



Smithsonian

*National Museum of American History Kenneth E. Behring Center*

## Guide to the N. Joseph Woodland Papers

NMAH.AC.1433

Alison Oswald

2017

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## Collection Overview

<b>Repository:</b>	Archives Center, National Museum of American History
<b>Title:</b>	N. Joseph Woodland Papers
<b>Date:</b>	1943-2012
<b>Identifier:</b>	NMAH.AC.1433
<b>Creator:</b>	Woodland, N. Joseph, 1921-2012 (Creator)
<b>Extent:</b>	3.5 Cubic feet (11 boxes, 1 map-folder)
<b>Language:</b>	Collection is in English. Some materials in French.
<b>Summary:</b>	The collection documents the career of N. Joseph Woodland, who, along with Bernard Silver, invented and developed the bar code.

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## Administrative Information

### Acquisition Information

Donated to the Archives Center in 2017 by Susan Woodland, the daughter of N. Joseph Woodland.

### Preferred Citation

N. Joseph Woodland Papers, 1943-2012, Archives Center, National Museum of American History.

### Restrictions

Collection is open for research.

### Conditions Governing Use

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## Biographical / Historical

Norman Joseph Woodland (1921-2012) was born in Atlantic City, New Jersey. Woodland also served during World War II in the Army as a technical assistant for the Manhattan Project in Oak Ridge, Tennessee. He earned a Bachelor of Science in Mechanical Engineering from Drexel University (1947) and a Masters in Mechanical Engineering from Syracuse University (1956). He joined the Drexel University faculty as a lecturer in mechanical engineering in 1947.

In 1948, Woodland became aware of the need for supermarket inventory control through automated checkout. He conceived of the idea of using printed parallel stripes of varying widths to encode prices of items in 1949. Woodland, together with Bernard Silver (1921-1963), an electrical engineer, and fellow Drexel University faculty lecturer, defined a system to exploit the bar code invention to automatically capture item prices as well as inventory data. Woodland and Silver were issued US patent 2,612,994 for a classifying

apparatus and method on October 7, 1952. Woodland and Silver sold their patent for \$15,000 to Philco in 1961.

Woodland joined IBM in 1951 as a mechanical designer and later worked as a senior planner in artificial intelligence in general and expert systems. While at IBM, Woodland identified and applied existing and emerging technologies to enhance planned IBM products and systems. He worked in store systems marketing, long-range market planning, product planning, and artificial intelligence development. In 1983, he received an IBM technical sabbatical to work on expert systems and robotics at Carnegie Mellon University and to study these systems in use in Japan. A significant portion of Woodland's career focused on the bar code in general and supermarket automated check-out processes. His work laid the foundation for the creation of the universal product code (UPC symbol), for which he was an integral part of the IBM team's winning design, in his role as the person responsible for IBM's UPC symbol proposal to the grocery industry's symbol selection committee.

In 1992, Woodland won the National Medal of Technology for his invention and contribution to the commercialization of bar code technology, which improved productivity in every industrial sector and gave rise to the bar code industry. Woodland holds six patents.

Woodland married Jacqueline Woodland (née Blumberg) in 1951 and they had two daughters, Betsy Karpenkopf and Susan Woodland.

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## Scope and Contents

The collection documents the career of N. Joseph Woodland, who, along with Bernard Silver, invented and developed the bar code. The collection includes papers relating to Woodland's early life and education, such as exams and transcripts; papers relating to his work with IBM, including correspondence, notes and notebooks, and technical drawings; patents; photographs; awards and honors; articles.

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## Arrangement

The collection is arranged into five series.

Series 1: Biographical Materials, 1943-2012

Series 2: International Business machines Corporation (IBM), 1951-2006

Series 3: Node Code, 1986-2003

Series 4: Consulting, 1987-2000

Series 5: Audiovisual Materials, 1990-2011

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## Names and Subject Terms

This collection is indexed in the online catalog of the Smithsonian Institution under the following terms:

Subjects:

- Bar coding
- Inventions -- 20th century
- Inventors -- 20th century
- Numerical control

Types of Materials:

- Articles -- 20th century

Correspondence -- 20th century  
Examinations (documents) -- 20th century  
Notebooks -- 20th century  
Notes -- 20th century  
Patents -- 20th century  
Technical drawings -- 20th century  
Transcripts -- 20th century

Names:

International Business Machines Corporation

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## Container Listing

### Series 1: Biographical Materials, 1943 - 2012

Scope and Contents: This series consists of biographical materials documenting N. Joseph Woodland and includes early drawings and ideas, educational documents (grades and diplomas), awards, and photographs.

Box 1, Folder 1	Drawings and ideas, 1943 - 1950
Box 1, Folder 2	Drexel Institute of Technology, 1940 - 1947
Box 1, Folder 3	University of Tennessee, Knoxville, 1945
Box 1, Folder 4	Notebook of ideas, 1948
Map-folder 1	Idea, Woodland needle valve, 1945 - 1945 2 Blueprints (17.5" in. x 26.5" in.)
Map-folder 1	Idea, special hinge, assembly drawing, 1946-01-20 - 1946-01-20 1 Blueprint (16" in. x 18" in.)
Map-folder 1	Idea, unidentified drawing, 1949-12-07 - 1949-12-07 1 Drawing (15" in. x 21" in. )
Map-folder 1	Idea, paper printed, foldeed and punched to form a coil, 1953-10-09 - 1953-10-09 1 Drawing (9" in. x 12' in. )
Map-folder 1	Idea, proposed page reader, 1955 - 1956 1 Blueprint (11" in. x 17" in. )
Box 1, Folder 5	Professional engineering licenses, 1987 - 1987, 1948
Box 1, Folder 6	Resume information, 1965
Box 1, Folder 7	<a href="#">Syracuse University (graduate school), 1953, 1956 - 1956</a>
Box 1, Folder 8	<a href="#">Photographs, 1957 - 1992</a>
Map-folder 1	Photograph, 1973-06 - 1973-06 Notes: George Laurer, David Savir, and Joe Woodland, recipients of an outstanding contribution award for developing and proposing an optical bar code for the supermarket industry.
Box 1, Folder 9	Correspondence, 1995 - 1995, 2001 - 2002
Box 1, Folder 10	Awards (IBM-related), 1963 - 1987

Map-folder 1	Awards (IBM-related), 1973 - 1973, 1976 - 1976
Box 2, Folder 1	Awards (robot-related), 1983
Box 2, Folder 2	<a href="#">National Medal of Technology (nomination), 1991</a>
Box 2, Folder 3	National Medal of Technology (award), 1992
Box 2, Folder 4	National Medal of Technology , 1992 - 2000
Box 2, Folder 5	Drexel University (barcode-related), 1987 - 2012
Box 2, Folder 6	Drexel University, exploration of Institute of Creativity, 1984 - 1987, 1998 - 1998
Box 2, Folder 7	Drexel 100, Centennial Alumni Honoree, 1992 - 1998
Map-folder 1	Drexel 100, Centennial Alumni Honoree
Box 3, Folder 1	Drexel University (honorary degree), 1998
Map-folder 1	Drexel University (honorary degree), 1998 - 1998
Box 3, Folder 2	Advanstar Communications Automated Data Award (50th anniversary of the barcode), 1998
Box 3, Folder 3	New Jersey Inventors Hall of Fame Award, 2005
Box 3, Folder 4	National Inventors Hall of Fame (inductee), 2011
Box 3, Folder 5	EE Seminar, Drexel University (Woodland notes), undated

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## Series 2: International Business Machines Corporation (IBM) , 1951 - 2006

Scope and Contents: Woodland joined IBM in 1951. An early inventor in optical bar code technology, his patent (US 2,612,994) covers a bar code symbol for automation of supermarket checkout. This series contains correspondence, memoranda, patents, notes, published materials, and lectures and presentations primarily about the development of the barcode (later referred to as the universal product code), created during Woodland's tenure at IBM. Other work undertaken by Woodland at IBM is also included here.

The development of standardized product codes was underway for many years but was uncoordinated. Various manufacturers, wholesalers, retailers, and industry organizations made efforts to establish barcodes that could be used to track products. Efforts failed because participants could not resolve conflicts about the size of the barcode, compatibility with existing product codes, and costs. In 1970, the Grocery Industry Ad Hoc Committee formed to study and report on the economic potential of the universal product code (UPC) along with any obstacles. In April 1970, the committee concluded that the UPC should be adopted with the understanding that the UP should have broad application, not just for checkout systems. From 1972 to 1973, work continued on symbol standardization. In March 1973, the decision to adopt the rectangular symbol was announced.

There are materials post 1987, the year Woodland retired from IBM. These materials include lectures, presentations, and seminars about the barcode. The materials for *25 Years Behind the Bars* exhibit include an audio interview with Woodland conducted on August 23, 1999 by curator David Allison of the National Museum of American History. The exhibit was located in the Museum's Information Technology and Society section and showed the development of the original symbology, its integration into the grocery industry, its massive effects on business, and the future uses of the famous black and white bars.

Box 3, Folder 6	Correspondence, 1979 - 1979, 1965 - 1966
Box 3, Folder 7	Work related items, 1972, undated
Box 3, Folder 8	Advanced Engineering Mathematics, 1951 1 Book
Box 4, Folder 1	Engineers notebook, 1951 October 8-1959 May 11
Box 4, Folder 2	<a href="#">Engineers notebook, 1959 December 22-1964 February 10</a>
Box 4, Folder 3	Bar code scanner feasibility model, circa 1949-1950
Box 4, Folder 4	Image disector optics [scanner?], 1961
Box 4, Folder 5	Ideas and invention disclosures, 1955 - 1986
Box 4, Folder 6	<a href="#">Supermarket checkout method, 1952, 1954 - 1954, 1962 - 1962</a>
Box 4, Folder 7	Department of Education, certificate for digital computers, 1952
Box 4, Folder 8	Ideas, proposed page reader, 1955 - 1956



Box 4, Folder 8	Phosphor buffer storage idea, 1953
Box 4, Folder 9	Woodland inventions and disclosures, 1964 - 1965
Box 4, Folder 10	Mohansic Systems Laboratory, 1964 - 1965
Box 4, Folder 11	IBM methodology and long range planning (strategic planning), 1967
Box 4, Folder 12	Writings (by N. Joseph Woodland), 1955 - 1986
Box 4, Folder 13	Concepts and Applications of Regression Analysis, 1972
Box 4, Folder 14	Shelf-space allocation, 1965
Box 5, Folder 1	Marketing expense by system, 1968
Box 5, Folder 2	Proposal to exploit the need of apparel and accessory stores for information which will help them to operate efficiently, undated
Box 5, Folder 3	Computations of customer service times for various front end configurations, undated
Box 5, Folder 4	On the determination of expense to revenue ratio by system, undated
Box 5, Folder 5	<a href="#">Classifying apparatus and method (US 2,612,994), 1952 October 7</a>
Box 5, Folder 6	Patents issued to N. Joseph Woodland, et al, 1962 - 1984 Notes: Patents include: High-speed column-by-column reading device (US 3,052,405), 1962 Pulse generator (US 3,103,593), 1963 Remote terminal (US 3,308,276), 1967 Fibre deflection means (US 3,470,320), 1969 Method for controlling the operation of an optical scanner (US 4,431,912), 1984
Box 5, Folder 7	Artificial intelligence delivery system (US 5,274,801), 1993
Box 5, Folder 8	Bar code development, 1954 - 1960
Box 5, Folder 9	Barcode correspondence, 1961 - 1961, 1952
Box 5, Folder 10	Super Market Institute 1 Binder
Box 5, Folder 11	Human Factors Evaluation of Simulated Supermarket Checkout procedures, 1997 - 1997, 1960 - 1961

Box 5, Folder 12	Universal product code development, 1971 - 1973, 1985 - 1985, 2004 - 2004
Box 6, Folder 1	<a href="#">Articles about universal product code, 1975 - 1992</a>
Box 6, Folder 2	Consumer Traction Systems, forecast assumptions human factors, 1971 June
Box 6, Folder 3	Universal Product Code Symbol Seminar, 1971 September
Box 6, Folder 4	Presentation, Print Quality Specification Separate from Symbol, 1971 November 12
Box 6, Folder 5	Presentation, A Proposed Standard Product Identification Symbology for a World Product Code , 1974 June
Box 6, Folder 6	Presentation, Universal Product Code Seminar, 1978 July
Box 6, Folder 7	Presentation, Barcodes in Item Identification, circa 1978
Box 6, Folder 8	Kiwanis Clubs presentation about the origins of the barcode, 1988 June
Box 6, Folder 9	Proposal for a World Product Code (WPC) , 1979 - 1979, 1974
Box 6, Folder 10	Barcode, research and exhibit-related materials, 1992 - 2006
Box 6, Folder 11	25 Years Behind Bars, Celebrating the Silver Anniversary of the Universal Product Code (National Museum of American History exhibit), 1999 September 30 4 Electronic discs (CD)
Box 6, Folder 12	<a href="#">Barcode, historical summaries, 1999 - 1999, 2007, 1997 - 1997, 1993</a>
Box 6, Folder 13	Uniform Code Council (guidelines), 1986 - 1992
Box 6, Folder 14	Barcode lecture at Berlitz Language Center, Raleigh, North Carolina, 1991
Box 6, Folder 15	Uniform Code Council (UCC), 1997 Notes: Includes an oral history with Joe Woodland by the Pinnacle Group. There are six 1/2" VHS tapes. See Series 4: Audiovisual Materials, AC1433.5-10.
Box 7, Folder 1	Barcode articles, 1973 - 2005
Map-folder 1	Barcode articles, 1980 - 1980, 1974 - 1974 Notes: Includes issues of the <i>IBM News</i> , System Development Division.
Box 7, Folder 2	Correspondence about the barcode, 1997 - 1999
Box 7, Folder 3	Flashes of Darkness (evolution of barcode technology by N. Joseph Woodland), 2003 - 2004

Notes: Includes two copy prints (black and white) of Woodland working at IBM, circa 1960s.

Map-folder 1	Brush Sensing Robot , 1952 - 1952 62 Blueprints (29.5" in. x 52.5" in. )
Box 7, Folder 4	Automatic Programming, 1971 - 1981
Box 7, Folder 5	Mechanism to Generate Delivery Vehicles for Export Systems, 1986
Box 7, Folder 6	Multiple Linear Regression Analysis Program for PC, 1986 - 1986, 1978
Box 7, Folder 7	Interactive Computer Diagramming, the what and the why (MID), 1984
Box 7, Folder 8	Return on Investment PC Program, 1983
Box 7, Folder 9	Various projects, 1975 - 1985

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## Series 3: Node Code, 1986 - 2003

Scope and Contents: Woodland collaborated with Michael Gordon, senior planning administrator in IBM Information Services, Software Development, to develop the node code. The node code was a virtual node-and-branch-constructed schematic device that constitutes a facility for tree organized storage of, and pointer facilitated retrieval of, node code packets. The series contains notes, drawings, correspondence, memoranda, invention disclosures, and patent applications about and for the development of node code.

Box 7, Folder 10	Proposal to IBM to test and evaluate a novel software development environment, 1987 - 1989
Box 7, Folder 11	Circuit board notebook materials, 1995
Box 8, Folder 1	Software (first version) with Michael Gordon, circa 1997
Box 8, Folder 2	Invention disclosures, 1983 - 1996
Box 8, Folder 3	Invention disclosures, 1997 - 1998
Box 8, Folder 4	Invention disclosures, 1998
Box 8, Folder 5	Invention disclosures (drafts), 1999 - 2000
Box 8, Folder 6	Figures 1-6 for node code tree, undated
Box 8, Folder 7	Miscellaneous notes, undated
Box 9, Folder 1	Patent application text, 1996 - 1997
Box 9, Folder 2	Patent application (draft), 1997
Box 9, Folder 3	Patent application figures for downlevel, undated
Box 9, Folder 4	Miscellaneous notes and notebook, 2000 - 2001
Box 9, Folder 5	Patent proposal with Michael Gordon, 2002
Box 9, Folder 6	Description and theory of node code (neuron code theory) , 2002 - 2003
Box 9, Folder 7	Expertise Availability Systems (drawing) , undated
Box 9, Folder 8	Massively parallel computing (research), 1986 - 1994 Notes: Massively parallel computing is when parallel computers link scores of microprocessors. The microprocessors work on different parts of the same problems at the same time. Traditional mainframe computers only contain one or only a few processors.

Box 9, Folder 9

Drexel University, Entrepreneurial Development Center, 2000

Box 9, Folder 10

Accommodating infinitely-variable parameters and external routines in the development of virtual expert systems, 1990 - 1990, 1988

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## Series 4: Consulting, 1987 - 2000

Scope and Contents: This series contains materials related to Woodland's consulting work after his retirement from IBM in 1987. In many instances, Woodland was retained as an expert witness in legal actions where technical knowledge of the barcode was necessary. Materials include a notebook, correspondence, patents, notes, faxes, and printed materials.

Box 9, Folder 11	Ilhan Bilgutay v. Uniform Code Council, Inc. , 1987
Box 9, Folder 12	Expenses, 1991 - 1993
Box 9, Folder 13	Frances Beck (merchandising handling and identifying system), 1992
Box 9, Folder 14	Mitsubishi v. Jerome Lemelson, 1994
Box 10, Folder 1	Notebook (prepared for IBM counsel), 1995
Box 10, Folder 2	Valutron v. IBM , 1995
Box 10, Folder 3	Holoscan bar code scanners (LeRoy D. Dickinson), 1993, 1996 - 1996
Box 10, Folder 4-5	Ford Motor Company v. Jerome Lemelson (relates to machine vision), 1992 - 1997
Box 10, Folder 6	Sidney Bresnick, 2000

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## Series 5: Audio Visual Materials, 1990 - 2011

Scope and Contents: This series contains 1/2" VHS and CDs of interviews with N. Joseph Woodland and media coverage of the 1992 National Medal of Technology.

Box 10, Folder 7	WUNC Radio segment, Joe Woodland discussing conceiving the barcode, 1994-12 1 Electronic discs (CD) (Total Running Time: 03:41)
Box 10, Folder 8	Joe Woodland interview, 2013-03-06 4 Electronic discs (CD)
Box 10, Folder 9	[Holograph disks], undated
Box 11, Item AC1433.1	Joe Woodland on TV News, 1991-01 - 1991-01 1 Videocassettes (VHS)
Box 11, Item AC1433.2	Joe Woodland stories on WRAL-TV (Raleigh, North Carolina), 1990 - 1991 1 Videocassettes (VHS) Notes: Aired on: WTVD-11, Raleigh/Durham, North Carolina and WRAL-5, Raleigh, North Carolina.
Box 11, Item AC1433.3	National Medal of Technology coverage, 1992 June 23 1 Videocassettes (VHS)
Box 11, Item AC1433.4	N. Joseph Woodland with President George Bush at the White House and Rose Garden, 1992 June 23 1 Videocassettes (VHS) (Total Running Time: 00:45.) Notes: Aired on WTVD-11, Raleigh, North Carolina.
Box 11, Item AC1433.5-10	Uniform Code Council, 1997 February 6 Videocassettes (VHS)
Box 11, Item AC1433.11	Scanning the World of Information: Barcodes Change History, 2000 - 2000 1 Videocassettes (VHS) (Total Running Time: 10:00.)
Box 11, Item AC1433.12	Joe Woodland (IBM Communications Network), 1992 - 1992 1 Videocassettes (VHS) (Total Running Time: 06:44.) Notes: Includes footage of Woodland at White House for National Medal of Technology.
Box 11, Item AC1433.13	National Medal of Technology coverage , 1992 - 1992 1 Videocassettes (VHS) Notes: Media coverage of Woodland and the National Medal of Technology. Created by IBM.

Box 11, Item  
AC1433.14

National Medal of Honor clips, 1992 - 1992

1 Videocassettes (VHS) (Total Running Time: approximately 02:00.)

Notes: Tape made by Paul Woodland, nephew of N. Joseph Woodland.  
features footage from National Medal of Technology ceremony  
at White House Rose Garden.

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