 20th century graphics was now ready to undergo the final great transition...



In 1931, the International Commission on Illumination (CIE), accepted and approved colorimetry standards based on the Munsell Color System of hue, chroma and value.

**SEYBOLD AD
NEW FILM**

DIGITAL TECHNOLOGY

OF PUNCH CARDS, VACUUM TUBES, BINARY THEORY AND LOGARITHMS

THERE LIVED IN SCOTLAND IN THE 16TH CENTURY A MAN regarded as a sorcerer, who inspired a sense of fear and mistrust among those who knew him. But John Napier, eighth Laird of Merchiston, was simply a man very much ahead of his time.

Napier is renowned in mathematical circles for his “Napier’s bones” — strips of wood or bone bearing the numbers from 0 to 9 with multiples of each digit underneath. This device comprised the first calculator. But it was Napier’s invention of logarithms (aided by his long time associate, a fellow named Briggs) which would provide the base upon which Isaac Newton would develop some of his most valuable scientific research.

IF IT QUACKS LIKE A DUCK — IS IT A COMPUTER?



The punch card system used to control the weft and warp of yarns in Joseph Jacquard’s loom, invented in 1801, was the first commercial implementation of “programming”.

“programming”, the history of his invention may actually be traced back to more than fifty years earlier.

In 1738, the city of Paris was astounded by a demonstration of technology the likes of which had never been seen before. A creative inventor named Jacques Vaucanson had constructed a gilded mechanical duck which walked, ate, swam, and in almost all respects behaved like a real duck. The cleverness of Vaucanson’s device did not escape the attention of Louis XV or his minister of industry.

The King’s representatives approached Vaucanson with a proposal: would he turn his inventive genius to the difficulties besetting the French silkweaving industry, which was suffering from the competition of cheaper wares manufactured in England and the Far East?

Vaucanson rose to the challenge and in 1750 unveiled a new loom which operated with a punched paper roll. Each roll, through a series of predetermined holes, would instruct the loom which yarn to feed next. By designing a punched roll for standard patterns, weaving could be automated and production increased immeasurably.

Alas, the weavers of France wholeheartedly rejected the idea that handweaving could be replaced by such a machine, for that

meant less value placed on their artistry, and less money for the guild. Eventually, Vaucanson gave up trying to modernize the industry and bequeathed his invention to the state.

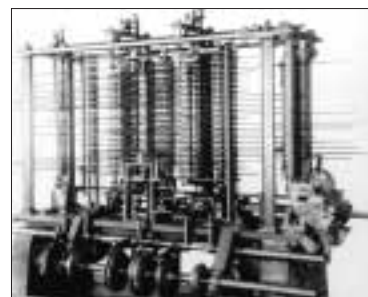
Vaucanson’s loom wound up in a museum in Paris, where it was discovered by none other than Joseph Jacquard, who borrowed it, repaired it, revised the roll system in favour of cards, and showed it to Napoleon — who instantly recognized its value and awarded Jacquard a lifetime honorarium for his remarkable invention. Over the next few decades, the punch card system was gradually adapted to a variety of industries.

THE GRANDFATHER OF THE COMPUTER

In England, a rather eccentric but brilliant mathematician named Charles Babbage came up with a concept around 1832 for what he called a “differential engine”, a device which merged Jacquard’s punch card system with a mechanical conglomeration of rods and levers to generate arithmetical calculations. Babbage developed his idea further and in 1834 lobbied the British government for money to build a second generation version which he called the “analytic engine”.



Charles Babbage, grandfather of the modern computer



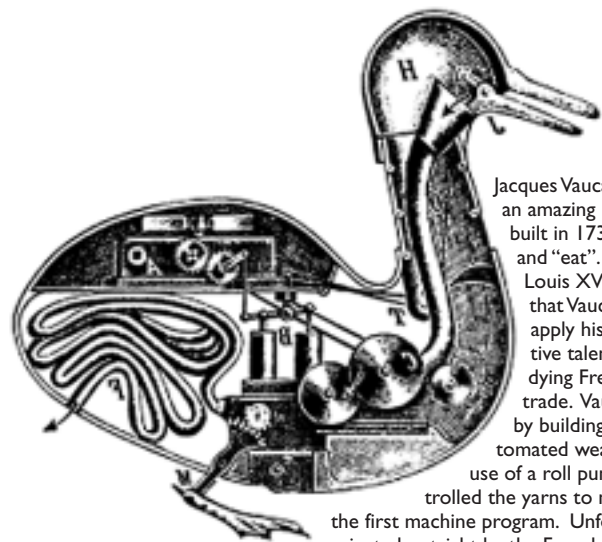
Babbage conceived the Analytical Engine in 1834, the first example of a design which incorporated the ideas of internal memory and a central processing unit.

Unfortunately, and despite the support of Lord Byron’s daughter, Augusta Ada Byron Lovelace, Babbage never succeeded in constructing his invention, and died without ever seeing his work come to fruition. Nonetheless, we must regard Charles Babbage as the grandfather of modern computing.

PUNCH CARDS AND HEAD COUNTS

Several years later in 1885, the head of the United States government department responsible for managing the census, Dr. John Billings found himself facing a sizeable problem.

The population of the U.S. was growing at a phenomenal rate, and he knew that the government’s manual system of gathering data would be inadequate to handle the upcoming 1890 census.



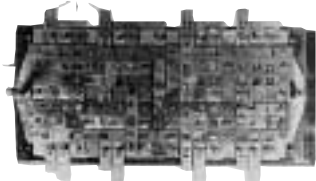
Jacques Vaucanson's automaton, an amazing mechanical duck built in 1738, could walk, swim and "eat". It so impressed Louis XV's finance minister that Vaucanson was asked to apply his prodigious inventive talents to rescuing the dying French silkweaving trade. Vaucanson responded by building a loom which automated weaving through the use of a roll punch which controlled the yarns to make patterns — the first machine program. Unfortunately it was rejected outright by the French silkweavers guild.

Billings, a well-educated man who had travelled in Europe, recalled the punch card concept, which he thought might be applied to resolve the situation. He directed his young protégé, Herman Hollerith, to design a machine utilizing this system which would allow information to be captured faster and more efficiently. Hollerith built a punch card tabulating machine that revolutionized the census procedure, and allowed him to start his own company, which he named the Computing-Tabulating-Recording Company. As names go, C-T-R lacked panache, and in 1924, it was changed to International Business Machines.



Herman Hollerith adapted the punch card system to invent the tabulating machine — and then founded the company that would become IBM.

THE BIRTH OF THE DIGITAL AGE



The world's first binary electro-mechanical computer — the Z-1, built by Konrad Zuse in 1936.

The inventor of the computer is really a triumvirate of men who worked independently during the period from 1936 to 1940.

Konrad Zuse's Z-1, built in 1936 in Germany, was the first prototype of a true binary electromechanical computer; but George Stibitz, working in the U.S., put together a binary micro-computer in 1937, and



ABC (Atanasoff Berry Computer), 1940



PAUL CÉZANNE

19TH C FRENCH PAINTER

Moody, reclusive and ridiculed during most of his lifetime, Paul Cézanne nonetheless influenced many 20th century artists, including Picasso and Matisse. Early on he was a member of the Impressionist movement; later he established his own unique style, breaking all convention, using unusual combinations of color to imbue landscapes and still lifes with a special vitality. Cézanne was probably the first modern anti-establishment artist and his attitude led younger artists to virtually deify him.



VICTOR HASSELBLAD

20TH C SWEDISH INVENTOR

Victor Hasselblad's enormous contribution to modern photography was his invention of the Hasselblad camera in 1948, a modular photographic system which incorporated interchangeable lenses, film magazines and viewfinders. Even today the Hasselblad is the Rolls Royce of image capture — NASA made sure that every Apollo flight was equipped with "Blads".



JOHN NAPIER

16TH C SCOTTISH MATHEMATICIAN

"Napier's bones" — rectangular strips of wood or bone with figures marked down one side, each divided into ten squares with a digit from 0 to 9 in the top square — are the legacy of mathematician John Napier, who in the 16th century devised the first principles of logarithms, without which modern computer programming would not be possible. Napier invented the decimal point and paved the way for advances by Kepler and Newton.



CLAUDE GARAMOND

16TH C FRENCH FONT DESIGNER

Born in 1490, Claude Garamond was the first type specialist, apprenticing under the Parisian punch-cutter and printer, Antoine Augereau. In the 1520s, having set up shop in Paris with the idea of supplying type design, punchcutting and typefounding services to other printers and publishers (making him the first prepress house), he landed his first big contract, a commission to supply type to the publishing firm of the famous scholar-printer, Robert Estienne. His first roman typeface appeared in 1530.



ALFRED STIEGLITZ

19TH C GERMAN-AMERICAN PHOTOGRAPHER

Leader of the Photo-Secessionist group of photographers and renowned for his captivating images of every day life, Alfred Stieglitz was the first to champion the notion of photography as art, a controversial concept at the turn of the 20th century. Today many regard him as the "patron saint of straight photography".



26 JAN VAN EYCK

15TH C FLEMISH PAINTER

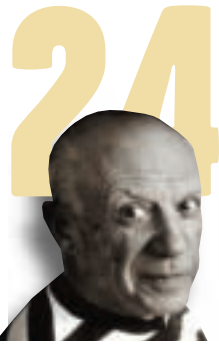
Jan van Eyck, credited with perfecting oil-based paints, was a true pioneer in painting perspective. His art was astonishingly realistic for its time; his oils had a magical sense of depth and amazing glazes. Born around 1390, his influence would inspire the great Renaissance painters who came after him, from Bosch to Leonardo. In addition, his trip to Spain in 1428 gave birth to a whole school of great Portuguese painters. Last but not least, his oil formulas provided Gutenberg with the base for mixing his inks.



25 ALDUS MANUTIUS

16TH C ITALIAN PRINTER/SCHOLAR

Namesake of Brainerd's desktop software company, Aldus Manutius founded the Aldine Press in 1495, funded by the prince of Carpi. Adhering to the terms of his deal, Manutius proceeded to devote himself to printing works by the great Greek writers, from Aristotle to Demosthenes. He is famous for his invention of italic type in 1501, along with having devised the portable book. Manutius was fortunate in hiring former goldsmith Francesco Griffo, who proved to be a punchcutter and type designer of considerable skill.



24 PABLO PICASSO

20TH C SPANISH ARTIST

Child prodigy, inventor of Cubism, and a dominant (and domineering) personality, Pablo Picasso, along with Matisse, was a towering figure in 20th century art. But unlike Matisse, Picasso discovered how to capitalize on the American hunger for "famous art", becoming an international icon. He gloried in his notoriety and ensured that his personal stamp was emblazoned on everything he did. His style evolved as the century progressed, and in each case it was followed and copied by his peers.



23 OSCAR BARNACK

20TH C GERMAN INVENTOR

The world's first 35mm miniature camera, designed by Oscar Barnack, became commercially available in 1924. The Leica's wide aperture lenses, permitting indoor exposures using available light, spurred the art of first moviemaking, and subsequently photojournalism; in fact, Barnack's radical invention allowed Salomon to be the first "candid cameraman". Barnack actually built a prototype of the Leica in 1913, and if not for World War I, it would have been produced and released years earlier.



22 PAUL BRAINERD

20TH C AMERICAN SOFTWARE DEVELOPER

Between 1985, when he founded Aldus Corporation and coined the term "desktop publishing", and 1994, when he merged Aldus with Adobe, Paul Brainerd was instrumental in launching the desktop revolution. The 1985 introduction of PageMaker, the first desktop page layout and assembly application, was an instant success and drove the replacement of expensive proprietary page makeup systems by personal computers.



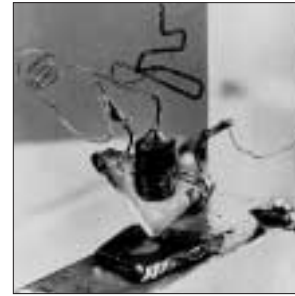
Eckert and Mauchly, developers of the ENIAC and UNIVAC mainframes.

John Atanasoff (with his assistant Cliff Berry) assembled an electronic digital computer in 1940 (known as the ABC computer) that would spark the feverish development of megalithic computers in the 1940s and 1950s.

It was Presper Eckert and John Mauchly who in 1946 took the seeds of Atanasoff's rudimentary invention and produced the first mainframes which dominated the early days of the industry. However they would lose their boasting rights to the computer's invention to Atanasoff and Berry in a titanic 1973 court battle.

THE POST-WAR YEARS

During the forty years after World War II a succession of inventions mark the trail of progress in digital technologies leading up to the desktop publishing revolution of the 1980s.



The first transistor, invented by William Shockley in 1947.

A short list would include the development of the first programming language in 1946 by Grace Murray Hopper; William Shockley's 1947 invention of the transistor; the Williams tube and the first stored computer program, created by Frederick Williams and Tom Kilburn in 1948; and Jay



PHOTO COURTESY TIM BERNERS-LEE

21 TIM BERNERS-LEE

20TH C AMERICAN INTERNET DEVELOPER

The World Wide Web, URLs, HTTP, HTML — these are all the invention of Tim Berners-Lee. In 1978 he wrote a multitasking operating system; in 1980 he conceived "Enquire", a program for storing information that would form the conceptual basis for the World Wide Web. His 1989 proposal to create a global hypertext project and his creation of the first WWW server and first WYSIWYG client set in motion the Internet as we know it.



20 GIAMBATISTA BODONI

18TH-19TH C ITALIAN PRINTER/FONT DESIGNER

Subtle thin straight serifs combined with bold verticals, delicate hairlines accentuating heavy strokes — this was the trademark font design of Giambattista Bodoni, rightfully regarded as the father of modern roman type. Bodoni's influence on 19th century printing was so great that after 1805 few printers even cast old style type; today's popular modern serif typefaces still carry his mark.

Forrester and his random access magnetic core memory in 1949.

The year 1959 marked the invention of the monolithic integrated circuit by Jack Kilby, working at Texas Instruments, at the same time as Robert Noyce was developing a planar version at Fairchild Semiconductors. Shortly thereafter came the refinement of COBOL [Common Business Oriented Language] in 1960 by Joe Wegstein.

The 1970s was a fruitful period for digital developments: dynamic random access memory [DRAM], invented at Intel by John Reed in 1970; the Atari computer, the brainchild of the legendary Nolan Bushnell in 1972; the fundamental software engineering algorithms published in 1973 by Don Knuth, which became the Bible of computer programming; the first personal computer kit, the Scelbi-8H, offered by Nat Wadsworth in 1974, as well as the first successful marketing of a microcomputer, the Altair, by Ed Roberts in 1975 (who hired Bill Gates to write his programming); the floppy disk, developed in 1976 by Alan Shugart (who would also introduce the first hard drive in 1980, the Winchester); and, of course, the milestone achievements at Xerox PARC, which included among its many innovations the invention of Ethernet networking in 1973 by Robert Metcalfe and Chuck Thacker's 1976 co-development (with Butler Lampson) of the server.



The first microcomputer kit on the market was Nat Wadsworth's Scelbi-8H.



Robert Noyce, inventor of the integrated circuit and co-founder of Intel Corporation.

When Noyce and Gordon Moore (who conceived Moore's Law, which stated that processing power would double every 18 months), together with Andy Grove, launched Intel Corporation in 1968, it set the stage for a new generation of computers — smaller, faster, less expensive and more easily re-engineered to adapt to new digital innovations. Arguably the most important event in personal computing was the creation of the first microprocessor in 1971, the Intel 4004, developed by Fagin, Hoff and Mazor under the direction of Bob Noyce.

HOMAGE TO THE ROOTS OF BINARY THEORY

Over the past fifty years digital technologies have had more impact on the way graphics are created and manufactured than any other single influence in history.

But if we take a step back and examine which individuals were most responsible for the development of binary theory and the invention of the mathematical formulae which make up the language of these technologies, three names stand out.

The first is John Napier, inventor of the decimal place, who we described at the outset. Second is the British mathematician George Boole, who between 1847 and 1859 articulated the fundamentals of formal logic, Boolean algebra, and differential equations in his trio of historic papers, *The Mathematical Analysis of Logic* (1847), *Investigation of the Laws of Thought* (1854) and *Treatise on Differential Equations* (1859).

Third, and probably foremost, is mathematician Alan Turing, also British. In 1936 he formulated the basic principles of binary computing with his theory of the "Universal Turing Machine" in a dissertation entitled *On Computable Numbers*. Years before computers were invented, Turing spelled out the essentials of the "stored program" concept and provided a simple but radical insight — symbols representing instructions are no different in kind from symbols representing numbers.

With the fundamentals of computing more or less firmly in place, the stage was set to apply these technologies to the business of producing graphic communications. But as the 1980s began, few would anticipate the revolution about to take place...



It was Grace Murray Hopper (left) who devised the first programming language — and found the first "bug", which she dutifully logged and taped to her log report in 1945 (right).



19 THOMAS EDISON 19TH C AMERICAN INVENTOR

Owner of 1093 patents, inventor extraordinaire Thomas Edison's work had an impact on almost every scientific field, including graphics. He helped Sholes with the design of the typewriter, co-developed the mimeograph with Dick, and worked with Eastman's film to invent a motion picture camera. He also discovered "Edison's Effect" and invented the "electric pen", forerunner of the memograph. And of course, he put electricity to good use with the light bulb.



18 TIM GILL 20TH C AMERICAN SOFTWARE DEVELOPER

Quark founder, inventor of Desktop Color Separations (DCS), and chief architect of QuarkXPress, Tim Gill was writing word processing software for Apple computers in 1981, then created QuarkXPress, which entered the desktop market in 1987. Almost overnight QuarkXPress was adopted as the de facto standard for high end page layout and has remained the cornerstone of professional desktop design ever since.

PHOTO COURTESY QUARK INC.

DESKTOP

HOW THE MAC AND THE GRAPHICAL USER INTERFACE CHANGED THE GRAPHICS INDUSTRY

WHEN A MANUFACTURER OF PUBLISHING SYSTEMS FOR NEWSPAPERS decided to close its Seattle plant in 1984, it left one of the company's vice presidents pondering over another means of gainful employment.

But Paul Brainerd had recognized that personal computers were quickly becoming viable business tools. His experience with pagination systems in the newspaper industry, together with what he had learned about developments in software which were happening to the south in sunny California, led him to the conclusion that it wouldn't be long before personal computers would be capable of handling page assembly better and more easily than expensive proprietary systems.



The desktop publishing revolution began in earnest in 1985 with the release of Aldus PageMaker, the first desktop page layout application, written initially for the Macintosh.

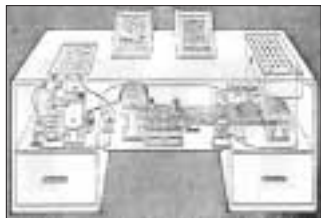
So, gambling his life savings, he gathered together a handful of engineers from Atex, his ex-employer, and started Aldus Corporation (named after Aldus Manutius, the fifteenth century printer who invented the portable book). Along the way, Brainerd coined the term “desktop publishing”. In 1985, Aldus released *PageMaker*, the first software for page assembly on the desktop.

Nine years later, having built Aldus from scratch into a \$250 million a year software company, Brainerd sold the company to Adobe Systems. But in that short ten year span, the desktop publishing revolution had swept through the graphics industry.

“AS WE MAY THINK” — THE FUTURE UNFOLDS

The list of individuals who contributed to a veritable tsunami of desktop technologies is long. Perhaps the most appropriate starting point is to recall an article which appeared in the July, 1945 issue of *Atlantic Monthly*.

In that issue, in an article entitled *As We May Think*, Vannevar Bush, head scientific advisor to the White House, published his



The “Memex” was Vannevar Bush's 1945 concept of computing in the future. His model was a double pedestal desk and the work area of the Memex was the “desktop”.

thoughts on the future of computer technologies. Besides holding a key position as consultant to the President, Bush had made his mark by inventing the Differential Analyzer in 1930, an analog computer hailed at the time as a major breakthrough in computing. In *As We May Think* Bush envisioned a future where information storage and retrieval would be controlled on an individual basis through what he labelled a

“Memex”, a system with many of the attributes of today's computers. However, being aligned to the analog world, and without benefit of familiarity with binary digital thinking, Bush pictured the Memex as a system housed within a desk, where an individual would sit, retrieving and sending data from his desktop.

(Around that same time, two aspiring entrepreneurs in California were about to incorporate a business they had originally launched in 1938 from a garage in Palo Alto. The company that David Packard and William Hewlett founded would grow to become a dominant force in personal computing products.)

THE GUI STARTS A REVOLUTION

One person whose imagination was fired by *As We May Think* was Doug Engelbart. Almost twenty years after reading Bush's vision of the future, Engelbart delivered what would prove to be the first component for an industry yet to be born. Using a block of wood, a micro-switch button, and some small metal wheels, he invented a device for graphically controlling the position of a cursor on a computer screen — in fact he patented it in 1964 under the name “The X-Y Positioning Indicator for a Display System”. Today that rather awkward piece of nomenclature has, of course, been abbreviated and we simply refer to it as a “mouse”. (Note: a few years earlier, Swedish inventor Håkan Lans had come up with the precursor of the mouse, which he called a digitizer.) In 1964, it cost Engelbart about \$US80,000 to custom build such a device.

Make no mistake about one thing: the essence of the desktop revolution was contained in one pivotal development — the graphical user interface, or GUI. In December, 1968, Engelbart would stun the California scientific community by demonstrating for the first time a GUI on a computer screen using a mouse, as well as showing collapsible windows and menus, copying and pasting text, and linked terminals, all via remote computing performed with his assistant sitting forty miles away. His futuristic vision of personal computing would blossom a few years later at Xerox's Palo Alto Research Center.

Although Engelbart must undoubtedly be awarded full credit for pioneering the development of the graphical user interface, it was actually computer graphics icon Ivan Sutherland who designed the first GUI in 1963 when he wrote a software program called *Sketchpad* which allowed real time graphics manipulation



Engelbart's first mouse was constructed from a wooden block, a microswitch and two metal wheels, one running in each direction.

The Legacy of Xerox PARC



Alan Kay



Butler Lampson



Doug Engelbart



Charles Simonyi



John Warnock



Robert Metcalfe



Gary Starkweather



Alvy Ray Smith

For anyone with passing familiarity with desktop publishing history, the legacy of Xerox's Palo Alto Research Center is classic technofolklore. Funded by mountains of cash generated by photocopier sales, Xerox PARC began in 1970 as a facility for creating "the architecture of information."

It quickly attracted some of the brightest minds in the industry, who were allowed to let their imaginations roam free to envision the future of information technologies. And they did exactly that.

Throughout a decade of incredible invention, the PARC team (some of whom are pictured here) created and/or refined the personal computer, the mouse, the graphical user interface, on-screen icons, windows, pulldown menus, cut-and-paste text editing, the WYSIWYG bitmapped display, the laser printer, laser typesetting, Ethernet networking, the server, the page description language, and object-oriented programming. What is even more amazing is the fact that at the time Xerox management didn't understand the significance of any of these creations. In the 1980s each of these inventions would be developed and brought to market by a company other than Xerox.

Chief scientist at the PARC was Alan Kay, who wrote one of the first object-oriented applications, SmallTalk. But the chief architect of the personal computer was Butler Lampson (who, in fact, first used the term in 1973). Lampson drove development of the Alto, a microcomputer which bore a remarkable resemblance to today's PCs, and which incorporated the mouse, GUI, icons, menus, windowing capability and high resolution pixel-based display with which we are all now familiar. His co-developers included Doug Engelbart (originator of the mouse and the GUI), Chuck Thacker (who designed Alto's system), and Charles Simonyi (designer of the Bravo WYSIWYG interface, later the basis for Microsoft Word). The Alto's fatal flaw was that it was built before the invention of the microprocessor, depending instead on integrated circuit technology which rendered its cost too high to compete with microcomputers.

With Thacker, Lampson created another specialized computer, the dedicated server; and with Gary Starkweather (who invented the laser printer at Xerox) and Ron Rider, Lampson produced the first high quality laser type.

Robert Metcalfe, who would later found networking giant 3Com, was another PARC member; his most well-known contribution was the invention of Ethernet. Richard Shoup moved to Palo Alto to continue working on his pet project, the creation of a graphics software application (SuperPaint in 1974), which he succeeded in doing with Alvy Ray Smith (who would take away his research and create the first 24-bit paint program in 1977).

And of course it was at Xerox PARC where John Warnock began work on the creation of an open architecture page description language, culminating in the 1985 release of Adobe PostScript, the linchpin of desktop publishing.

When the Apple team of Steve Jobs, Bill Atkinson and Jef Raskin paid a visit to the PARC in 1979 (which Xerox permitted in return for the privilege of buying into Apple's public stock offering), they went away amazed and inspired by the look, feel and design of the Alto — and the Apple Macintosh was conceived.



Apple's 1983 Lisa computer, the first to incorporate a GUI.



This shot shows Engelbart on an overhead screen delivering his historic address to the Association for Computer Machinery Conference in San Francisco in December, 1968. It marked the the first public demonstration of the basic elements of personal computing, including the mouse and graphical user interface.

on a TX-2 computer. Sutherland went on to co-found (with Dave Evans) the Evans & Sutherland Computer Corporation, a well-known digital graphics firm of the 1970s; he also co-developed "virtual reality".

BIRTH OF THE MACINTOSH

For all intents and purposes, desktop was born in the 1970s at Xerox PARC (see sidebar). But it was Steve Jobs who took the concepts which the PARC team had generated and turned them into a commercial reality by spearheading Apple's development of the Macintosh, introduced in 1984. Yet the Mac would never have been created if not for the contributions of three other individuals of historical significance.

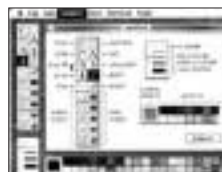
Jobs' buddy and Apple co-founder Steve Wozniak was the technical brain behind the Apple I and II, building them virtually from scratch in 1975 and 1976. Sales of the Apple II would sustain the company for its first twelve years of existence.

Wozniak showed off his technological achievements to Mike Markkula in 1976. This ex-Intel marketing exec instantly recognized the Apple's engineering brilliance, and early in 1977 had lined up the financing (part personal, part bank guarantee) that would allow the two Steves to go forward.



The Apple II computer, created in 1976

But it was finding a "killer app" for the Apple computer that really set things on fire. In 1979, Dan Bricklin wrote *VisiCalc* for the Apple, the first desktop spreadsheet program. By declining to patent it, Bricklin lost the opportunity to make himself very wealthy. Nonetheless, between 1979 and 1983 *VisiCalc* generated huge revenues for both Bricklin's



The Apple Macintosh graphical user interface, unveiled in 1984.

17

PIERRE BÉZIER

20TH C FRENCH MATHEMATICIAN

We may indirectly thank the Renault automobile company of France for providing us with the formulae for describing curves in desktop programs, for it was while employed as an engineer and mathematician at Renault in the early 1970s that Pierre Bézier devised his “Bézier curves” in order to further computer-aided automobile design. In the early 1980s, Adobe made the Bézier curve a desktop standard when it built the description into the PostScript language.



16

BUTLER LAMPSON

20TH C AMERICAN COMPUTER SCIENTIST

The “personal computer”, “WYSIWYG”, “Ethernet”, the “laser printer”, the “server”, and “icons” define the modern digital desktop workflow, and all were spearheaded at Xerox PARC by Butler Lampson. In 1973 Lampson created the Alto minicomputer (brought to market as the Macintosh 11 years later) and worked with Charles Simonyi, Gary Starkweather, Robert Metcalfe and Chuck Thacker to develop the Bravo WYSIWYG text editor, laser printing, networking and servers.



15

DOUG ENGELBART

20TH C AMERICAN COMPUTER ENGINEER

Doug Engelbart pioneered many of the personal computing tools which we take for granted today. His 1964 invention of the mouse, and his concept of viewing data on a monitor using “windows” and collapsible menus were just two of the contributions he made to today’s graphical user interface. Engelbart was also a key player in the development of the personal computer at Xerox PARC in the 1970s.



14

LEONARDO DA VINCI

16TH C ITALIAN PAINTER/INVENTOR

Leonardo’s influence on Western art is nothing short of profound. His technique of capturing the “sweet light” before sunset, his use of sfumato (smoky shadows), and his creation of chiaroscuro have been studied and copied by artists for centuries. The first recorded use of camera obscura for drawing was by Leonardo in 1558. His many scientific endeavours, far ahead of his time, and his position as arguably the world’s most well-known icon of Renaissance art puts him near the top of any list of great artists.



13

ALAN TURING

20TH C BRITISH MATHEMATICIAN

Binary computing theory using algorithmic calculations and stored programs was a primary development that first emerged with the work of Alan Turing, a brilliant British mathematician who proposed the Universal Turing Machine in his 1936 paper “On Computable Numbers”. In addition to laying the groundwork for the modern digital computer, Turing also summarized the principles of artificial intelligence in “Computing Machinery and Intelligence” (1950).



company, VisiCorp, and Apple.

But despite emerging as the leading vendor of personal computers in the late 1970s, Apple would soon find itself with competition it couldn’t ignore. After IBM’s dynamic president, Frank Cary, saw *VisiCalc* for the first time, he would ask the question at every executive meeting thereafter: “Where’s my Apple?”

Enter Bill Gates.

IBM TAKES IT TO THE PEOPLE

After Bill Lowe sold Cary on his ability to deliver a personal computer in 1980, IBM’s technical team went shopping for an operating system. They went first to Microsoft, where Gates sent them off to see Gary Kildall, who at that time owned the dominant OS for small computers, called CP/M.

In one of the more lamentable business meetings in the history of computing, Kildall brushed off IBM’s advances. In frustration they went back to Gates.

Seizing the opportunity, Bill Gates had his buddy and company president Steve Ballmer negotiate with a Seattle computer store to purchase an operating system it owned (actually, a ripoff of CP/M) called QDOS (Quick and Dirty Operating System), developed by one of its employees, Tim Paterson. After buying QDOS for \$50,000, Gates turned around and licensed “PC-DOS” to IBM — and the rest, of course, is history.

In August, 1981 the IBM PC was released. With the talents of top IBM system architect Lew Eggebrecht behind it and the production and marketing flair of Don Estridge pushing manufacturing and public relations, IBM’s personal computer took off. By 1983, annual shipments had reached 400,000 units.

THE CREATION OF DESKTOP PUBLISHING

In 1985, with Steve Jobs ousted and sales stagnant, Apple president John Sculley, with myopic misjudgment rivalling Kildall, made a deal with Bill Gates to let Microsoft copy the Macintosh graphical user interface in Windows 1.0 (the plagiarized name suggested by Microsoft marketing head Rowland Hanson). In truth, the design



Gary Kildall would rue the day that he failed to impress IBM with his business demeanor and lost the chance to supply the operating system for the IBM PC.

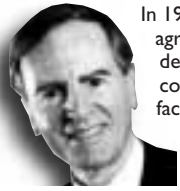
12

ISAAC NEWTON

17TH C ENGLISH COLOR SCIENTIST

The colors of the rainbow were first demonstrated by Isaac Newton, arguably the greatest English scientist of all time. Newton’s observations on the behaviour and characteristics of light and his experimentation with splitting white light through a prism to reveal the colors of the visible spectrum, then reconstructing them into white light again through a second prism (in 1666), laid the foundation for all color theory that followed.





In 1985 Apple president John Sculley agreed to renew Microsoft's Apple developer license and let Bill Gates copy the Mac's graphical user interface in Windows. In return, Gates agreed to hold the release of Microsoft Excel for Windows for a year. It was a good deal for Bill.

programmers, Neil Konzen, to rewrite Apple system code for the PC from the ground up. Gates had initiated Windows development in 1984 after seeing a demo of a product called VisiOn, the very first GUI for the PC, developed by Bricklin's company VisiCalc.

Nineteen eighty-five would prove to be the year desktop publishing was officially launched. Two years earlier, Jobs had been visited by an ex-Xerox PARC employee named John Warnock, whose small struggling software development company was in danger of financial collapse. Jobs persuaded Apple's board to invest in the company and its fledgling open architecture print technology. It would pay off handsomely after the release of Adobe Systems' first product: PostScript.

That was also the year in which Canada's Michael Cowpland founded Corel Corporation, which in 1989 would offer PC *PageMaker* users an alternative page assembly program — *CorelDraw*. (And it was the year that the first compact disc was released, after inventor James Russell had spent twenty years trying to convince industry that his idea had commercial value.)

Also in 1985 Scitex introduced its users to a hot new WYSIWYG page layout program called *VIP*. A clever programmer who had begun writing word processing software for Apple in 1981 took a look at this Scitex program and decided he could create a "VIP" for the Mac that could compete with Aldus *PageMaker*, the established leader. *QuarkXPress* was more than just competition; it decimated *PageMaker* and became the de facto standard for professional page design and assembly (and in the process made both Tim Gill and his partner, Fred Ebrahimi, very rich).

THE INTERNET — A NEW GRAPHICS FRONTIER

However by the mid-1990s, the Internet was adding a whole new twist to the meaning of a "page".

In the late 1980s, Apple had dabbled with an internal project offering online services but had lost interest, selling the business

for Gates' new OS had been surreptitiously under way ever since Microsoft had lured away one of Apple's top

(including the interface) back to the small company who was managing it, Quantum Computer Services. Quantum's president, Steve Case, renamed the service America Online and copied the snappy graphical interface of the Mac online package onto the Windows platform. AOL's subscriber base took off, and by 1993 had passed CompuServe, the online king.

That was the year that Marc Andreessen, a hack programmer of somewhat mundane ability, badgered Eric Bina, a genius code-builder at the University of Illinois, into writing a simple but elegant browser for the Internet (which they called *Mosaic*).

By the end of 1993, Andreessen had moved to California, where he was sought out by the founder and now ex-president of Silicon Graphics, Jim Clark, who was looking for his next business venture. With a refined version of *Mosaic* (now called *Navigator*) ready to go, they launched Netscape Communications the following year. *Navigator*, a free browser with a rich graphical interface, opened up the Internet to North America — and the world.

For the graphic design community, the Internet has created a new medium that integrates the traditional page elements of type, 2D images and color with a brand new suite of dynamic tools: animation, sound and interactivity. It is the new frontier, a digital canvas with almost unlimited flexibility, reach and creative scope.

Software developers from every corner of the civilized world have rushed to fill the needs of graphic cyberartists; New Age evangelists from web diva Lynda Weinman to Canada's Keith Kocho have spread the word about the power and versatility of new web page design tools.

In a way, graphics on the web is the final handoff of all the disparate elements that constitute the fabric of graphics — art, design, photography, color, and desktop technologies — from the analog world of printing and publishing to the digital sphere. Although the influence of the Internet on graphics in the millennium just passed has been too brief to gauge objectively, it seems a certainty that it will reshape our approach to graphic communications in the 21st century.

How ironic, then, that the individual who was most responsible for the creation of the World Wide Web — the man who invented the concepts of URLs, HTTP and HTML in 1989, and who continues to play a leading role in the evolution of Internet affairs as Director of the World Wide Web Consortium that coordinates Web development worldwide — had no thoughts about or even interest in utilizing cyberspace for graphics. He was an academic whose goal was to construct a global hypertext project that would allow people to work together by combining their knowledge in a "web" of hypertext documents.

And how deliciously appropriate that when Tim Berners-Lee sought funding for his project, his application was only granted after he revised it to include the purchase of a computer, on which he would build the first World Wide Web server, "httpd", and the first client, "WorldWideWeb". What Berners-Lee chose for his landmark project was the NeXT machine that Steve Jobs had hoped would revolutionize personal computing.

In a roundabout way, Jobs was right...

11

RUDOLF HELL 20TH C GERMAN INVENTOR

Rudolph Hell may be viewed as the father of modern color scanning. The Hell recorder (or "Hellschreiber"), a "device for the electric transmission of written characters" which he invented in 1929, provided the basic technology for today's fax machines. The "Klischograph", an electronically controlled engraver which Hell invented in 1947, ultimately led to the Chromagraph, the world's first commercially successful high end analog color scanner, which revolutionized prepress production.



PHOTO COURTESY HEIDELBERG

TOP TEN

THE VISIONARIES WHO INVENTED MODERN GRAPHICS

CHESTER CARLSON 20TH C AMERICAN INVENTOR

Without xerography, invented by Chester Carlson in 1937 (which he initially called “electrophotography”), there would be no photocopiers and no laser printers. Without Xerox, which Carlson co-founded, there would never have been Xerox PARC, and no personal computers as we know them today. Carlson graduated from the California Institute of Technology in 1930 with a degree in Physics — but he had the misfortune to be jobhunting in the depths of the Great Depression. However the dead end job he finally landed in the P. R. Mallory patent department turned out to be serendipitous, for it led him to search for a better way to create copies. Carlson’s invention was the first completely new printing technology since the printing press; the company he started has been a leader in technological innovation for more than fifty years.

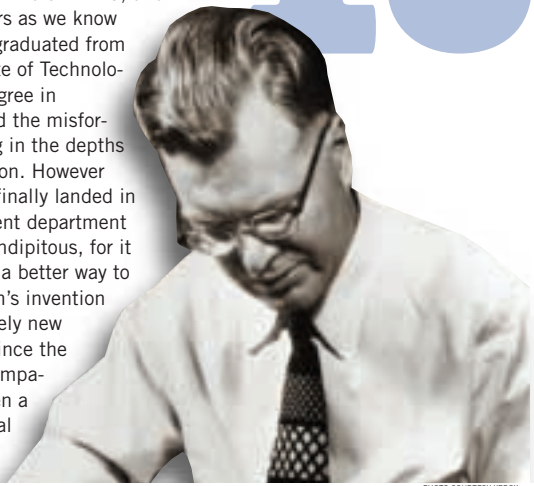


PHOTO COURTESY XEROX

10

IF PICKING ONE HUNDRED GRAPHICS PEOPLE OF INFLUENCE was tough, narrowing down the top ten was even tougher. Here’s who we chose and why we chose them.

Xerography established a brand new field of printing, one that continues to grow as new digital technologies are invented to take advantage of its speed, cost efficiency and flexibility. Photocopiers and laser printers are used today in virtually every design and print environment — for everything from preliminary proofing to final output. And the evolution of the personal computer can be traced directly back to the research and development performed at Xerox PARC more than twenty years ago.

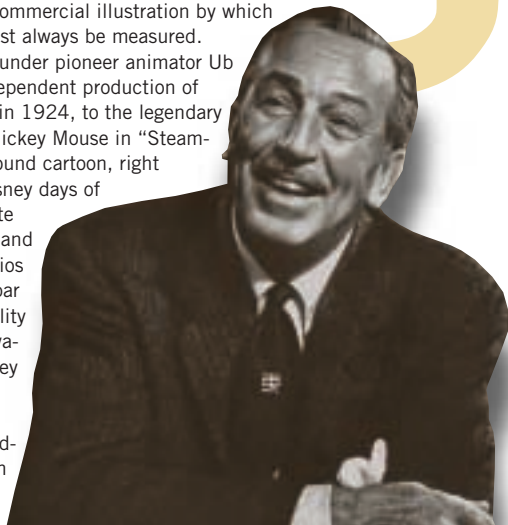
For these reasons and more, Chester Carlson is number ten on our list of most influential graphics people.

Commercial art has seen many great illustrators but none can match the global awareness and far-reaching influence achieved by Walt Disney and the legacy he left behind.

His genius lay not in drawing — he barely ever picked up a pencil — but in understanding what people wanted to see, in gathering together the best talent money could buy to create it, and in taking enormous risks both with content and with new technologies in order to deliver it.

WALT DISNEY 20TH C AMERICAN ANIMATOR

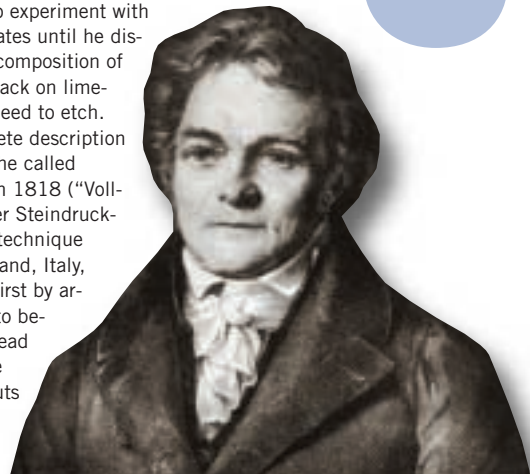
The genius of Walt Disney is recognized around the world, and his concept of assembly line animation revolutionized Hollywood production. But what the graphics industry owes Disney above all else is the creation of an enduring standard for commercial illustration by which all other illustration must always be measured. From his early tutoring under pioneer animator Ub Iwerks and his first independent production of “Alice in Cartoonland” in 1924, to the legendary 1928 introduction of Mickey Mouse in “Steamboat Willie”, the first sound cartoon, right through the halcyon Disney days of “Fantasia”, “Snow White and the Seven Dwarfs” and “Bambi”, Disney’s studios continued to raise the bar both on illustration quality and technological innovation. The magic of Disney is firmly ingrained in Western consciousness, and as such he deservedly belongs in the top ten most influential graphics people of all time.



9

ALOIS SENEFELDER 19TH C BAVARIAN INVENTOR

The principles of lithography (literally “writing on stone”) were discovered and refined between 1796 and 1818 by Alois Senefelder. This technological breakthrough provided the groundwork for modern offset printing. Ironically, Senefelder’s invention was motivated by his difficulty in finding a publisher for his dramatic writings, prompting him to experiment with etching and copper plates until he discovered that a greasy composition of soap, wax and lamp black on limestone eliminated the need to etch. He published a complete description of the process, which he called “chemical printing”, in 1818 (“Vollständiges Lehrbuch der Steindruckerey”), after which the technique quickly spread to England, Italy, and France. Adopted first by artists, lithography was to become the most widespread form of printing on the planet, and as such puts Senefelder’s name among the elite in the history of graphic arts.



8

The Disney name glows with as much magic today as it did fifty years ago, and because of that, we selected Walt Disney as our ninth most influential graphics person.

There are many kinds of printing in the world, but the backbone of the industry and its most common form is still what is produced by offset printing presses. The principles of offset printing remain rooted in the discovery and development of lithography, the process which was first brought to the attention of the world by Alois Senefelder two hundred years ago.

It remained for others to invent the machinery to capitalize on his work, but we acknowledge Senefelder's important place in history by awarding him the eighth spot on our list.

Few technologies have had as great an impact in as short a time as the creation of the PostScript language. In an industry renowned for its slow conservative approach to change, PostScript was like an adrenaline injection for the graphic arts. In the ten years following its introduction in 1985, it virtually wiped out conventional design, typesetting and prepress and effectively democratized the process of content creation for print.

John Warnock and Charles Geschke propelled Adobe Systems to a near stranglehold position in high end publishing with products for the prepress imaging market (PostScript and PDF), illustra-

tion and creative imaging (*Photoshop* and *Illustrator*), and typesetting (Type 1 fonts and Adobe Type Manager), each de facto standards in their software categories. Now Adobe is closing in on web design (*GoLive*), page layout (*InDesign*) and production workflow (*InProduction*). PostScript sparked a graphics revolution, and we think John Warnock and Chuck Geschke fit well into our group of visionaries at number seven.

How fundamental are the letters of the alphabet to graphic communications? How do we rate the influence of the man who designed the alphabet as we know it?

If any one person belongs in our top ten, it is Nicholas Jenson. Gutenberg may have invented moveable type, but Jenson's roman font probably influenced the appearance of printing for more years than any other single development in graphic arts. We think he sits comfortably in sixth position in our index.

Like Dorothy awaking in the land of Oz, the graphics industry woke up one day to find that its world had been transformed from black and white into color. There was only one problem: there were no standards for what color meant, or how to measure it, or how to describe it effectively in an objective, scientific fashion.

Fortunately, the groundwork for building a system for color perception and measurement had already been laid by the man

JOHN WARNOCK & CHUCK GESCHKE

20TH C AMERICAN SOFTWARE DEVELOPERS

Without an open architecture for page creation and printing, desktop publishing could not exist. Adobe PostScript provided that architecture, and by so doing defined a new digital era in design, creative imaging and printing. We must recognize its creators, software developers John Warnock (left) and Charles Geschke (right), as a team, for they co-founded Adobe Systems together in 1982 and have been the company's management partners ever since.

Adobe products dominate the high end creative market: Photoshop is the de facto standard in desktop imaging; Illustrator is the leading drawing package; and now the Adobe-driven Portable Document Format is being touted as the next standard in cross-platform file formats. For their outstanding contributions to the field of desktop publishing, we include Warnock and Geschke in our top ten list.

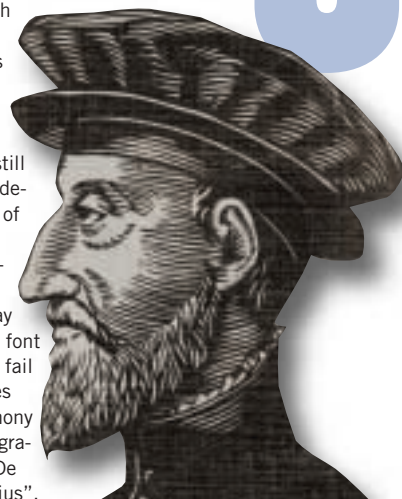


PHOTOS COURTESY ADOBE SYSTEMS

NICHOLAUS JENSON

15TH C FRENCH ENGRAVER/TYPOGRAPHER

Born in 1420, trained as an engraver and appointed Master of the Royal Mint by King Charles VII, Nicholas Jenson set a standard for font design which has carried through to the present day when he created his classic Roman font in 1470. Indeed, it is Jenson's upper and lower case roman letter forms which we still use today, and it is without doubt one of the greatest typefaces of all time. An artisan in his own right, Jenson combined his skills as a designer, punchcutter and printer to produce volumes which still stand as classic examples of great design and engraving. His main body of work was carried out in Venice between 1470 and 1480, after he returned from Germany where he learned the art of printing (some say under Gutenberg himself). Not one font designer of the past 500 years can fail to acknowledge that their work owes something to the proportions, harmony and clarity which this giant of typography demonstrated in his original "De Evangelica Praeparatione of Eusebius".



who resides in the fifth slot in our compendium. Albert Munsell, inventor of the hue, chroma, value color system, made it possible to create a common base for resolving these problems. His work was instrumental not only in standardizing colorimetric values for the graphic arts but also in establishing a digital equivalent when the desktop revolution happened.

THE FINAL FOUR

Our nomination for the fourth most influential graphics person of the millennium really rests on one single assumption. Short of hand drawn posters and flyers, is there any example of advertising, publishing or printing that doesn't include type which has been input using a keyboard? Mundane as it may be, the keyboard (and its forebear, the typewriter) has been the most common interface connecting humans with type production since its invention 125 years ago. Moreover, the QWERTY arrangement of letters on a keyboard has withstood change throughout that entire time.

With the advent of personal computers, the QWERTY keyboard has become more integral than ever to the workflow which generates content both for print and for new media. It is difficult to imagine how Christopher Sholes, inventor of the typewriter and the QWERTY layout, could fall below fourth in the line of influences on the modern graphics industry.

As incomprehensible as it may seem today, for well over four hundred years general commercial printing was a black and white reproduction process. Nothing in between, strictly 100% black ink or no ink at all. Any other printing service was an expensive specialty item — if you could find it.

The halftone changed that overnight. Suddenly there were

shades of grey. Suddenly there was a bridge between the camera and the press. Suddenly expensive labour-intensive wood engravings were obsolete. Suddenly publications could come alive with imagery that had subtlety and depth. And suddenly advertisers could show their wares in print exactly as they looked — or even better, if they so decided.

Halftone screening would evolve to accommodate process color printing. It would follow along with the digitization of prepress, bending and mutating into rational and irrational screening, and supercell technologies, but always in the end feeding the press reliably and with reasonable consistency.

Perhaps someone else would have come along with a similar idea anyway, but it was a photographer named Frederick Ives who persisted with his vision of a method to convert photographic images into printing plates, and who devoted ten years or more to perfecting that process. Ives' crossline halftone technology changed the face of graphic arts, and with it, graphic communications entered the modern era.

And as if that wasn't enough, Ives also established a permanent place for himself in the annals of color photography with the invention of panchromatic emulsion, one of over seventy patents on which his name appeared. But the patent he would have enjoyed most was the one he never took out, for the halftone escaped to the public domain before he grasped its significance.

This, however, does not prevent us from naming Frederick Ives to our top ten, at number three.

Prior to 1984, the personal computer was a machine with unlimited potential for juggling text and numbers, but it offered nothing to cater to the right brain.

ALBERT MUNSELL

20TH C AMERICAN COLOR SCIENTIST

Albert Munsell — creator of the Munsell Color Theory the man who devised the concept of describing colors in terms of hue, value and chroma, and the inventor of one of the first colorimeters in 1901 — was no scientist, but an artist and professor. However his dedication to color science and to establishing a systematic approach to measuring color makes him the father of modern colorimetry. Munsell was initially spurred into his pursuits after reading a book by Ogden Rood called "Modern Chromatics" when he was twenty-one. He spent the rest of his life working towards achieving this goal, publishing his first studies in "A Color Notation" in 1905 and the "Munsell Atlas of Color" in 1915. Throughout, he received tremendous support from the Bureau of Standards in Washington. Munsell's work was finally officially adopted in 1931, fourteen years after his death, when the CIE in France established color standards based largely on his pioneering efforts.

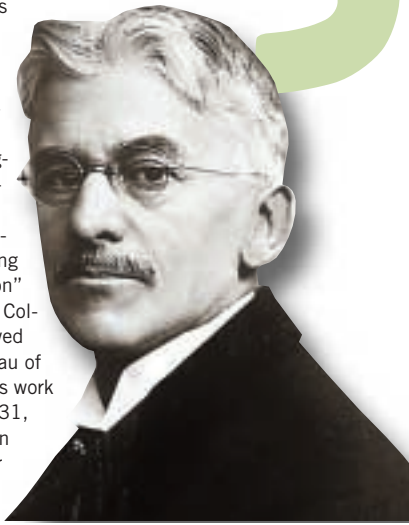
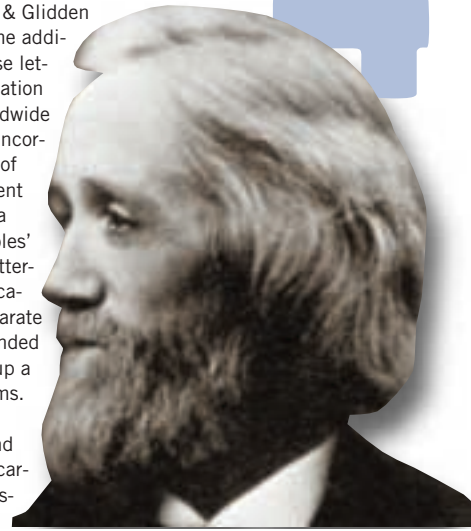


PHOTO COURTESY MUNSELL COLOR & LIGHTING

CHRISTOPHER SHOLES

19TH C AMERICAN INVENTOR

The keyboard, the QWERTY keyboard design and credit for the invention of the typewriter belong to Christopher Sholes, who patented his invention in 1868. In 1873 he contracted with the Remington company to manufacture his first machine, the "Sholes & Glidden Type-Writer". Five years later, the addition of a shift key and lower case letters propelled the second generation "Remington Typewriter" to worldwide success. The original machine incorporated a circular arrangement of "typebars"; however, two adjacent typebars hit in succession had a tendency to clash and jam. Sholes' solution, based on a study of letter-pair frequency provided by educator Amos Densmore, was to separate the typebars of letters which tended to fall together, thus speeding up a user's ability to type without jams. The QWERTY arrangement was part of Sholes' 1878 patent, and has survived through various incarnations right through to the present day computer keyboard.



Steve Jobs changed all that with the Macintosh.

Not only did the graphical user interface of the Mac simplify the computer experience, but its marriage to Adobe PostScript and a new wave of PostScript applications suddenly turned it into a new generation of inexpensive graphics workstations with a degree of power and ease of use never seen before.

Jobs' vision — even his near-tyrannical desire to make something “insanely great” — set off a revolution in publishing and transformed the graphics industry to its very core. He inspired Steve Wozniak to build the Apple computer. He grasped the import of the technology development at Xerox PARC. He rescued Adobe from the brink of oblivion. He energized the computer graphics business with the formation of Pixar. He aimed higher with the NeXT computer. And he reversed the tide at Apple just when it seemed like the company's future was awash in red ink.

In the year 2000, it is not hyperbole to state that the business of graphics creation and production owes its present and its future to the creative imagination of the second most influential person in graphics history: Steve Jobs, non-interim CEO of Apple Computer.

OUR MOST INFLUENTIAL GRAPHICS PERSON

And finally, our nomination for the person who most affected modern graphics: a man revered for his humility and discipline, but whose inventive nature transcended mere manufacturing and established a modern model for business practice, marketing and even social conscience.

George Eastman invented the Kodak camera, as we all know. He also invented a machine for automating the production of dry photographic plates, banishing the wet collodion photo process to

the history books forever. And he invented flexible coated film, and the film roll holder, and the \$1 Brownie camera.

But over and above all that, he invented the systems for delivering his inventions. He created a modern network for international sales and service, and the concept of consistent ubiquitous advertising. And he put a system in place for employee benefits and profit sharing long before such ideas had been heard of.

First and foremost, Eastman gave the world pictures. He handed the man on the street a magic box that would not only let him capture lifelike photographic images but also feed them into a unique production system which would convert “pressing a button” into wonderfully realistic memories that could be held, viewed and shared.

Photography for the masses fed Ives' halftone screening and Senefelder's lithographic process; it complemented the words from Sholes' typewriter in Jenson's type. In due course it would provide a real world application for Munsell's theories; and it would provide fodder for Steve Jobs' hardware and Adobe's software, and even Chester Carlson's reproduction technology.

In short, Eastman gave birth to an industry, and literally changed the world in the doing.

So it is that, with due consideration and confidence, the editors and contributors of GRAPHIC EXCHANGE name our choice for Most Influential Graphics Person of the Millennium — George Eastman, founder of Eastman Kodak Company.

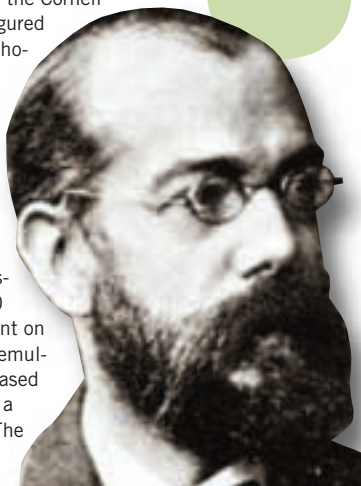
Now just picture that. ✱

MANY THANKS TO LIDKA SCHUCH, ROBERT RUSSEL AND MARK BRILL FOR THEIR ASSISTANCE IN PREPARING THIS ARTICLE.

FREDERICK IVES

19TH C AMERICAN INVENTOR/PHOTOGRAPHER

There was hardly a ripple of interest when in 1888 Frederick Ives announced that he had invented a new screening method for printing. Yet the crossline halftone would prove to be the most revolutionary introduction in graphic arts since the invention of the press. Ives began experimenting with printing plates in 1875 at the Cornell University photo lab. By 1878 he had figured out a method for producing “halftone” photoengraving. In 1879 Ives joined Crosscup & West, a manufacturer of wood engravings, and continued with his development until by 1885 he had created the crossline screen. Although Ives' original halftone was patented in 1881, the crossline method was never registered. He would regret that decision when it swept through the printing industry, as wood engravings which cost \$300 were replaced by \$20 halftones. Ives went on to patent “panchromatic” photographic emulsion, the basis of all modern chemical-based color photographic processes, as well as a colorimeter and the “tint photometer”. The value of his contributions to both printing and photography are inestimable.

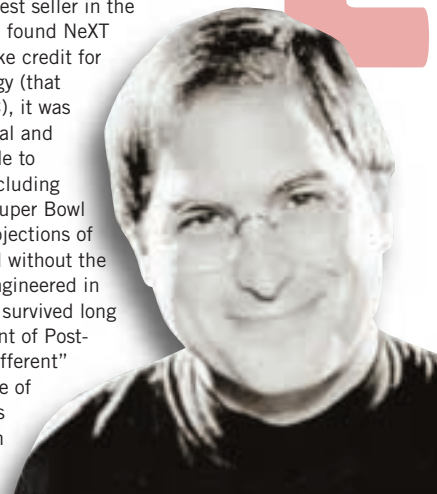


3

STEVE JOBS

20TH C AMERICAN TECHNOLOGY DEVELOPER

The power and ease of WYSIWYG color display, the mouse, and the graphical user interface arrived in 1984 with the introduction of the Macintosh, the personal computer that revolutionized the graphics industry. Apple Computer co-founder Steve Jobs not only co-developed the Apple II, which became a best seller in the late 1970s, but also went on to found NeXT and Pixar. Although he can't take credit for conceiving Macintosh technology (that goes to the team at Xerox PARC), it was Jobs who recognized its potential and dedicated the resources at Apple to building and marketing it — including approval of the famous 1984 Super Bowl commercial (and despite the objections of Apple's board of directors). And without the financial support which Jobs engineered in 1983, Adobe might never have survived long enough to complete development of PostScript. Jobs' ability to “think different” changed the basic infrastructure of the graphics industry, and earns him the number two position on our list of most influential graphics people of all time.



2

PHOTO COURTESY APPLE COMPUTER



GEORGE EASTMAN

19TH C AMERICAN INVENTOR

The consumer photography market was invented primarily through the energies of one man, George Eastman, founder of Eastman Kodak. Between 1880 and 1900, Eastman introduced dry photographic plate production, transparent photographic film, the low cost "Kodak" box camera, transparent roll film, the daylight-loading camera, the "Folding Pocket camera", and the one-dollar "Brownie" camera. He transformed what had been a complicated technical exercise, accessible only to those with a darkroom and all the peripherals, into an effortless, inexpensive pastime, readily available to everyone. Gutenberg gave the world moveable type, which let us print words.

Over four hundred years later, it was George Eastman who gave us the other half of the equation for graphic communications — easy access to photographs to go with our words. For this, we salute him as the most influential graphics person of the millennium.

1



YOU PRESS THE BUTTON.
WE DO THE REST.

