Early steps in computer typesetting in the 1960s

Jonathan Seybold, September 2018

1961–1964 Michael Barnett's "Experiments in Typesetting"

In 1961, Michael Barnett, an associate professor at MIT wrote a computer program that could produce punched paper tape output to drive a phototypesetting machine. He used this to produce the "Tail" from *Alice in Wonderland,* and a phototypeset press release. These were the first documents that were phototypeset from output generated by a computer.

In 1962 Barnett received a research grant to continue this experiments. This lead to development of the PC6 system, which was used to produce a variety of reports, pamphlets and other publications in late 1963 and early 1964.[1]

Hardware: IBM 709/90 computer and a Photon 560 phototypesetter.

Software: Written in Fortran, with a few routines written in FAP (Fortran Assembler).
Written for a specific Photon 560 set-up. Typefonts were identified by disk position and row number.

The TYPRINT program for text output composed text to fit a predefined page width and depth. Lines were broken after the last complete word that would fit on that line. There was no attempt at hyphenation. Pages were arbitrarily broken after the last line that would fit on the page. Special commands could be embedded in the text to tie text elements together. When it encountered these, the program would simply make the page as long as necessary to accommodate all of the text in the "no break" area.

Given the scientific academic setting, the most notable feature of TYPRINT was a program written by J.M. Gerard to set multi-level mathematical equations from punch card input — although the input coding required to accomplish this was formidable. For example,
(XRU2)LV*LBA*RV*RBA* produced (X^2)

TABPRINT was a special program for setting tabular material.

BCDPRINT was used to set input from punched cards.

Barnett himself stated that PC6 output was typographically primitive and not suitable for commercial work, but it was a great improvement over computer line printer output.

1962: John Duncan began research on computer typesetting at the University of Newcastle-upon-Tyne in the UK.[2]

1962–63: Newspaper hyphenation and justification (H&J).

H&J programs written for the RCA 301 computer were installed at the *West Palm Beach Times* in Florida and the *Los Angeles Times* in 1962. Paper tape containing wire service copy without line breaks was fed into the 301, and the H&J program decided how to break the lines and punched out paper tape containing line breaks.[3]

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1 M.P. Barnett, *Computer Typesetting, Experiments and Prospects,* MIT Press, 1965.

2 C.J. Duncan, J. Eve, L. Molyneux, E.S. Page and M.G. Robson, 'Computer typesetting: an evaluation of the problems', *Printing Technology,* vol. 7(1963) pp. 133-151. See also `http://history.cs.ncl.ac.uk/anniversaries/40th/webbook/typesetting/index.html`

3 David R. Davies, "An Industry in Transition: Major Trends in American Daily Newspapers, 1945-1965," (PhD diss., University of Alabama, 1997) chapter 9, `http://ocean.otr.usm.edu/~w304644/ch9.html.` This section does not appear in the author's related book, *The Postwar Decline of American Newspapers, 1945-1965,* Praeger, 2006.

Similar systems running written for the IBM 1620 computer were installed starting in 1963,[4] including an installation at the Washington, DC *Washington Star* newspaper.[5]

Fall, 1963 Rocappi produces its first commercial job.

See article on Rocappi.

May, 1964 Photon Zip phototypesetter produces *Index Medicus*[6]

The Photon Zip was a special very high-speed phototypesetter developed specifically for this purpose. Producing *Index Medicus* pages on the Zip saved 40 percent of the printing and binding costs compared to printing photo-reduced line printer output.

1964–5 IBM 1401, 1130 and DEC PDP-8 programs introduced

Computer H&J was one of the earliest applications for the 1130.[7] Initially, this was straight H&J with logic hyphenation (done according to general rules, without regard to exceptions). Competitive programs written for the PDP-8 soon followed.[8] A Finnish newspaper used an IBM 1401 for H&J in 1964.[9]

The 1130 and PDP-8 were, by far, the dominant computer typesetting platforms well into the 1970's. By that time, the software packages included dictionaries of "exception words" (words that the logic was known to get wrong) and programs to handle newspaper classified advertising. Although these software packages were developed for newspapers, they were also purchased by commercial typesetting companies as well. A survey conducted in 1972 tallied 272 1130 typesetting installations and 392 PDP-8 installations.

Mainframe text processing.

Another major program was Jerome H. Saltzer's RUNOFF, written in 1964 in FAP and MAD (Michigan Algorithmic Decoder) for the MIT CTSS time-sharing system.[10] It provided simple formatting "dot-commands" that were inserted in text to produce formatted pages (without h&j) to be printed on a monospaced printer. It was the forerunner of the nroff and troff Unix text-formatting programs (and the GNU groff program for Linux). These were widely used by non-professionals in the 1970's to typeset their texts before the advent of other desktop publishing systems.

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4 Hans. E. Weiss, IBM's Position in Electronic Composition and Text Editing, in *Electronic Composition in Printing: Proceedings of a Symposium, June 15-16, 1967,* ed. Richard W. Lee and Roy W. Worral, National Bureau of Standards Special Publication 295, US. Department of Commerce, Washington, DC, 1968.

5 The Greencastle *Daily Banner*, July 13, 1963, p. 1, article, "Machines setting 12,000 lines an hr," says that IBM reported that its 1620 typesetting system was ordered by the *NY Daily News*, the *Washington Evening Star*, and the South Bend, Indiana *Tribune*, and that two Oklahoma newspapers tested the 1620 system during March 1962 (https://newspapers.library.in.gov/cgi-bin/indiana?a=d&d=TDB19630713-01.1.1).

6 Mary E. Stevens and John L. Little, *Automatic Typographic-Quality Typesetting Techniques: A State-of-the-Art Review*, National Bureau of Standards Monograph 99, US. Department of Commerce, Washington, DC, 1967, p 69. See also Charles P. Bourne and Trudi B. Hahn, *History of Online Information Services 1963-1976*, MIT Press, 2003, pp. 202-203.

7 Seybold, J.W., Seybold, J., "Typesetting and pre-press technology." *The Seybold Report on Publishing Systems* 18, 3–23 (1985)

8 PDP-8 Typesetting System, Digital Equipment Corporation, Maynard Massachusetts, 1965.

9 Nils Enlund and Han E Andersin, The Early Days of Computer Aided Newspaper Production Systems, J. Impagliazzo, T. Järvi, P. Paju (Eds.) *History of Nordic Computing 2*, Springer 2009.

10 Jerome H. Saltzer, TYPSET and RUNOFF: Memorandum editor and type-out commands (MIT Computation Center CC-244, Project MAC MAC-M-193, Cambridge, 1964), http://web.mit.edu/Saltzer/www/publications/ctss/AH.9.01.html.

1965–1968 RCA Graphic Systems[11]

In 1965, the Rudolf Hell company in Germany developed the Digitset CRT typesetter. RCA established a Graphic Systems Division to sell modified versions of the Digiset as the RCA Videocomp. It hired Michael Barnett to oversee development of typesetting software for the RCA Spectra 70 computer (an IBM 360 clone).

Barnett's team developed Page-1 — a "typographic compiler" that that allowed users to program specific routines for typesetting specific types of pages on the Videocomp. As with PC6, pages were composed one page at a time by composing text to fit into a pre-defined rectangular frame. A later version of the software was called Page-2

1967: First Videocomp 820 delivered. (Output limited to a 5.4 inch line length.)

1968: First Videocomp 830 delivered.

December 1967

First production on a Linotron 1010 CRT typesetter at the U.S. Government Printing Office. Like the earlier Photon Zip, the 1010 was developed in response to a specific RFP for a high speed computer output typesetter. Linotype also provided a "Master Typography Program" to produce output for the 1010.

1968–on: Database output to CRT typesetters

The 1964 Photon Zip had been developed to output a specific computer data base. The Linotron 1010 was used to output a wider variety of computer-generated material at the U.S. Government Printing Office and Wright-Patterson Air Force Base.

Alphanumeric Inc, developed its own all-digital CRT typesetter for output of computer data bases. It offered the services of its APS 2 typesetter in a service bureau. IBM commissioned Alphanumeric to build a version of the machine that could be driven as a peripheral device directly attached to a 360 computer. The IBM 2680 was announced in 1967 and was part of the IBM product line until 1970 (see ref. 11, pp 351-352).

Starting with the Videocomp 830 and the Harris-Intertype Fototronic CRT, more versatile high-speed digital CRT typesetters started to come onto the market in 1968. These proved to be suitable for both commercial typesetting and for producing typeset output of large computer data bases.

Most often, data base output that had previously been printed on a computer line printer could be converted to typeset output by writing relatively simple software that output specific data in a specific format to a particular CRT typesetter. More complex formatting could be done with the aid of programs like the Linotype Master Typography Program and the RCA Page-1 compiler.

1970s: Computerizing the Typesetting Process

The 1970's saw phototypesetting and computer-based technology almost completely take over all forms of publishing: newspapers, magazines, books, journals, technical documentation, manuals, proposals, financial printing, advertising, catalogs, packaging, drug package inserts, signs, flyers, newsletters etc. etc.

This shift from the industrial-age technology of casting molten lead to electronics and photographic output enabled a great many more organizations to do their own typesetting. The amount and variety of material being typeset increased significantly.

By the end of the decade the unionized craftsmen who had performed hot-metal typesetting had mostly retired (often prompted by "buy-out" incentives).

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11 Arthur Phillips, "Computer-aided Composition," in Jack Belzer, Albert G. Holzman, and Allen Kent, eds., *Encyclopedia of Computer Science and Technology*, vol 5, Marcel Dekker, New York, 1976, pp 350-351.

Phototypesetting machines

By mid-decade there were 18 manufacturers of phototypesetting machines. These machines ran the full gamut from simple, inexpensive stand-alone phototypesetters to the high-speed digital CRT and laser typesetters used for output generated from larger computer typesetting systems:

Entry level: Inexpensive self-contained desktop phototypesetters. Initially, these contained a keyboard, microcomputer-based programmed logic, a small display screen and integrated phototypesetting output. As the technology improved, they came to include a CRT editing screen and text storage (typically a diskette) —essentially, a phototypesetting word processor. The counting logic kept track of the characters placed on each line and alerted the operator to make a decision as to how to end each line.

Separation of input/editing from output. Multiple keyboard/editing units similar to the above, but with punched paper tape output rather than the built-in phototypesetter. A separate larger, faster and more capable output typesetter was driven by punched paper tape output from the counting keyboards. As with the stand-alone entry-level desktop phototypesetter the decision on how to end lines was made by the operator as he or she typed.

Computer-driven phototypesetter. Most medium-to-high volume operations used computer systems to prepare, edit, and format text with output to a digital CRT or laser typesetter. At the low end, the typesetter might still be driven by punched paper tape generated by the computer. Some higher volume operations that used mainframe computers had output typesetters with magnetic tape readers, but most computer publishing operations had high speed digital typesetters that were driven as directly-connected computer peripherals.

Computer publishing systems. As the decade progressed, everyone wanted computer publishing systems that included interactive video terminals for input and correction of text. No computer manufacturer provided terminals that were deemed suitable for the task. In addition, many publishing applications demanded specialized hardware (such as a direct output interface to a high-speed digital typesetter). Therefore, the companies that supplied computer publishing systems had to become full hardware/software systems integrators.

The "vendors" (as we came to call them) typically built proprietary hardware/software systems based on standard minicomputers. They sold these systems as turn-key packages and provided training, service and support for their customers.

Since different publishing markets had different requirements, individual vendors tended to specialize in serving particular markets. There was, for example, essentially no market overlap between a publishing system sold for book publishing and one sold to newspapers.

The largest and most demanding market was that for newspaper automation. Every newspaper in the U.S. and Europe was installing comprehensive interactive computer systems that served as the heart of their business.

For further reading

The works cited in references 6 and 11 are excellent general sources of information on early computer typesetting, as is *The World of Digital Typesetting* by John Seybold, Seybold Publications, 1984, on line at http://history.computer.org/annals/dtp/seybold-84.pdf .