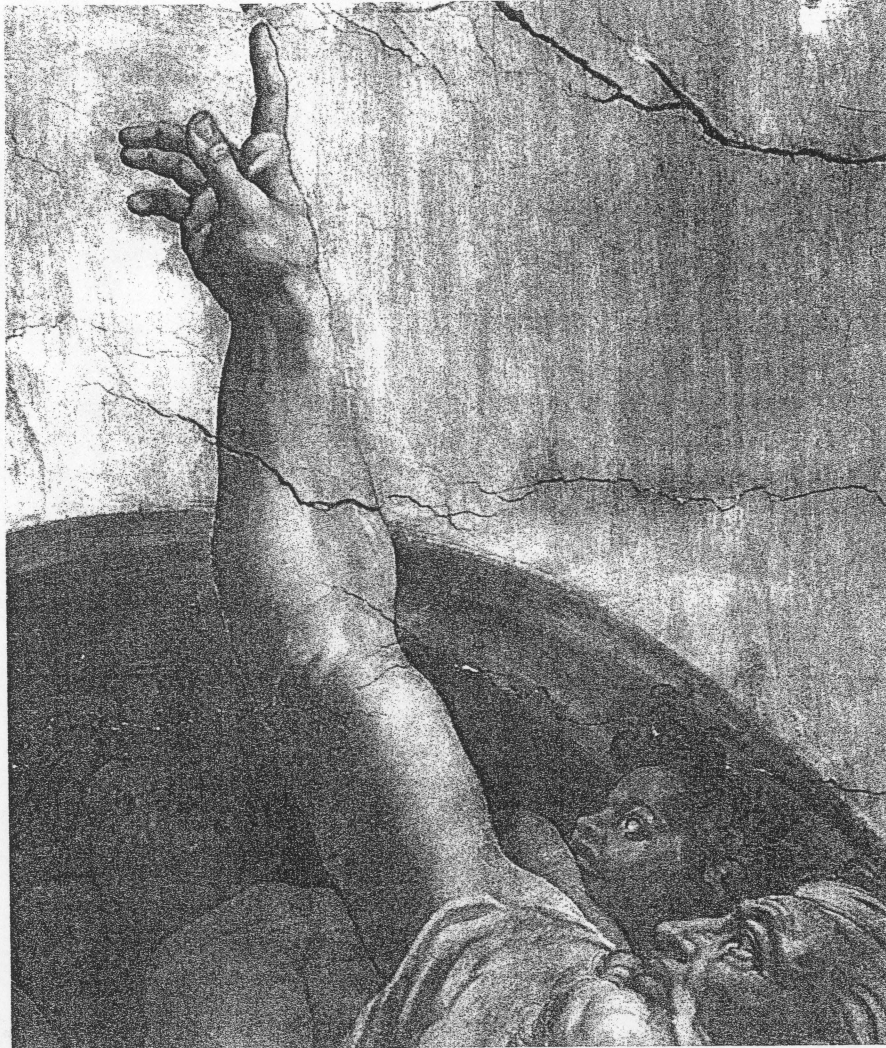


# Wasn't That a Time

## Stretch/Harvest Retrospectives



Ah, but a man's reach should exceed his grasp,  
Or what's a heaven for?

LookBack Publishing  
September 2002

# Wasn't That a Time

## Stretch/Harvest Retrospectives

Dedicated to the memories of Sullivan G. Campbell  
and  
Stephen W. Dunwell



**S. G. Campbell**  
Manager, Stretch and  
Harvest Software



**S. W. Dunwell**  
Manager, Project Stretch

Stretch/Harvest Reunion • September 28 and 29, 2002 • Poughkeepsie, New York

Compiled, written and edited by Eric Knutsen  
with the help of 124 other Stretch/Harvest Alumni(ae)

## Foreword

*Bill Collier and Eric Knutsen organized this Stretch/Harvest reunion (Ken Tooker was preoccupied with a family member's needs). Bill was the people hunter, web master and back office factotum. Eric was the promoter, arranger and book author. Here are a few words from Bill and from Eric.*

**F**or years Joe Harth, Ken Tooker, and I talked about having a reunion. We never acted. Joe died in May 2000 and this lent urgency to thoughts of a reunion. Last fall Ken and I talked again, but we got stuck. I mentioned this to Eric. He said, "I know what to do. I've done this before. Let's do it." Eric laid out a schedule and things started happening and they haven't stopped.

Eric has always been a mystery to me. How could a man of such obvious high intelligence prefer working with people rather than writing programs? The mystery endures, but we have worked well together, and I did get a kick out of watching Eric in action, talking to people, planning, coordinating, and keeping everyone contented, cooperative, and on course.

In the beginning we started contacting the people whom we remembered and/or who were listed in Tooker's newsletters in the 1970's and 1980's. They were our friends who were, of course, almost all Poughkeepsie programmers. Very quickly the list of names expanded to include engineers and others from outside the center of our universe.

When Chris Larson got on board., he went after every name on the list. If you are not a programmer from Poughkeepsie, then the probability is that you owe Chris thanks for being found. Chris also was unnerving in his ability to find errors in the information I put on the web site. Have you ever felt grateful for being irritated? Interesting experience.

Many people put a lot of effort into recalling long lists of names and addresses for the reunion contact list. I really appreciate the help provided by Laura Adams Bensley, Charlie Allen, Stan Anderson, Steve Behmann, Alice Carter, John Carter, Bob Conrod, Ed Councill, John Griffith, Ed Hofler, Esther Hunter, Harwood Kolsky, Dick Lamy, Bob Litwiller, Leslie Lowry, Marge Merritt, George Monroe, Dick Toepfer, Stu Tucker, Jeanette Voorhees, Herb Wild, and Leon Wun.

**Bill Collier – September 1, 2002**

**A**round Thanksgiving 2001, Bill Collier told me that he and Ken Tooker were contemplating a reunion of Stretch developers. In January 2002, we were off to the races. It's been a fascinating experience, not to mention rewarding, energizing and lots of fun.

The reunion owes a nontrivial debt of gratitude to the annual Harvard-Yale football game and to Bill's and my shared enthusiasm, at least in times gone by, for Scotch whiskey. For many years after my 1962 departure from Poughkeepsie, we renewed our annual wager, a bottle of Scotland's finest, on the outcome of The Game. For staying in touch, it was better than Christmas cards. Collaborating on this reunion has renewed and strengthened our friendship. Thank you Bill (and Ken).

Thanks also to the many contributors to this reunion book, in particular Bob Blosh, Betty Lou Campbell, Julia Dunwell, Dick Hatch, Harwood Kolsky, George Monroe, Paul Lasewicz and Dawn Stanford at the IBM Corporate Archives, Leo Notari, Emerson Pugh and his co-authors of *IBM's Early Computers*, Stu Tucker and Herb Wild. My wife Gail was a valued reader/editor and advisor, who endured all this reunion hoopla with her usual grace.

**Eric Knutsen – September 1, 2002**

**Cover:** The book's title, "Wasn't That a Time," is taken from a 1950's folk song of the same name, sung by the Weavers. The illustration is from Michaelangelo's Sistine Chapel work, "The Creation of Adam." The couplet "Ah, but a man's reach ... Or what's a heaven for" is from Robert Browning's poem *Andrea del Sarto*.

Second Printing: October 21, 2002

Copyright © 2002 by

LookBack Publishing

Seven Pell Place

Riverside, Connecticut 06878-1909

Reproduction of this book or any portion thereof is prohibited without prior written permission.

Price: \$25 US

## Note from a Los Alamos Friend ...

[Charles Folkner was in charge of computer operations at Los Alamos Scientific Laboratory ("LASL") during the early years of Stretch. He was also the first President of the Stretch User's Group (SUG), formed in 1961. We remember Charlie as a genial and kind host to IBM visitors, most of them unaccustomed to New Mexico and its high desert. This note from Charlie arrived in the nick of time.]

Ladies, Gentlemen and Stretch Partners:

I am very sorry that I will not be able to be with you on the reunion evening and would like to extend my best wishes.

The Stretch experience and success meant a great deal to those of us at Los Alamos. It provided the foundation for the supercomputer future of the laboratory. It also provided many of us with the personal underpinnings of our own futures. We were not neophytes when we started, but when we finished, we had participated in and completed a project that could not be termed anything but a success. Although IBM built only a few of the computers, we all know that the technology and innovations developed were instrumental to many of the Company's ongoing financially successful computers.

In my view, the operating system software you and we jointly developed set a standard that was hard to equal for many years. Flexibility and ease of use was something to be proud of for a lifetime, and I have been.

The great number of meaningful and unforgettable professional, technical, humorous, and personal exchanges were so large that I have difficulty in deciding on only a couple which to relate. You may be surprised that I can remember so many, but I can. [See page 21 for Charlie's memories.]

One of the things that was striking to me was the variety of venues we used during our time on the project, in particular the wilds of New Mexico to the metropolis of New York City to one of the original counties in New York. This melding of environments was one of the best products in our strong partnership.

The advances made by the IBM/LASL partnership on the MCP operating system were tremendous. Working together, sometimes under difficult circumstances, we built great working relationships. In my career, I have not been a participant or an observer of any project that was so well performed, respected all the other parties, and used the best material and methods available.

Thank you for being such wonderful and talented people. Please have a terrific time.

**Charlie Folkner  
Formerly LASL  
September 2, 2002**

# Contents

<b>Section</b>	<b>Page</b>
Introduction .....	1
Glossary of Names, Terms and Acronyms .....	2
A Brief Project History .....	3
Prologue .....	3
Timeline, 1955-1980 .....	4
Engineers, Planners and Programmers .....	11
Tom Watson, Jr. and Red Dunwell .....	14
Kingston Takes Over .....	18
Customers and Applications .....	19
Memories .....	20
Dunwell, Campbell and Cocke .....	27
Red Dunwell .....	27
Sully Campbell .....	29
John Cocke .....	31
Stories .....	34
Software Recollections .....	44
Fortran .....	44
STRAP .....	44
Writing Software .....	45
MCP .....	46
Impact on Us .....	51
Biographies .....	56
Survey Questionnaire .....	56
List of 125 Responders .....	57
Biographies .....	58
Closing Remarks .....	148
Appendix .....	153
 <b>Exhibits and Diagrams</b>	
Full-page Stretch Ad, NY Times, April 28, 1960 .....	6
An 80-Column Punched Card .....	45
“Typical IBM 7030 System” Diagram (from the IBM “7030 Data Processing System” Reference Manual) .....	47
The Complete 7030 Stretch Instruction Set .....	50

# Introduction

**W**e came to the Mid-Hudson Valley from 26 US states and 10 foreign countries.\* We held degrees in Electrical Engineering, Mathematics and Physics mostly, plus an assortment of other disciplines. A majority of us (93%) were men. We were young: in January 1956, when IBM appointed Steve “Red” Dunwell manager of the Stretch project, almost half of us (48%) were in our 20’s, another 35% of us were in our 30’s and 16% of us were callow teenagers. Only Red was over 40, and that by a mere two years.

From 1956 through 1962, we came to tackle a phenomenal challenge – design, build and deliver the most powerful computer system in the world. More than 40 years later, we are gathering in Poughkeepsie once again, this time to celebrate our accomplishments, our friendships and the work we did together. Indeed, “Wasn’t that a time!”

This reunion book has been compiled for the enjoyment and edification of Stretch and Harvest project alumni(ae) and their interested relatives and friends. Accordingly, we have tried to make the text accessible by those who may lack familiarity with computer technology and jargon.

While it includes a high-level history of Stretch, the book is mainly about people, the 125 alumni(ae) who responded to a survey requesting information, memories, anecdotes and observations. The book also touches on many other people, who were mentioned in those 125 responses.

In the pages that follow you can review project history; you can also learn where we came from, what we did for Stretch and Harvest and where we went afterwards. There are memories, stories, recollections and personal reflections – from perspectives seasoned and matured by the passage of 40+ years.

---

\* Statistics in this book are drawn principally from responses to the alumni(ae) survey.

## Arrangement of this Book

The book is arranged in nine sections and an appendix, as follows:

**Introduction** (this section) – Includes a one-page Glossary of names, terms and acronyms

**A Brief Project History** – Project goals, timeline, people, Watson and Dunwell, role of Kingston, customers and applications, with photos and other materials from IBM’s corporate archives

**Memories** – A collection of vivid and fond memories submitted by project alumni(ae)

**Dunwell, Campbell and Cocke** – Two brief biographies, one obituary and remarks by their colleagues

**Stories** – Amusing and illuminating anecdotes from project alumni(ae)

**Software Recollections** – Overview of Fortran, STRAP and MCP by a Stretch programmer

**Impact on Us** – Interesting answers to the survey query: “What impact, if any, did the Stretch experience have on you and your life’s trajectory?”

**Biographies** – Summaries of 125 lives, before, during and after Stretch/Harvest, with a sprinkling of photos. In this longest section of the book, your curiosity will be amply satisfied by some and merely stimulated by others.

**Closing Words** – Answers to the open-ended question, “Anything else you’d like to tell us?” A mixed bag of philosophic musings, afterthoughts and other sentiments.

The **Appendix** includes a Harvest Farewell, a 1982 *Datamation* article on Stretch, a Stretch R.I.P. from Brigham Young University and an Index of Names.

## Glossary of Names, Terms and Acronyms

**650, 701, 702, ... , 7090:** Numbers designating early IBM computers of the 1950's

**7030:** Number designating Stretch, starting in 1960

**AEC:** Atomic Energy Commission, a US agency

**AN/FSQ-7:** Army-Navy Fixed Special Equipment, a special-purpose defense computer used in SAGE

**Architect:** Computer system planner and high-level designer of functional specifications

**Assembler:** Software that translates mnemonic codes one-for-one into machine language

**AWRE:** Atomic Weapons Research Establishment, a UK research and development organization

**Bit:** Binary digit, a number that can have only one of two possible values: zero and one

**Byte:** A group of eight contiguous bits. (Before Stretch, it was six bits)

**BYU:** Brigham Young University

**CDC:** Control Data Corporation, an IBM competitor in the 1960's

**CEA:** Commissariat a l'Energie Atomique, the atomic energy agency in France

**Compiler:** Software that translates a high level language into machine language, one-to-many

**CPU:** Central Processing Unit, a computer's engine that performs arithmetic and logical operations and supporting functions

**DPD:** Data Processing Division, IBM's sales and marketing arm in the 1950's and 1960's

**DSD:** Data Systems Division, the IBM large computer development and manufacturing arm

**Fortran:** A computer language for scientific and technical people (Formula translating system)

**FSD:** Federal Systems Division, IBM's group responsible for federal government computers

**Harvest:** Code name of a custom computer system developed for NSA on a Stretch platform

**Headcount:** The number of authorized people at work in an organization, both employees and contract staff. An important IBM control metric.

**I/O:** Input/Output. Referring to devices and computer processes that bring data into computers from keyboards, punched cards, magnetic tapes, disks, etc. and send data out of computers to printers, tapes, disks, monitors, etc.

**IT:** Information Technology. An umbrella term for hardware, software and media used in connection with digital (bits and bytes) information

**Joint Computer Conference:** An important annual gathering of computer vendors and users in the 1950's and 1960's. There were Western ("WJCC") and Eastern ("EJCC") events each year

**K1, K2, ... , K6:** IBM Kingston's designations for the six 7030 Stretch computers built in and shipped from Kingston

**LARC:** Livermore Automatic Research Computer, a system procured by the AEC in the 1950's

**LASL:** Los Alamos Scientific Laboratory, an AEC facility in New Mexico

**LRL:** Lawrence Radiation Laboratory, an AEC facility in Livermore California

**MCP:** Master Control Program. Stretch software that would be called an "operating system" today

**Mitre Corporation:** A national engineering, R&D and IT resource originally associated with MIT

**NSA:** National Security Agency. A cryptologic organization that employs the country's premier code makers and code breakers.

**Plantation:** A 1950's NSA project to study computer capabilities that would speed application processing for the Agency

**SAGE:** Semi Automatic Ground Environment, a system developed in the 1950's and deployed in the early 1960's as part of US air defense

**Silo:** An NSA task for the development of fast computer memory

**STRAP:** Stretch Assembler Program, language in which other Stretch software such as MCP was written (See "Assembler")

**Stretch:** The name given to the project launched in 1955 as well as to the machine delivered to Los Alamos in 1961. The project was tasked with "stretch"ing technology to its limits

**Stretch Acronym Retrofit:** The process by which Stretch achieved acronymic status in 1961 (Super Tool, Relentlessly Endeavoring To Compute, Hard), at least among MCP programmers

**System/360:** IBM's computer product line announced on April 7, 1964. System/360 comprised a family of compatible machines in a wide range of sizes and prices. The product line incorporated many features that originated in Stretch.

## A Brief Project History

This section of our reunion book presents a brief history of the Stretch and Harvest projects. It is drawn from the book *IBM's Early Computers* (by Emerson Pugh et al), from responses to the reunion questionnaire, from the IBM corporate archives in Somers, New York and from answers to specific questions provided by several of you. The section comprises the following segments:

- Prologue
- Timeline, 1955-1980
- Engineers, Planners and Programmers
- Tom Watson, Jr. and Red Dunwell
- Kingston Takes Over
- Customers and Applications

### Prologue

**B**y the end of 1954, the IBM Company had installed eighteen “701 Electronic Data Processing Machines” in customer sites. The 701 was a “scientific” computer, designed for customers wanting to do lots of computation. Also in 1954, IBM was taking orders for 1955 delivery of the 702 (a “commercial” computer for customers with lots of data in records and files), had installed the first model 650 drum computer (with orders for 450 more model 650’s) and was feeling pressure from Remington Rand’s sales of UNIVAC computers.

It was a pivotal year for IBM computers, all of which relied on vacuum tubes. (Stretch was to be one of the first transistor-based computers.) During 1954, IBM announced the 704 computer as a successor to the 701 and the 705 computer as a successor to the 702. In April 1954, President Tom Watson, Jr. appointed sales manager T. Vincent Learson to the newly created position of director of electronic data processing machines (EDPM). Learson established in Poughkeepsie a council of EDPM managers, including lab manager Ralph L. Palmer, a distinguished electrical engineer. In the summer of 1954, highly regarded product planner Stephen W. Dunwell joined with Palmer to work on “advanced concepts” for computing machines.

In August, Dunwell and engineer Werner Buchholz began collaborating ideas for a new computer called the “Datatron.” An excerpt from a Dunwell position memo in October presaged the Stretch initiative:

“ ... we must take a giant step and make substantial advances on all fronts ...  
The Datatron is to be equally usable for commercial and technical applications”

### Enter Stretch

A year later, in August 1955 Palmer and Cuthbert Hurd, IBM’s director of applied science, got management approval to discuss the Poughkeepsie lab’s supercomputer initiative with potential customers. The preceding year had seen, among other developments:

- Advocacy from John von Neumann, who urged IBM to sometimes “write specifications for the most advanced machine ... possible in the present state of the art;”
- Pressure from customers, such as the Atomic Energy Commission (AEC) laboratories at Los Alamos, New Mexico and Livermore, California and the National Security Agency (NSA) in Washington, D.C.



- Perceived competitive threats from Sperry Rand, a company with revenues exceeding IBM's and a winning bid for the Livermore Automatic Research Computer (LARC)

August 23, 1955, the date of an agreement within IBM to proceed with plans to secure a supercomputer contract, can serve as well as any other to mark the beginning of the Stretch project. In January 1956, the Poughkeepsie lab was organized in two major activities:

- A product development laboratory headed by H. S. Beattie
- A research group headed by R. L. Palmer

Within the research group, Steve Dunwell was named head of Project Stretch in January 1956 and provided with a budget.

## Timeline

The events chosen for this summary-level timeline reflect the editor's judgment as to their significance and their potential interest to alumni(ae) readers.

<b>Year</b>	<b>Date or Month</b>	<b>Event</b>	<b>Comments</b>
1955	January 14	VP and engineering director Wallace McDowell holds a meeting to discuss six alternatives for the "next large computer" [after the 704]. Alternative 6 is a machine 100 times the speed of a 704	This is an early instance of "100 x 704" rallying target
	August	The National Security Agency (NSA) gives informal approval to IBM for "Silo," a fast memory development task, and "Plantation," a computer capabilities study	Palmer and Hurd get approval to pursue supercomputer talks with potential customers
	November 1	The first in a series of "Stretch Memos" is issued. There will be 19 such memos by year-end	Steve Dunwell and Gene Amdahl are major contributors and rivals for Stretch leadership
	December	After learning that Dunwell will be appointed head of Stretch, Gene Amdahl resigns from IBM	Amdahl will return in 1960 to IBM and work on System/360
1956	January	Los Alamos Scientific Laboratory (LASL) seeks bids for an advanced computer	IBM's cover letter to its February response includes a design criterion "speed at least 100 times greater than ... existing machines"
	April	LASL committee decides to recommend IBM	Contract ink would take another six months

## Timeline (Cont'd)

Year	Date or Month	Event	Comments
1956	Summer	Gerrit Blaauw, Fred Brooks, Werner Buchholz, John Cocke and Jim Pomerene join the Stretch team. Lloyd Hunter provides transistor leadership.	Also in 1956: Charlie Allen, Orest Bedrij, Ed Council, Paul Herwitz, Dick Lamy, Dura Sweeney, Jack Wenner, Herb Wild, Leon Wun and Hannon Yourke come to Stretch.
	July	A Werner Buchholz report lists the advantages of a 64-bit word length for Stretch	“Byte” replaces “bite” to denote a group of bits. The coinage is credited to Werner by some, among them his wife.
	November	The LASL/IBM contract is formally approved	Delivery is set 42 months out, May 1960
1957	January	The Stretch project is reassigned from Research to Product Development	Allows Stretch to remain in Poughkeepsie, as Research moves to Westchester County
	May	The first Harvest manual is published. It summarizes NSA’s requirements for computing	NSA proposal acceptance would come 12 months later
	Summer	LASL mathematician Harwood Kolsky joins IBM. He and John Cocke design a Stretch simulator, to run on a 704 computer.	The Cocke-Kolsky simulator will prove an invaluable tool for Stretch system planners (aka “architects”) and design engineers
	November	Stretch project headcount reaches 180	Headcount will grow to averages of approximately 200 in 1958, and 300 in 1959
1958	May	The first Stretch operations manual is published	Publication allows detailed logical design activities to begin
	First half	Erich Bloch joins the Stretch project as engineering manager	Jim Pomerene is Harvest’s engineering manager
	May	IBM’s Harvest proposal is accepted by NSA	
1959	January	Assembly of the Stretch engineering model begins	Concurrent initiation of the Harvest engineering model strains Poughkeepsie lab staff resources
	July	IBM’s corporate magazine <i>Business Machines</i> reports that Stretch will be “about 100 times faster than the most advanced computer working today.”	

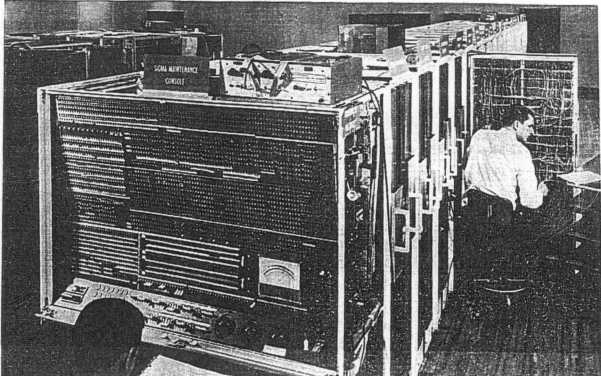
## Timeline (Cont'd)

Year	Date or Month	Event	Comments
1959	November	Stretch technology reaches the marketplace, embedded in 7090 scientific computers	Stretch innovations will strengthen the 7000 series and the System/360
	December	Erich Bloch presents a detailed report on Stretch at the Eastern Joint Computer Conference. Speed comparisons are carefully qualified, in terms of specific applications and requirements for arithmetic precision.	
1960	April	At IBM's annual meeting for shareholders, CEO Tom Watson, Jr. announces that "IBM will now contract with business firms and government agencies to build Stretch type computers ... [they] will perform more computations per dollar than any other system in the world."	
	April 28	The Data Processing Division, IBM's sales and marketing arm, places full-page Stretch ads in major newspapers	

The ad copied below appeared on a full page in the New York Times on April 28, 1960

THE NEW YORK TIMES, THURSDAY, APRIL 28, 1960

STRETCH—the world's fastest and most powerful data processing system—under test at IBM's Poughkeepsie plant.



**IBM STRETCH—a giant in all but size... a single solid-state system with the power of seventy-five IBM 704's, nearing completion for the Atomic Energy Commission. IBM now offers to negotiate contracts for STRETCH-class systems tailored to the individual needs of private industry and government agencies. To solve tremendously complex data processing problems, STRETCH-class systems offer speed\* and capacity far beyond that of any system ever built. IBM's years of experience in the design, development, and manufacture of data processing equipment enable it to undertake contracts for systems of this immense magnitude.**

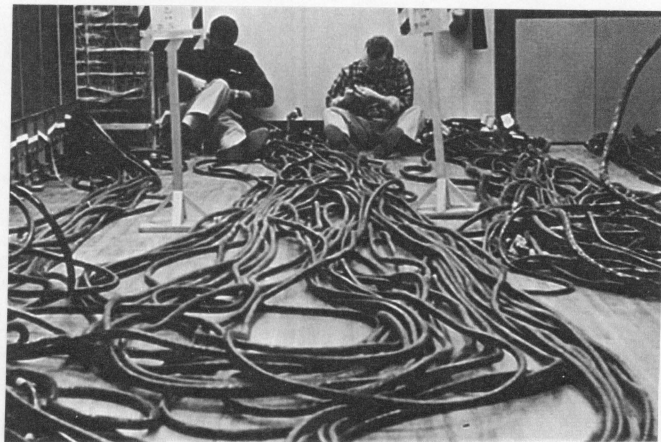
\*One million additions, one-half million multiplications per second.

**IBM**  
DATA PROCESSING CORPORATION

## Timeline (Cont'd)

Year	Date or Month	Event	Comments
1960	First Half	IBM's Federal Systems Division (formerly Military Products Division) on the downslope of peak SAGE workload, begins preparations to manufacture and install Stretch computers out of its Kingston, New York facility	SAGE was a large US Air Force procurement. The disciplines of federal contracts will be applied to the last six Stretches delivered
	December	The AEC orders a Stretch for its Lawrence Radiation Laboratory (LRL), at a price of \$13.5 million, delivery in October 1961. Plus or minus 10 per cent, the contract terms call for floating point operation times in microseconds of .83 (load/store), 1.38 (add/subtract) 2.48 (multiply) and 9.00 (divide).	Using the Consumer Price Index (CPI) to adjust for inflation, \$13.5 million in 1960 is more than \$80 million in 2002
1961	February-March	Tests run by IBM and LRL suggest that Stretch is only 4-5 times the speed of a 7090, against a contract target of 8 times	IBM management will reduce Stretch's price later, from \$13.5 million to \$7.78 million
	April 16	The LASL Stretch is shipped from Poughkeepsie	

### Images of LASL Moving Day: April 16, 1961



## Timeline (Cont'd)

Year	Date or Month	Event	Comments
1961	May	Ralph Palmer writes a six-page memo putting Stretch into a historical perspective: "... IBM [in 1954-55] was behind competition in device and circuit development ... the Stretch program was intended to force IBM by commitment into a lead position."	
	May 9	Tom Watson, Jr. gives a talk at the Western Joint Computer Conference in Los Angeles. The talk is titled "Automation and National Power." Early in his remarks, Watson has this to say about Stretch: <p style="margin-left: 40px;">"We have had a recent problem of trying to take longer steps. I'm referring to the IBM Stretch machine and some of our problems our company has had in that regard. You have heard about them, I'm sure.</p> <p style="margin-left: 40px;">Anyway, we reached for what we thought might be possible beyond present bounds. And we fell a little short of our optimistic expectations. We're proud of what Stretch is and sorry it didn't end up stretching further. Nevertheless, it is the world's most powerful computer by a comfortable margin.</p> <p style="margin-left: 40px;">Our greatest mistake in Stretch – as I see it – is that we walked up to the plate and pointed at the left field stands. When we swung, it was not a homer, but a hard line drive to the outfield. We're going to be a good deal more careful about what we say in the future."</p>	
	July	Returning from a meeting at LASL, Harwood Kolsky writes in a trip report, "... the people at LASL who are actually using Stretch ... are almost uniformly happy about the machine. They feel that it is very reliable, ... easy to use, and quite fast."	
	Second Half	Steve Dunwell returns to Research in northern Westchester. He begins a study of development methods for computer-aided instruction.	
	November	The LRL Stretch is delivered to Livermore, California	<b>Note:</b> This and subsequent delivery dates are based on personal recollections and hence are approximate.
1962	January	The Harvest system is delivered to NSA in the Washington, D.C. area	(This date is accurate)
	February	The Atomic Weapons Research Establishment (AWRE) Stretch is delivered to Aldermaston, England	

## Timeline (Cont'd)

Year	Date or Month	Event	Comments
1962	June/July	The Weather Bureau Stretch is delivered to Washington, D.C.	
	September/ October	The Naval Weapons Lab Stretch is delivered to Dahlgren, Virginia	
	December	The Mitre Corporation Stretch is delivered to Bedford, Massachusetts	It may have been early in 1963
1963	November	The Commissariat a l'Energie Atomique (CEA) Stretch is delivered to somewhere in France	CEA is the French version of AWRE in England
1964	April 8	The day after IBM's System/360 announcement, Dunwell wrote to Watson:  <p style="margin-left: 40px;">“The new System/360 is in many respects the image of Stretch. It is important to me that you know this, for I hope that in time you will look upon the Stretch contribution to our technical heritage as an excellent bargain.</p> <p style="margin-left: 40px;">Attached is a partial list of System/360 system features whose first appearance ... was in Stretch</p> <p style="margin-left: 40px;">Also attached is a book edited by Dr. W. Buchholz setting forth the design considerations for Stretch. The book contains sections [written] by several of the principal contributors to System/360 ... ”</p> <p style="margin-left: 40px;">The system features listed included multiprogramming, memory protection, interrupts, memory interleaving, lookahead, 8-bit byte, and standard I/O interface.</p>	System/360, after a shaky start, became (with its successors) IBM's flagship product line for the next 20 years.
1966	March 15	Steve Dunwell is named an IBM Fellow at IBM's Annual Awards Dinner. Tom Watson, Jr., speaking of his 1961 decisions says, “I fear ... the great contribution of Stretch to our whole future in IBM got obscured and muddy.”	(More Watson-Dunwell lore can be found later in this history section.)
1971	2 <sup>nd</sup> Quarter	After 10 years of Stretch service, LASL holds a seminar, “The Historical Importance of Stretch.” Dunwell and Buchholz are invited to speak.	Later, LASL decommissions its Stretch computer
	May	Brigham Young University (BYU) acquires Mitre's Stretch as “government surplus”	In November 1971, BYU acquires the LASL Stretch for spare parts
1976	February 27	Harvest is retired at NSA after 14 years	See photo, next page

## Timeline (Cont'd)

Year	Date or Month	Event	Comments
1980	September	BYU retires the Stretch 7030 from its service bureau operation	This is the last of the Stretch 7030 computer systems to retire

\*\*\*\*\* End of the Stretch Timeline \*\*\*\*\*

[Editor's Note: The foregoing prologue and timeline were culled largely from *IBM's Early Computers*, by Emerson Pugh, et al. Chapter 11 in this estimable work is 43 pages long, and is devoted solely to "Project Stretch." A perusal of the book's Index reveals 36 names of Stretch/Harvest alumni (yes, they are all male): Gene Amdahl, John Backus, Gerry Blaauw, George Blenderman, Erich Bloch, Fred Brooks, George Bruce, Werner Buchholz, Bengt Carlson, J.M. Brownlow, John Cocke, Edgar Codd, David Crawford, Steve Dunwell, Philip Fox, Maurice Every, John Griffith, William Harding, Mike Haynes, Bill Heising, Bob Henle, Lloyd Hunter, Harwood Kolsky, Seymour Keller, Rolf Landauer, Joe Logue, Dick Merwin, Ralph Partridge, Jim Pomerene, Louis Russell, Ernest Schuenzel, Dura Sweeney, Leonard Thompson, James Walsh, Bill Wolensky and Hannon Yourke.]

Below: Photo Taken at the Harvest "Retirement" on February 27, 1976



L-R; Jim Pomerene; Mike Reilly, IBM Applied Science rep; Denny Penders, IBM FE manager; W. T. Fairbairn, DPD branch manager; Dick Hatch; Red Dunwell

## Engineers, Architects and Programmers

Considered from a life cycle viewpoint, the Stretch project can be seen as having five overlapping phases:

- I – Conception: 1954-1955
- II – System Planning and Design: 1955-1960
- III – Development and Initial Deliveries: 1958-1962
- IV – Manufacturing and Delivery of six “7030 Data Processing Systems”: 1960-1963
- V – Use of Stretch/7030 systems by customers: 1961-1980

Virtually all the responses to the questionnaire for this reunion book came from people who joined the Stretch project in Phases II and III. In 1956 and 1957, it was mostly engineers and system planners. (“System planner” would soon be replaced by “architect” as a more accurate, descriptive term.)

Below are the names of engineers and architects who responded to our questionnaire by the June 30 deadline, and who joined the Stretch or Harvest project in the four years from 1956 through 1959. The numbers in parentheses indicate the year the person started with IBM.

### Engineer and Architect Responders Hired into Stretch, 1956-1959 (In parentheses, 1<sup>st</sup> year with IBM)

#### 1956

Charlie Allen (56)  
Orest Bedrij (56)  
Fred Brooks (56)  
Werner Buchholz (49)  
Ed Councill (56)  
David Crawford\* (50)  
Philip Fox (46) \*\*\*  
Lloyd Hunter\*\* (51)  
Dick Lamy (51)  
Jim Pomerene (56)  
Dura Sweeney\* (54)  
Jack Wenner (56)  
Herb Wild (52)  
Leon Wun (54)  
Hannon Yourke (55)

#### 1957

Stan Anderson (54)  
Bob Blosk (53)  
John Fairclough (57)  
Dick Holleran (54)  
Harwood Kolsky (57)  
Bob Kuenstner (52)  
Sydney Lindauer (55)

#### 1958

Erich Bloch (52)  
Andris Padegs (58)  
George Swift (56)

#### 1959

Carl Conti (59)  
George Monroe (54)  
Richard Siebold (55)

#### Notes

\* Responses for Crawford and Sweeney were submitted by their widows

\*\* Esther Hunter responded for Lloyd, who is an Alzheimer's patient

\*\*\* Phil Fox started on Stretch in 1955

Gerry Paul, who started with IBM in 1955, omitted a Stretch project start year

Gene Amdahl worked on Stretch in 1955

The questionnaire also asked, “Who hired you onto the Stretch project?” While not every responder could remember, the tally for 1956-1959 is revealing:

### Hiring manager, as Recalled and Reported by Engineer/Architect Responders

Steve Dunwell 7	Dick Merwin 3	Jim Pomerene 3	Fred Brooks 2
Werner Buchholz 2	Arthur Samuel 2	Chet Baccari 1	Bob Henle 1
Lew Blenderman 1	Max Paley 1	T.V. Learson 1	

On the next page we'll take a look at programmer (software) hires ...



## Engineers, Architects and Programmers (Cont'd)

Paul Herwitz, a PhD mathematician, joined IBM in 1955. In 1956, he was brought onto the Stretch project, he says "Probably by Red Dunwell and/or Bill Lawless." In 1957, programmers ("software people" seems like a better label) started arriving on the Stretch project, building to a peak arrival rate in 1960.

Here are the details for those who returned a reunion questionnaire and came on board Stretch in 1957 through 1960. As previously, the numbers in parentheses indicate the year the person started with IBM.

### Responding Software People Hired into Stretch, 1957-1960 (In parentheses, 1<sup>st</sup> year with IBM)

1957	1959 (Cont'd)	1960 (Cont'd)	Notes
Jack Garrity (57)	Leslie Lowry (59)	Eric Knutsen (60)	* Omitted an IBM start year
Cas Scalzi (56)	George Mine (56)	Chris Larson (60)	** Sherman Prosser joined IBM in 1955.
	Sam Patton (59)	Walter Leach (60)	His Stretch start year (1958) is a guess
1958	Joe St. Germaine (59)	Bob Manente (60)	
Tom Apple (56)	Bob Webster (59)	Marla Orr Mackenzie (60)	
Frank Gagliano*	Don Whitmore(54)	Jack McBride (60)	
George Grover (58)		Bob McConnell (60)	Hiring managers and the number of people they hired from the group at left:
Dick Hatch (58)	1960	Jack Miller (60)	Paul Herwitz (12)
Gordon Kerr (51)	Al Alexander (55)	Barbara Call Myers (60)	Sully Campbell (5)
Ray Polivka (58)	Bruce Chalmers (60)	Jack O'Connell (60)	Tom Apple (3)
Sherm Prosser **	Marilyn Charap (59)	Stan Pitkowsky (60)	Carl Gerberich (2)
	T.C. Chen (56)	Ken Plambeck (60)	George Grover (2)
1959	Bill Collier (60)	Lee Scott (60)	
Carol Garrity (56)	Jim Havender*	Ron Staheli (60)	One Each: Fred Brooks, Werner Buchholz,
Larry Grodman (59)	Phil Joslin (60)	Charlie Strauss (60)	Ted Codd, Steve Dunwell, Bill Heising,
Ann Hardy (59)		Ken Tooker (54)	Jack Parsons and Ken Tooker
Ed Lowry (59)		Sherman Uchill (60)	

### Comparisons: Engineers/Architects vs. Software People

The wave of engineers and architects joining the Stretch project preceded by two to three years the software people.

The engineers to a much greater extent were drawn from the existing ranks of IBM staff. Of the 29 engineers and architect names listed on the previous page, 19 of them – 66 per cent – came from other IBM jobs. By contrast, for 30 of the 42 software people listed above – 71 per cent – Stretch was their first assignment upon joining IBM.

The engineers were more experienced than the software people, and they were older. The table below shows the birth year distribution of the people who answered our reunion questionnaire and included a birthday (presumably a truthful one).

#### Distribution of Birth Years for the Responder Group, Per Cent of Total

	<1920	1920-24	1925-29	1930-34	1935-39	>1939	Total
<b>Engineers</b>	2	29	41	26	2	0	100%
<b>SW People</b>	0	11	26	31	29	3	100%

## Engineers, Architects and Programmers (Cont'd)

Besides being older and having more IBM experience, engineers came from a discipline considerably better established than software. Engineering has been with us since the Egyptians built the pyramids or at least since the Romans built roads. Electrical engineering started sometime in the 19<sup>th</sup> Century (IEEE was founded in 1884), and by the 1930's EE programs were established in many colleges and universities.

By contrast, software was something that had to be learned mostly on the job in the 1950's and 1960's. Apart from a few scattered outposts such as Cambridge, Mass., Princeton, New Jersey and Philadelphia, Computer Science would have to wait until the 1970's before academic programs became widespread.

Engineers tended to stay with IBM longer than software people. In our reunion survey, 92 responders recalled and reported their tenures with IBM. The table below shows the distribution.

### Reunion Group: Years of Service at IBM, Per Cent of Total

Years at IBM	1-9	10-19	20-29	30-39	40+	Total
<b>Engineers</b>	14	11	11	60	4	100%
<b>Software People</b>	37	10	10	35	8	100%

The greater incidence of software people in the 40 years+ category is easily explained by the fact that they were younger than the engineers to begin with.

One more contrast: There were eight responding alumnae (women). Not one was an engineer.

### The Group as a Whole

Like the farmers and the cowmen in the musical play *Oklahoma*, engineers and programmers should be friends. In the spirit of amity, we'll conclude this segment with data aggregated for our reunion survey group as a whole:

#### All Responders: States and Countries of Birth

California	3	Michigan	1	Ohio	7	Austria	1
Colorado	1	Mississippi	1	Oregon	1	Canada	5
Connecticut	2	New Jersey	9	Pennsylvania	6	China	1
Illinois	5	Brooklyn*	4	Rhode Island	1	England	2
Indiana	2	Bronx	1	South Dakota	1	Germany	2
Iowa	1	Other NYC	14	Tennessee	1	Holland	1
Kansas	1	Other NYS	19	Texas	1	Hong Kong	1
Louisiana	2	Sum, NY State	38	Vermont	2	Latvia	1
Massachusetts	5	North Carolina	1	Virginia	3	Sweden	1 (Raised there, born in NJ)
		North Dakota	1	West Virginia	1	Ukraine	1
				Wisconsin	1		

\* Editor's chauvinism at play

**Education statistics:** 20 PhD's. Fields of study: 36 EE's, 34 Mathematics, 9 MBA's, 8 Physics, 7 Math/Physics, 3 Psychology, 3 Computer Science, 2 Economics, 2 Mechanical Engineering and 1 each in Aeronautical Engineering, Applied Science, Biochemistry, Business, Ceramic Engineering, Chemical Engineering, Education, Engineering Science, English, Forestry, Government, Humanities, Industrial Management, Linguistics, Sociology, Theology and a partridge in a pear tree.

## Tom Watson, Jr. and Red Dunwell

To this day, the 1961 Watson-Dunwell contentious episode has fired imaginations and sparked conversations of IBMers past and present. This project history segment sheds some light on the events.

### The Men

While they both were born and died within a year of each other, Stephen W. (“Red”) Dunwell and Thomas J. Watson, Jr. had little else in common, other than their dedication to the IBM Company. Dunwell lost his father at the age of ten. Watson initially dreaded the thought of succeeding his father as CEO of IBM. Dunwell was a hardworking boy who rose at dawn to pick vegetables for a cannery. Watson was a playboy who “rated the pleasures of drinking and dancing far above those of learning” according to a *Time* magazine article. Dunwell was an engineer and a product planner at IBM. Watson rose through the ranks of sales and marketing.

Their acquaintance dated back to the early 1950’s, when they both worked in IBM headquarters at 590 Madison Avenue in Manhattan. They were friends.

### The Episode in a Nutshell

CEO Watson in 1961 lowered Stretch’s price and apologized for the machine’s failure to meet its performance goals. Dunwell was moved out of his management role into a staff position. In 1966, Dunwell was named an IBM Fellow and Watson apologized again, this time to Dunwell.

Subsequently, in *Time* magazine’s words “System/360, which revolutionized the industry, proved to be wildly successful ... IBM's base of installed computers jumped from 11,000 in early 1964 to 35,000 in 1970, and its revenues more than doubled, to \$7.5 billion. At the same time, IBM's market value soared from about \$14 billion to more than \$36 billion.”

System/360, of course, incorporated numerous features that had been conceived and implemented in Stretch. And many Stretch veterans went on to contribute their talents and experience to the System/360 program.

### The Urban Legend

One Stretch alumnus who left IBM in 1963 wrote in his reunion questionnaire response:

A persistent urban legend has it that IBM punished the engineers who designed STRETCH for not achieving their goal: running 100 times faster than the 704 ... I never knew their names, but they should be found, and honored at the reunion for architecture that still informs today’s machines.

Another responder stated:

It is my understanding that [Watson's] public apology ... came only after Harwood Kolsky, upset as we all were by Watson's statements to the press, had the nerve to request an audience with Mr. Watson. This was after several months during which the bugs were worked out of the Los Alamos system and the AEC expressed enthusiasm about its performance. During this time Steve, who had been appointed Systems Development Manager for the Poughkeepsie lab, was removed from this post after about three days. I heard that Dr. Kolsky's session with Mr. Watson was extended to a full day and after this an educated Watson issued his public apology to both Dunwell and Stretch. Steve then was awarded a richly deserved fellowship. I can't verify this story, but it is what we all understood to be the facts at the time.

## The Facts

For verification of the Harwood Kolsky- Tom Watson anecdote, the editor sent it to Harwood himself. He replied with the following:

Well, there is some truth in the story, but it has become more “heroic” in the retelling. There were two stories. The bare facts are [these]:

In 1961 an investigation was launched at IBM HQ on why Stretch did not meet its goals. I became upset over the negative implication of the term “investigation” and wrote a 14-page memo entitled “Stretch Investigation” to E.R. Piore, Chief Scientist. I spelled out the Stretch project's accomplishments and objected to there being a witch hunt. He assured me that this was not the intention of the investigation (although it probably was). In June 1961, the “Stretch Evaluation Reports” came out. They were ambiguous, but not as bad as expected.

July 11-12, 1961, there was a Stretch Users’ Group meeting at Los Alamos. The users and prospective users were enthusiastic about Stretch and were looking forward to a “Stretch II,” which they assumed was inevitable.

LRL Livermore was still negotiating for a Stretch. They argued that since the machine was not 100 times as fast as the 704 they should not have to pay full price. IBM caved under pressure and cut the price. LRL got their machine, but also doomed the 7030 to never be profitable.

T.J. Watson made his famous speech at the 1961 Western Joint Computer Conference in Los Angeles. Although he didn't actually say the words, everyone understood, “IBM is getting out of the super computer business.” The effect was the same. IBM lost momentum and opened the gates for Control Data and other competitors. Steve Dunwell had been banished to a “dungeon” office in the basement of Yorktown.

By 1963 the CDC 6600 was a real threat. On August 23, 1963, I wrote a strongly worded memo “The AEC Computer Situation” saying IBM's inaction was losing our top customers, and urged the establishment of a new Stretch-like project to recapture them. Again I sent it to my old friend Manny Piore. (This memo also got me on the witness stand of the IBM antitrust trial in 1974.)

It so happened there was a meeting of top executives the very next week at Jenny Lake, Wyoming. Piore showed my memo to Watson, who reportedly hit the roof. Those who were there told me that at one point he held my memo rolled up like a club and shook it while he blasted THEM for losing the super computer market.

My telephone began to ring immediately. Everyone wanted to know what was going on. So did I. One week later, I had a lengthy meeting with T.J. Watson in Santa Monica. Two nervous aides were with him. The discussion was very serious but friendly. He really wanted to know what was going on...Later I got a letter from him saying that our meeting was “most useful and interesting” and that “you will see sufficient changes taking place.”

## Two Hot Tempers

George Monroe submitted an anecdote of a different kind:

After Tom Watson, Jr. had cut the price on Stretch and berated Red, he visited the South Road Lab at Red's invitation, to tour the Stretch model room. Red wanted to prove to him that the System was up and running, albeit not as fast as touted. Well, everything was going OK on the surface, but Watson was obviously smoldering. Suddenly, while Red was defending Stretch, an angry altercation took place between them. Bob Evans and I physically separated them and engaged them in one-sided conversations in order to get them cooled off. I could see that Watson was mightily miffed and quite red-faced. It was with some trepidation that I greeted him into my 7090 model room, next door to the Stretch model room, to view the fully operational 7090 System. I feared that I would be next to experience Tom's wrath. Actually it went very well but I was glad to see him move on to a meeting with Bob Evans!

## Watson's 1966 Awards Dinner Remarks

The following transcript of T.J. Watson's remarks were lifted from a copied archival document titled "ANNUAL AWARDS DINNER 3-15-66" and dated 3-24-66:

"I want to say something about all of you tonight. I'd like to say something about each contribution award winner ... but I want to change that policy and say a word or two about my friend Red Dunwell, because I think that there have been some things happen in IBM over the last few years that haven't been as fair to Red Dunwell as they might and they may bear on questions that are in all of your minds and when he has gotten tonight this fellowship, I have myself a great relief because Red Dunwell in his STRETCH machine as well as in many other machines, has been a major contributor to the success of this business, and I have been unwittingly a major contributor to the headaches of Red Dunwell.

So a confession is good for the soul.

Those of you who are closely associated with STRETCH will remember that when it finally emerged it did not go quite as fast as we expected and some of the orders that we had, began to waver and I went to the West Coast Joint Computer Conference and after some hasty discussions with the sales side of things seemed appropriate to get at least the orders that we'd started with, I announced that the machine would sell for 75% of the price because it went about 75% as fast.

From that a number of unfortunate things happened. I was simply trying to sell the machine or get a machine sold. What I didn't stress and what I should have stressed was the fact that this was the lead machine at that time in the whole world and maintained that position of leadership for a substantial number of years. Also from this machine derived most of the features that enabled us to prolong the 700 line into the 7000 line and the 7000 line into the 7000X line – literally billions of dollars of revenue and growth for the IBM Company, and I have learned a great lesson from this because I have always admired Red Dunwell. I never realized really what sort of careless statements on my part can do around the IBM Company, and now being 52 and learning this lesson I am going to make a good many less careless statements because I fear from this reducing the price of the machine the great contribution of STRETCH to our whole future in IBM got obscured and muddy.

And I think tonight at long last the situation is clarified. I think that the Corporation, perhaps belatedly, has shown Red and his family what we really think of him, how much we prize his contributions, and I just thought I would take the opportunity of publicly trying to correct the record in saying that as an old time salesman I repriced a product so that it would sell and in doing so perhaps besmirched some of the great contributions of that product which it and Red deserve to have in full measure.

... So, Red, I thought we ought to put that on the record for a change, and [to the wider audience] I'm sorry that I have been concentrated on one winner tonight but when you think of what I said perhaps you'll see the reason for it.

Congratulations to all of you again.

Five years later, in 1971, Watson retired from IBM, a year after suffering a heart attack. Red Dunwell, who had joined IBM three years before Watson, retired in 1975.

## From a Watson Memoir ...

*Father, Son & Co.: My Life at IBM and Beyond* by Thomas J. Watson Jr. and Peter Petre was published by Bantam Books in 1990, three years before Watson died. The text below was scanned from that book.

Before Control Data came along, IBM had been at the top of the supercomputing game. Our flagship project in the late '50s was a machine called STRETCH that grew out of a contract with the weapons lab at Los Alamos. STRETCH was the brainchild of an engineer named Stephen Dunwell and was going to be IBM's masterpiece: it was a daring design, with all sorts of exotic innovations. We promised customers that it would perform a hundred times as fast as our biggest commercial processor. Looking back, I think STRETCH was so ambitious that it is a wonder we got it built at all. But when it came out in 1961, behind schedule and only 60 percent as powerful as planned, I was disappointed and irate. I thought our engineers needed to be taught a lesson about not letting customers down. So, in the course of a press conference at an industry convention, I announced that the new computer had failed to meet specifications, and that I was hereby cutting the price on the machine from \$13.5 million to \$8 million to reflect its performance. We couldn't make any money at that price, and before long the project got shelved.

Making an example out of STRETCH shook up the engineers all right, but it turned out to be a grievous mistake. The engineers understood me to be saying, "No more of those big machines around here," and it was true that I would have snapped at anybody who brought up the subject. So for two years IBM did almost nothing in supercomputing, leaving the field wide open for Norris and his men.

In August 1963 came their bombshell: a machine called the 6600 that everyone recognized as a triumph of engineering. For seven million dollars, it delivered three times the power of STRETCH. Word of the new machine made me furious, because I thought the distinction of building the world's fastest computer should belong to IBM. At that point the System/360 was the most advanced set of designs we had, and nothing in that whole product plan was even remotely comparable to the 6600. On August 28, 1963 I sent my top men a memo:

"Last week Control Data had a press conference during which they officially announced their 6600 system. I understand that in the laboratory developing this system there are only 34 people, including the janitor. Of these, 14 are engineers and 4 are programmers, and only one person has a Ph.D., a relatively junior programmer.

Contrasting this modest effort with our own vast development activities, I fail to understand why we have lost our industry leadership position by letting someone else offer the world's most powerful computer."

This note, eventually introduced as evidence in the antitrust suit, became famous as the "janitor memorandum." It wasn't illegal but it was where our troubles began, because the moves IBM made in response to my anger were too close to the limits of the law. Even though our engineering staff was overloaded we tried to catch up with Control Data, and at the System/360 unveiling the following April, we said we would bring out a supercomputer at the top of the line that would leapfrog Control Data's machine.

### **The Last Word (well, almost)**

Tom Watson and Red Dunwell were on good terms in the years that followed 1966. During a recent visit to gather material for this reunion book, the editor listened as Red's widow Julia spoke warmly of Watson and his speech at the 1966 Awards Dinner. She expressed regret that Watson did not stay on at IBM's helm longer than he did.

For Julia's words on the subject, see her biography entry for Steve Dunwell on page 82.

## Kingston Takes Over

Kingston is a historic New York city on the opposite side of the Hudson River from Poughkeepsie, and some 25 miles distant by car. In 1955, IBM opened a facility there to house its electric typewriter manufacturing (later moved to Lexington Kentucky) and to provide lab and manufacturing resources for its Military Products Division, later to be renamed "Federal Systems Division."

During the late 1950's, MPD/FSD Kingston was heavily engaged in development and delivery of AN/FSQ-7 (Army-Navy Fixed Special Equipment) computers for the SAGE (Semi Automatic Ground Environment) system. The SAGE project was direct fallout of the first Russian nuclear explosion in 1949. US Air defenses had been judged as woefully inadequate, and computers were deemed indispensable to any defense solution. SAGE got underway in 1952, and the system was fully deployed by the early 1960's.

In 1960, SAGE workload was beginning to taper off at Kingston. Also in 1960, a corporate audit of the Stretch program had found numerous opportunities for improvement in the product and in management and technical processes. These would be needed as the project evolved from the research and development character of LASL and NSA activities to the disciplines of manufacturing, customer installation and field support for subsequent Stretch customers.

With its SAGE-driven experience and knowledge of large-scale systems management, it was natural for the Kingston organization to assume a similar role for the "7030 Data Processing System," as Stretch was renamed in 1960. And that is precisely what happened. Kingston took on responsibility for manufacturing, installing and supporting the next six systems after the LASL machine. The six machines were designated "K1" through "K6." Their destinations were:

Machine	Customer	Location	Timing
K1	Lawrence Radiation Lab (LRL)	Livermore, CA	4 <sup>th</sup> Quarter 1961
K2	Atomic Weapons Research Establishment (AWRE)	Aldermaston, UK	1Q 1962
K3	US Weather Bureau	Washington, D.C.	2Q/3Q 1962
K4	Naval Weapons Lab	Dahlgren, VA	3Q/4Q 1962
K5	Mitre Corporation	Bedford, Mass	4Q 1962 or 1Q63
K6	Commissariat a l'Energie Atomique (CEA)	France, somewhere	4Q 1963

In addition to carrying out a variety of systems management activities, Kingston personnel supported manufacturing, marketing, field engineering, legal and contracts for the balance of the Stretch program.

This Stretch/Harvest reunion started with people from Poughkeepsie and was enabled by old Poughkeepsie IBM telephone books and organization charts that helped the organizers to find project alumni(ae). It wasn't until late in the game that Kingston personnel began to be found and contacted. Consequently, in the Biographies section of this reunion history book there are only four submissions by Kingston-based Stretch staff: Chester Baccari, Ed Hofler, Leo Notari and Bob Rockefeller. Their accounts provide further details about Kingston's role in the Stretch program.

On a personal note, your author/editor (Eric Knutsen) spent six delightful weeks in Aldermaston England, with Leo Notari and his merry band of some 30 Kingston engineers, helping to check out and install the K2 7030. (As I recall, to avoid onerous contractual late-delivery penalties, K2 had been shipped from Kingston prematurely.) Since one of my roles was to divine the nature of stoppages when an ambiguous malfunction might be MCP-related, Leo insisted that I be on call 7 days, 24 hours a week. He relented at last one Saturday late in May, allowing me a visit to London, provided I returned by midnight. (A belated thank you, Leo.) I did indeed return by midnight, and I still have the glass slipper to prove it.

## Customers and Applications

**D**uring the planning stages of our September 2002 Stretch/Harvest reunion, many project alumni(ae) professed ignorance of Stretch customers beyond LASL and NSA and, in particular, what applications those customers executed on their machines. Harwood Kolsky generously supplied the precis that appears below.

**NSA** - The National Security Agency is the Nation's cryptologic organization. It has been on the frontiers of communication and data processing since before World War II. It employs the country's premier code makers and code breakers. The combinatorial problems of cryptology strain the largest computers.

While Stretch/Harvest was being developed, only a few members of IBM were cleared to know for whom and for what use it was being built. We referred to "The Customer" or "BUSHIPS," the Navy Bureau of Ships purchasing agent.

**LASL** - Los Alamos was the birthplace of the Atomic Bombs, which brought World War II to sudden end in September 1945, saving untold thousands of American and Japanese lives by stopping the impending invasion of Japan. People tend to forget that LASL, and later LRL Livermore, were on the front line during the Cold War. The nuclear weapons they designed were essential to keeping the peace for nearly 40 years.

**LRL** - Lawrence Radiation Laboratory at Livermore was founded in the mid-1950s as the country's "second source" for nuclear devices, particularly H-Bombs. There was a friendly rivalry between Los Alamos and Livermore over getting the biggest and best computers. One could say that the whole Stretch project was an indirect result of this rivalry.

**AWRE** - Atomic Weapons Research Establishment at Aldermaston was UK's equivalent of Los Alamos or Livermore. It was started in 1954 from earlier organizations. It had close collaboration with the US, including using the Nevada test site. AWRE also worked in Nuclear power reactor development and biological technology.

**CEA** - The French Center for Atomic Energy was France's equivalent of Aldermaston.

Stretch gave LASL, LRL, AWRE, and CEA a big boost in being able to increase the complexity of physics models used in weapons design and test analysis. Their machines were also used as service bureau resources for general laboratory use.

**Weather Bureau** - Numerical weather forecasting is among the most computer-intensive applications. There is a vast range of scale of physical phenomena to model, from global circulation to the condensation of raindrops. The need to visualize the results is another large computational problem

A several-day forecast depends on solving the hydrodynamic equations of motion by advancing quantities on a computational grid by finite time steps. The accuracy of the forecast depends on the number of physical quantities being modeled, the spacing of the grid points and the number of time steps used. The Stretch system's large storage and fast arithmetic allowed the Bureau to process a finer mesh, at more frequent intervals, than had been possible with prior systems.

**NPG** - Naval Proving Ground at Dahlgren was an early user of large computers, including the original ENIAC. The original use was for ballistics. They are a major developer of non-nuclear weapons.

**Mitre** - Originally associated with MIT, Mitre is a national resource that provides systems engineering, research and development, and information technology to the government, such as the Department of Defense and the Federal Aviation Agency. It used Stretch for a variety of heavy modeling computations.



## Memories

In the reunion survey questionnaire that elicited 125 responses from Stretch and Harvest project alumni(ae), one of the requests was “[Please describe] fond and/or vivid memories of persons, events.” Here are the answers from those who elected to answer that request.

**Charlie Allen** Leon Wun (memory design engineer) and the great Exchange Memory wipeout while the rest of us attended the group Xmas party. (Ask Ed Council for details) ... Long hours in development month after month without a break; falling asleep at the wheel on the way to and from work; dead tired for months at a time.

**Stan Anderson** I remember the respect I developed for people like Dick Holleran, Wes Stetler, Jules Dirac, Olin MacSorley, Gerry Paul, Les Winter et al ... Trying to stay awake during the graveyard shift debugging of hardware (never in my lifetime have I been able to sleep during the day) and the repartee we had via log entries with the “design” group. In fact, Dick Holleran brought up this subject this past [2001] New Year’s Eve!

**Tom Apple** The people, in my group and others at my end of the building ... we had a few evening parties; one at my house where the highlight in my memory was of the people chasing each other around the house shooting each other with ping pong ball guns I had gotten for my boys.

**Chet Baccari** Memories included urgent meetings with top management to account for planning, design progress and cost status of budgets etc. to people such as Bob Evans of DSD and Armonk HQ persons critical of IBM’s response to the 1960 Corporate audit of 7030. Meeting all of our major program schedule commitments became a real emotional experience each time they occurred.

**Orest Bedrij** It was like going to the moon. Many challenges. Many long hours. A lot of excitement. A lot of joy.

**Lucy Ann Berry** The dedication of managers, in particular: Sherm Prosser! Generosity of spirit among the groups, in general! In Poughkeepsie, picking blueberries from the front vista of the IBM property to top off our 5:00-5:30 AM breakfasts on early shift. (This was a group-romp!)

**Erich Bloch** Great collection of doers and thinkers

**Bob Blosk** Many fond and vivid memories of the entire project, which still stands out as one of the best remembered and cherished of my 40-year career. Hard to pinpoint individual events but overall, the most memorable has to be the collection of great people all working together on a terrific challenge.

One of the frequent pictures I often recall is that of our dear old friend John Cocke coming in our office to describe/explain some new design idea of his while he puffs his way through cigarettes.

**Fred Brooks** Werner and 8-bit byte, Werner coining “Byte.” Gerry Blaauw and indexing, decimal.

**Werner Buchholz** My one visit to Los Alamos.

**Bruce Chalmers** I have very fond memories of my time with the Stretch/Harvest compiler – especially all the fine, supportive people that I met while at IBM. In particular, I will never forget Bob Manente's ability to shoot a fly out of the air with a rubber band in the humid dungeons of the NSA in which we were ensconced.

**T. C. Chen** My group (Problem-Oriented Programming) had a number of young programmers of Asiatic descent, and was nicknamed Problem-Oriental Programming.

**Bill Collier** Later [after MCP and Jack Garrity], I worked for Marla Orr MacKenzie on the [Fortran] compiler. The Project Coordinator was David A. Drake. Acronymically, I worked for MOM and DAD.

I remember working on the MCP and feeling lost; I found no “concepts” behind the work. Later, I worked on the Fortran compiler; the programs had a lot more structure, and it was more fun to write them. (Ironic then, that when I subsequently had a

choice on the 360 project, that I opted to work on the operating system.) I remember John Carter talking about interlocks: program 1 gets resource A; program 2 gets resource B; program 1 requests resource B and waits because program 1 has it; then program B requests resource A and waits because program 1 has it. The problem is that neither program can advance and so release the resource it holds, and therefore both programs are doomed to wait forever. This situation seemed to me to be just too bizarre to contemplate. Later on OS/360, the problem came up again, but now it was known as deadlocks. Solving this problem forced onto the operating system a structure that defined which programs could obtain what resources and in what order. This was the structure that I had found lacking in MCP.

The subject of deadlocks became a very hot research topic later in the 1960's. The earliest recorded writing on the subject was by a fellow named E. J. Braude, in Poughkeepsie, in 1961. Does anyone know what became of him?

**Ed Council** Leadership and guidance of my line management as well as superb support and recognition by Stretch management, especially Steve Dunwell and Erich Bloch. Teamwork within the memory group and the achievements of some great guys in overcoming many difficult technical problems. People such as Charlie Allen, Fred Neves, George Bruce, Ted Marcy, Bob Flaherty and many others made all of the 60- and 70-hour weeks worthwhile.

**Sir John Fairclough** Making an awful presentation on the I Box interrupt mechanism. My leaving [going away] party

**Charlie Folkner (LASL)** My first trip to Poughkeepsie to run on the computer. I had written an interrupt handler, which I sent ahead with Jack Worlton on his first journey to be on the machine. When the handler was loaded and run, the engineers could not get control of the machine back, and spent a lot of time getting the handler out of control. When I went to Poughkeepsie, I was told that Lew King wanted to see me. He said he really wanted to meet the person who wrote the monster. Those were not his exact words [Editor's Note: This is a family book.]. His discussion was very colorful and all in

fun. I will never forget hearing about Tom Apple's loading of his first card deck, with the cards shooting out all over the floor. Also, loose solder in the memory units caused us many difficult days.

**Philip Fox** Memory group called back from vacation in 1955 to prepare proposal to NSA for advanced memory development.

**Carol Garrity** Paul Herwitz trying to explain expense account for separate motel rooms for Jack [Garrity] and me. We were weren't married at the time of the expense, but were when the account was filed.

**Richard Gowetski** Waiting for Harvest machine runs with Jack McBride, Bob McConnell, Gene Conroy, Frank Gagliano, Lee Scott, Fran Allen while the uncleared people waited upstairs for the dumps. I especially enjoyed my time with the Harvest Technical Representative to the US Government, Dick Hatch.

I also remember the drives to the Kingston plant to get machine time on machines that were still being debugged on the manufacturing floor in early 1962. It was always sad to lose a machine because it was reliable enough to ship so we would have to continue debugging our software on the next partially debugged machine on the line ... Gene Conroy's perfectly composed comments (no vowels, so it was challenging reading after Gene left) in column 40 of every card ... Debugging in time zones in the Harvest streaming unit. Some adjustments were made in later time zones as I recall. Thank goodness, the engineers were there to determine which time zone. How many people remember the adjustments? ... Herbie Flanagan's MODHHXW macro, which we all used ... and who can forget the SBBB (Stream Byte By Byte) instruction?

**George Grover** I have had several valuable friendships that lasted many years after Stretch. In the cases of Dick May and John Carter, I also had working relationships after Stretch. I recall an evening in Paris, long after Stretch, sipping wine and playing chess with John and a couple of others in a cafe.

**Norman Hardy** Long discussions with John Cocke on everything from computer design to language theory.

**Dick Hatch** Drinking beer after work (1542) with the other on-site DSD people at the 6-0-2 ... Working with the “purple deck” (E. Conroy’s test system) in 1963 and then finding it in a file drawer in the computer room on the occasion of the Harvest “retirement” in 1976.

**Jim Havender** Laura Adams, Walt Doherty, Marilyn Charap and Ron Staheli

**Mike Haynes** Being called back in the middle of vacation!

**Paul Herwitz** Best assignment was building a statistical package in APL. I was in the Corporate Personnel Department and a consultant to the Corporate Legal Department when the Federal EEOC sued IBM. I used it to verify the statistical results produced by our outside consultants. I can’t remember the name of the package (in other words “retired is retired”), but it was a hell of a lot of fun! I worked with Howard Ziff in Legal.

**John Hipp** The dedication and ingenuity of all the people I worked with to develop and build Stretch, especially Erich Bloch, Steve Dunwell and Fred Brooks

**Dick Holleran** Too numerous to relate, but it was the best, most exciting project of my career. Three I-Box engineers – Bob Blosk, Stan Anderson and I – and our families are great friends and see each other often.

**Lloyd Hunter** I, his spouse [Esther], have fond memories of our association with IBM, especially with Lloyd’s co-workers and their wives, and the happy times the Company provided for us. The five children grew up happy in Poughkeepsie, with good schools and good friends.

**Thomas Jordan (LASL)** This was a fertile ground for anyone who had a computer language to promote. Few survived. Thanks for selecting my birthday for the reunion.

**Larry Josephson** Lasting memories include being interviewed in Berkeley by Sully Campbell. Sully charmed me with stories of his exploits. He destroyed IBM’s reputation as a stiff, buttoned down company. If he improbably worked there, then I wanted to.

My two years in Poughkeepsie were made bearable by a few good friends: Bill and Tush Collier, who invited me into their home for many nights of good conversation about the meaning of life (there isn’t any); Joe Harth, Barbara Call, Leslie Lowry, and some unlikely drinking companions at the Treasure Chest: Carl Reynolds, Al Podvin, Elaine Boehm, George Mealy, and a tall man with a deep Southern accent who never seemed to stop talking about machines, John Cocke. I was grateful that these very senior people would allow a nobody to be a fly-on-the-wall at their table.

I was also sustained by my work, first on STRETCH, then on OS/360 Job Control for which I invented the “/\*” card. Actually I adapted (stole) it from IBSYS/IBJOB. I am supported in dotage by the royalty checks I still receive from IBM (10 cents anytime anyone uses this command).

In spite of Poughkeepsie, I remember my time there fondly for the cutting edge machines I was given a chance to work on (STRETCH and S/360), but especially for the friendships, some of which have lasted to this day. As I write this, I have just returned from Paris where I stayed with Bernie and Marcia (Armstrong) Scholl, technical writers who started in Poughkeepsie, moved to Time/Life, then somehow got a transfer to IBM La Gaude and eventually to Paris.

For me IBM was a world-wide exclusive club of wonderful human beings, brilliant, quirky, eccentric and, it must be said, loving men and women who extended a hand of friendship to a lonely depressed Californian. I still feel privileged to be a member of this club.

**Phil Joslin** Mainly I remember Tom Apple, who was one of the best managers I ever had in my 31 years at IBM. Also, lots of bridge games with Leslie Lowry and others, and fabulous parties hosted by Bill and Tush Collier.

**Gordon Kerr** The month spent at Los Alamos with Don Whitmore and Phyllis Singleton ... the camaraderie of the STRAP II group ... afternoon golfing with Sherman and the gang ... arriving at the Ed building at 8:00PM in a snow storm and being marooned until 3:00PM the next day ... my wife Grace bringing coffee and doughnuts to the office at 6:30AM, since we started work at 5:00AM (We were slaves of machine time availability.) ... trying to beat the clock for delivering software with the first customer ship to Los Alamos. We worked around the clock, would catch a couple of hours' sleep and go back to work. Time became a blur ... the term "The Door". We posted our software change patches on the back of the office door ... the "Hatch Patch." Dick Hatch wrote the software for the patch so that we could make software changes without recompiling ... the "Cereal Box" routine, a nesting routine named for the picture on a Quaker Oats box ... Sherman carrying my golf bag because I was too tired to continue ... the after-lunch, post-bridge game arguments.

**Eric Knutsen** A vivid memory is of using an ingenious debugging tool called the "Big Box Trace," which recorded every transfer of control from one MCP program module ("box") to another. Sometimes interrupts had to be disabled, and MCP was rather like a submerged submarine, whose flaws would surface later, when interrupts were enabled once again. Working backwards through BBT clues to discover bugs, I was Sherlock Holmes, drawing conclusions from meager evidence – high adventure. (OK, maybe you had to be there.)

So many fond memories ... entering the Education Center at 8:00 AM to go to work on the second floor, passing a classroom full of IBM sales trainees. They were singing their heads off while I was thinking, "How bizarre!" ... teaching cubicle-mate Jim Way the rudiments of programming. Jim had spent many years as a field operative in IBM's time clocks business ... with Ken Tooker, discovering the only bug we ever found in a Jack O'Connell-authored program ... being present in Los Alamos when Jim Havender used acronym retrofit to define Stretch: "Super Tool, Relentlessly Endeavoring To Compute, Hard." ... on a weekend trip from Los Alamos to El Paso/Juarez, observing Roger Kahng's face turn from yellow to deep red as he first experienced hot Mexican food.

Absorbing Management 101 from wily Gul Hira, thusly: "Gul, you repeatedly request elapsed time estimates, but you never check back on actual times. Why is that?" Gul: "I just double everyone's estimates and send them up to Paul [Herwitz]. That seems to work well." ... the company of Jack Garrity, whose wisdom and sense of humor had a way of keeping things in perspective ... feeling privileged and entertained whenever Sully Campbell, raconteur extraordinaire, gathered the troops in an auditorium to give us the lowdown on current affairs in the Lab ... learning software development from a master of the craft, Jack O'Connell ... hearing occasionally, "Eric, is your marriage OK?" (After programming staffs were consolidated in the 705 building, my bride and 7080 programmer Gail and I would pass each other in the corridors, sometimes without speaking.)

Staying six weeks at AWRE (Atomic Weapons Research Establishment) in Aldermaston, England where I was the sole software person accompanying 30 Kingston-based engineers who had been sent with the Stretch machine to finish its checkout. On arrival, Good Friday morning 1962, watching as philosopher Bertrand Russell and his acolytes started their annual three-day nuclear weapons protest march from Aldermaston to London. Their ban-the-bomb icon, an upside down, bisected "Y" inscribed in a circle, would later be adopted in the US as a peace symbol.

**Harwood Kolsky** My fondest memories were of working with John Cocke and Sullivan Campbell. John really personified the technical meaning of the word "Stretch." Ideas poured from him all hours of the day and night. Not enough can be said about Steve Dunwell. His real genius was that he saw where IBM should be five or ten years hence and was able to put together a huge project over the endless objections of everybody. At the end of the project he became IBM's scapegoat for the financial "failure" of Stretch, but was later apologized to by Tom Watson Jr. and named an IBM Fellow.

**Richard Lamy** Fond memories include working with so many talented and inspiring engineers, and the challenge of the chase to help make IBM first in the super computer race.

**Roger Lazarus** All my memories connected to Stretch are fond, from Cuthbert Hurd's first presentation at Los Alamos until our [LASL] Stretch was retired.

**Sydney Lindauer** Knowing Fred Brooks, Erich Bloch, Gene Amdahl

**Robert Litwiller** a) During frigid 3<sup>rd</sup> shift, Harvest debugging with Dave Anderson and Harry Carlson, both in heavy jackets and ear muffs: Dave was sitting on the floor, in the corner made by the extended gate and the frame, trying to find the pin of interest for the oscilloscope probe, when he exclaimed/questioned, "You mean they pay us to have fun like this?!"

b) When the bearded Lew King came up from manufacturing to join the engineering team he asked Erich Bloch if his beard would be OK in this new environment. The answer, as I heard it second hand: "It doesn't make a difference to me, it's your face."

c) From the always amusing John Wierzbicki during a shift on the raised floor: In the midst of trouble-shooting a Harvest problem, John attempted to set the contents of an index register from the Stretch console (remember the toggle switches?) and even that basic operation wouldn't work. John scanned down the LONG row of Stretch frames, and observed, "I guess we're just asking too much of too little."

**Ed Lowry** Lunch hour discussions: philosophy, politics, science

**Leslie Lowry** The warm cooperation and support. The many large family parties. The excitement of achievement as delivery approached. The heated discussions about whether a bug was in software or hardware as we worked nights on the machine in the South Road Lab.

**Bob Manente** I remember well the old Church Street Tie Factory and the days spent at the NSA with Jack McBride, Dick Gowetski, Bob McConnell, Bruce Chalmers, Harlow (now Frank) Hertel, Joe Kusmiss, Dick May, Fran Allen, Jack Miller, Gene Conroy, Dick Hatch, Herb Flanagan and others whose names I'm sure I will remember later. And, I remember fondly Dick Gowetski and Jack McBride handling the burn bags.

**Dick May** Working with so many bright motivated people.

**Jack McBride** The most vivid memory I have was the scope of the task we were undertaking and how capable everyone was. Some were a little strange, but all were pretty sharp.

**Marjorie Merritt** Have many fond memories, especially of the 701 coterie. These were special times among very special people.

**George Mine** DC-to-Frame short [circuit] on the raised floor area at the South Road Lab on eve of big demo

**George Monroe** Running into Red Dunwell in White Plains after he had received an apology from T.J. Watson Jr. along with an electronic Bulova money clip watch, and being the second person to congratulate him on his rehabilitation.

**Barbara Call Myers** I vividly remember first seeing my husband-to-be down the hall of the 007 building. I remember watching for the boats on the river in afternoons when I shared a window office with Joe St. Germaine ... making correction cards on the hand punch – making up 64 bit word corrections in octal/hexadecimal and then punching them up ... learning to drink wine at Ed and Leslie Lowry's apartment or maybe with them at Phil Joslin's apartment ... Dick Gowetski's MGB ... I remember the meetings on the S/360 architecture, chaired by Gene Amdahl in his crisp, white, cuff-linked shirts – as a young associate programmer, [the meetings] scared me to death.

**Tom Myers** Got to travel to Weather Bureau (Washington, D.C.), Naval Weapons Lab (Dahlgren, Virginia) and other exciting trips for a young gung-ho programmer. I'll never forget the bits all over the floor, the lousy card readers, the blinking Stretch console. How did it ever work?

**Sam Patton** Sully Campbell's driving. The time the engineers thought Harvest was broken because Carl [Gerberich]'s program didn't crash immediately.

**Gerard Paul** It was all good. I got married early in the project. Those were good times. I had trouble

staying awake on fourth shift, but I was good at debugging.

**Stan Pitkowsky** Seeing work actually perform.

**Ken Plambeck** My wife writing wedding thank-you notes in the bathroom at a motel while I slept during the day after working nights at the Naval Weapons Lab in Dahlgren, VA (enjoyed the Smithfield ham) ... She building a snowman outside the machine room at the plant when our new Fortran compiler first produced output ... The hamburgers at Marjo's in Hyde Park on the way to a Stretch in Kingston ... Lunch (martini and filet) every day at Kansas City Steak House next to Weather Bureau Stretch (where J. Edgar Hoover building is now) in DC ... Ribs at Arbaughs in DC ... The Stretch party at Trader Vic's in DC -- flew in Sully's little plane with George Werner, and Sully kept hopping out during taxiing to lift up the tail to point the nose because the brakes didn't work -- the rudder would do it when we were up to speed ... Party at Hank Dater's house. He provided big fuzzy boots. On way home, in back seat, with feet on back of front seat, noticed I had on two different shoes. Traded with someone (Sully?) on steps of DuPont Plaza.

Words by Sully to the department saying not to despair that we were done (I wasn't done) because other good things would come along after Stretch ... Drinks at Treasure Chest and John Cocke "resting for the night" on my convertible couch at Corlies Manor ... Missing lobster dinner at Lincoln Labs because I had to find a bug while John Carter and Jack Bishop and the LL guy ate -- it was in Jack's front-end phase (a table used for indexing creation built improperly) ... After finishing the Fortran compiler, a boondoggle trip to UCLA, with John and Jeanne Senk, for a course on how to write a compiler. At least John and I cut the classes after the first one. We rode down Sunset Boulevard with Jean Sammet.

The submarine at Disney Land and the telescope at Mt. Palomar ... Request by Gene Amdahl to modify the compiler so it would pretend it needed base registers and then to run many programs to see how the use of registers for base registers affected register spills. The point was to prove S/360 would be good ... Boondoggle trip to French AEC in Paris with John [Carter] and honeymooning Joe and Pat

Harth. Was there on announcement day in April 1964 and had to come home early (immediately) to present compiler-modification results at Los Alamos to beat out CDC ... Immediately then joined OS/360 with John.

**Ray Polivka** Some of my fondest memories were simply in the excitement of it all. We were out to really stretch the technology. The calmness of Gerry Blaauw was always reassuring. The Bible studies at Gerry and Paula Blaauw's along with Fred and Nancy Brooks helped keep the actions and activities in proper perspective.

**Sherman Prosser** Our Strap II team

**Harry Reinheimer** Ralph Bahnsen, Jules Dirac and Gerry Paul. The most vivid event is of the engineering change activity to support System Test when bringing up the checkers. The number of trash pickups per day indicated the phase of the change activity. Finally, the Checking worked when the System worked and the System continued to operate in the face of single errors.

**Bob Rockefeller** The people in Kingston ... Sully and his gang ... interfacing with Dick Merwin on the transfer ... traveling back from Washington in T.C. Chen's leaky convertible on a cold January evening ... George Monroe's defending our lack of action on some RPQ's (which would have been prohibitively expensive) in front of Stretch customers at a Share meeting. It was George's finest hour. It almost brought tears to my eyes.

**Ed Rodgers** Going in early on third shift so the second shift could get home in the heavy snow. Then being stranded by the blizzard until late afternoon. The food ran out at about 6 AM. I also clearly remember manually generating wiring add/delete wire lists for design changes to fix bugs. I don't recall any bugs in my design. I also used the wire wrap gun a time or two for temporary fixes.

**Joe St. Germaine** Programming development when it was fun, yet productive, as member of the Stretch family. Pressing the Stretch IPL button for the first time and experiencing the raw power of Stretch. Being held captive in a Los Alamos basement while awaiting test time on Stretch above me.

**Cas Scalzi** 1) The STEM [Stretch Experiment in Multiprogramming] performance trials at the Los Alamos Laboratory with Betty McDonough and Ed Lowry, who did the scheduler part of the control program. These were done at Los Alamos, because when we were ready for the performance testing, LASL had the only working Stretch computer in the world.

2) The opportunity I had to work with the outstanding team assembled to define the Stretch computer architecture is something I have always appreciated, especially considering I had only been in IBM less than two years when I joined the team. Working daily with Fred, Gerry, Werner, and later with Betty, Ed, and Ted is one great learning experience!

**Lee Scott** Norm Hardy running down the stairs at Church Street three steps at a time. I was always waiting for the crash ... Jack Bishop, my best friend, who has since passed. A very conservative guy from Illinois, who added a conservative view to the group ... I have very pleasant memories of Hinckle's restaurant, which is now gone ... I remember the McDonald's restaurant, which stated xxx millions (not billions) sold. One of the CE's said he took one bite and didn't get to the meat, then he took a second bite and went past the meat.

**Jim Shelly** My most vivid memory was of a conversation with Dick Merwin in which he introduced me to the concept of microprogramming, which I immediately tried to shoot down.

**Richard Siebold** Round the clock completion of the design and debug 24 hours/day and 7 days/week, complete dedication of the whole team.

**Charlie Strauss** The yards and yards of snow!

**George Swift** Memories of Werner Buchholz, Fred Brooks, Gerry Blaauw, Andris Padegs, Harwood

Kolsky, Sullivan Campbell, Edgar Codd, Casper Scalzi, Bill Wright, Tien Chi Chen, Eric Bloch, Steve Dunwell, John Cocke, and others that I hope will not feel neglected.

**Richard Toepfer** Frank Sparacio and John Lind and Julie Mallon are names that stick in my memory. The entire group was extremely competent and

welcoming. They made my experience positive and one to treasure.

**Stuart Tucker** Working two days on a rotten intermittent that turned out to be a missing card! (Quite a lesson!) ... midnight swimming in the LASL Reservoir ... writing a one-card binary program called "Tilt". It ran TILT across the console lights like the NY Times sign. Ran it at LASL as the last two hours of the acceptance test.

**Sherman Uchill** This might be silly, but my fondest memory of the project was learning to play chess from some of the fabulous chess players who were on the Stretch team, and actually winning a chess game from someone who had been a chess champion.

**Allen Walker** Bob Webster, Jack Bishop

**Bob Webster** In Los Alamos with Phyllis Singleton and Don Whitmore

**Ronald Weiss** Chemical lab was on third floor above Stretch. Chemicals were dropping into top of CPU, which caused the machine to have problems.

**Jack Wenner** The old hydraulic tape drive was tested in a sound proof room. It didn't make it!

**Hannon Yourke** Very fond memories of many members of an elite technical organization that was pushing very hard in a brand new technology

## Dunwell, Campbell & Cocke

This section of the book is about three men associated with the Stretch project. The reunion book is dedicated to the memories of two of them, Steve Dunwell (1913-1994) and Sully Campbell (1922-1972). John Cocke (1925-2002) passed away only two months ago. For each man, the section includes a brief biography (for Cocke, an obituary) and remarks by his Stretch and Harvest colleagues.

### Stephen W. ("Red") Dunwell

(April 3, 1913 – March 24, 1994)

Stephen "Red" Dunwell was born Kalamazoo, Michigan, where his mother was a violinist in the Kalamazoo Symphony and a teacher of piano. His father was a pharmacist. His uncle on his mother's side was Clarence W. Avery, who developed Ford Motor Company's moving assembly line for automobiles. The Dunwells lived in Plainwell, 15 miles from Kalamazoo. When Stephen was ten years old, his father died. Young Stephen and his mother made do with help from their relatives: Steve's paternal grandfather gave them the Plainwell house they had been living in, and his mother's Detroit family brought food from their Century farm in western Michigan. At the age of 12, Steve chauffeured his invalid grandfather around town. At 14, he hired a team of country boys to harvest beans and onions for a local cannery.

He showed an early interest in electronics by designing, building and operating an amateur radio station when he was 15 years old. In 1930, Steve entered Antioch College in Yellow Springs, Ohio, majoring in electrical engineering. Cooperative work-study jobs were an important feature of the Antioch program, and in 1933 Steve alternated ten weeks at a time between Antioch and IBM Endicott, where managers noticed his exceptional skills at wiring special features into punched card machines. In 1934, Steve joined IBM as a full time employee.

At Endicott, Steve demonstrated to IBM management the potential of electronics in punched card machines by designing and building an electronics-driven card sorter. He also designed and built a switching device used by Dr. Wallace Eckert at Columbia University in his lunar orbit calculation experiments. In 1938, Steve was transferred to IBM corporate headquarters in New York City, where he worked in "Future Demands," a group charged with anticipating and planning for customer needs that could not be met by current IBM product lines.

A few months before the Pearl Harbor attack, Steve was commissioned as a Second Lieutenant in the U.S. Army Signal Corps and assigned to Signal Security in Arlington Virginia. His assignment was to manage the "machine room," where masses of coded data arrived and a million cards were punched every day. Steve had to figure out how best to present data to the cryptanalysts. He emerged from the war years a Lieutenant Colonel, and was awarded the Legion of Merit for his contributions to wartime code breaking.

Red Dunwell was also a war groom. While working in Arlington he met Julia McClure, a civilian Signal Corps employee whose family had moved to Virginia from Missouri, after her stockman father lost everything in the Great Depression. Julia earned a bachelor's degree in Zoology at the University of Richmond. (Years later, she would add a Vassar Master's degree in French to her academic credentials.) Julia and Steve were married on January 18, 1943. They had two sons and one daughter, and Julia is currently grandmother of five. In 1946, Steve resumed his IBM career at headquarters in future product planning. The Dunwells established a home in Larchmont, New York.

The summer of 1954 saw a move to Poughkeepsie, as Steve joined Ralph Palmer in T.V. Learson's council of laboratory managers. Earlier that year, IBM president Tom Watson Jr. had appointed sales manager Learson to the new post, "Director of EDPM," (electronic data processing machines). Palmer and Dunwell



Learson to the new post, "Director of EDPM," (electronic data processing machines). Palmer and Dunwell collaborated on ideas for the high end of IBM computing machines. The Stretch project was kicked off in August of 1955, and Steve Dunwell was appointed project manager in January 1956. The contract with Los Alamos Scientific Laboratory (LASL) was signed on November 21, 1956. In order to provide an organizing principle and a clear target for developers, IBM management established a goal for Stretch of a hundredfold increase in power over the 704 computer.

### Steve Dunwell with Erich Bloch, ca. 1960

The first Stretch computer was delivered to LASL in April 1961. Stretch had not hit its ambitious target, and shortly after the LASL delivery, Steve was reassigned to a staff position. Over the next several years, Stretch's many architectural and technical innovations found their way into subsequent IBM product lines. Steve was designated an IBM Fellow in 1966. At the 1966 awards dinner IBM CEO Tom Watson, Jr. went out of his way to apologize to Steve for the Company's earlier treatment of him, saying "Red Dunwell's Stretch and other machines have been a major contributor to the success of this business."

As an IBM Fellow, Steve was free to pursue his own interests. These included the APL computer language and development of COURSEWRITER, which combined his interests in timesharing and education, and became one of IBM's first software products offered on a timesharing platform. His interest in the APL computer language continued after his retirement from IBM in 1975.



After retirement, Steve and Julia spent several years (1976-1979) as volunteers rescuing Poughkeepsie's historic (1869) Bardavon Opera House, and operating it until a professional management team could take over. For this work, Steve received a New York State Arts Award. In 1980, Steve and Julia established a timesharing company and a laboratory to investigate a universal computer language, which Steve called "AUL" in a 1986 monograph he wrote on the subject. In 1992, he was awarded the IEEE Computer Pioneer Medal. Befitting an Elizabethan man, his hobbies included extensive reading on the Elizabethan Age. He collected rare books on cryptography and astrology, especially books concerning Queen Elizabeth I's librarian, Dr. John Dee.

Steve Dunwell died in 1994 of prostate cancer. Julia continues to live in the Dunwell home in Poughkeepsie, a short distance from the main IBM complex on Route 9.

### Colleagues' Remarks

Not enough can be said about Steve Dunwell. His real genius was that he saw where IBM should be five or ten years hence and was able to put together a huge project over the endless objections of everybody. At the end of the project he became IBM's scapegoat for the financial "failure" of Stretch, but was later apologized to by Tom Watson Jr. and named an IBM Fellow.

Harwood Kolsky

“Vivid Stretch memory: Running into Red Dunwell in White Plains after he had received an apology from T.J. Watson Jr. (along with an electronic Bulova money clip watch) and being the second person to congratulate him on his [reputation’s] rehabilitation.”

George Monroe

“The debt owed to Stretch and Steve Dunwell by the present and future generations of computer systems, large and small, has never been adequately acknowledged.”

Herb Wild

## Sullivan G. (“Sully”) Campbell

(July 29, 1922 – February 2, 1972)

In 1752, the Campbell forbears emigrated from Scotland to what is now Tennessee. From there they migrated westward, eventually settling down in Kansas and Iowa, just before the Civil War. The Kansas Campbells were sufficiently influential that their community was named Campbell Town, after Tennessee-born David Gee Campbell. In the 1890's, Campbell Town was renamed Merriam, taking the name from Charles Merriam, a railroad executive.



Sullivan G. (“Sully”) Campbell was born in Merriam on July 22, 1922. He was raised with “old fashioned values,” and became an Eagle Scout during the Great Depression. He studied mathematics and taught at the University of Kansas City, which later became the University of Missouri at Kansas City. At the University of Chicago, he met Larry Kempton who invited him to join the Manhattan Project (developing and building the first atomic bomb).

Sully chose instead to study at Cal Tech, where he earned a Master’s degree in Meteorology. While in California, he met a beautiful young singer and model, Betty Lou Hillock. He proposed to her four days later, and they were married soon thereafter. The couple moved back east, where Sully received a Ph.D. in Mathematics from Syracuse University, while Betty Lou earned a Bachelor’s degree in Music and a Master’s in Library Science from the same institution.

Following a stint at Oak Ridge National Laboratory in Tennessee, Sully accepted a position at Duke University, where he met, among others, T.C. Chen and John Cocke. Sully joined IBM and the Stretch project in 1957, with overall management responsibility for Stretch and Harvest software. He liked to fly his airplane whenever possible to customer meetings in Washington D.C. and other locations.

Sully left IBM in 1963 to fill a top executive position with Xerox Corporation in Rochester, New York. In 1967, he and Gul Hira (a Stretch manager who had accompanied Sully to Xerox) and a Xerox sales and marketing executive founded Graphic Sciences, Inc. The principal mission of GSI was to develop and bring to market facsimile products based on a new technology. GSI reached back into IBM for other founding employees, including Stretch colleagues Jack O’Connell and Eric Knutsen. The Company set up headquarters in Danbury, Connecticut. Betty Lou, Sully and their six children moved into a historic house on Main Street in nearby Ridgefield.

GSI had several successful public offerings of stock. Earnings from the custom software and computer leasing divisions contributed early to investor confidence. The Company named its fax product line “Dex” (for decision expediter) and crafted little desktop “Decide” signs, modeled after IBM’s famous admonitions to “Think.” By 1974, GSI had been sold to Burroughs Corporation, which later sold the business to a Japanese company. Dex machines still could be found in business offices as late as 1990.

Sully died on February 2, 1972, when his Jaguar automobile struck a tree near his Ridgefield home, where Betty Lou continues to reside.

### **Colleagues’ Remarks**

After Stretch I went to Stanford (initially supported by a research assistantship arranged by a phone call by Sully Campbell and then later by an IBM fellowship, for which I owe many terrific people at IBM, who supported my efforts) and obtained a Ph.D. in mathematics. **Bruce Chalmers**

Before the Stretch project, I had never been outside of the United States. Consequently, our first meeting with Stretch users in England and France was for me something more than “just another business trip.” I had never drunk wine with a meal, and was totally unacquainted with the wonders of French cuisine and, indeed, the wonders of French culture generally. It is difficult to imagine a better, more spirited mentor on a first trip abroad than Sullivan Campbell. He had a gift for appreciating and enjoying and in general energetically making the most of the uniqueness of each country and culture – its virtues, values, nuances, living styles – being the complete tourist one moment, and then melding in with the citizens the next.

I recall in particular one incident when our schedule had been lengthened, and he said something like “Let’s see ... we have to stay somewhere this weekend ...” And then, looking up with sudden insight: “How about Monte Carlo?” **George Grover**

Lasting memories include being interviewed in Berkeley by Sully Campbell. Sully charmed me with stories of his exploits. He destroyed IBM’s reputation as a stiff, buttoned down company. If he improbably worked there, then I wanted to. **Larry Josephson**

My fondest memories were of working with John Cocke and Sullivan Campbell. **Harwood Kolsky**

... feeling privileged and entertained whenever Sully Campbell, raconteur extraordinaire, gathered the troops in an auditorium to give us the lowdown on current affairs in the Lab ... **Eric Knutsen**

Sullivan Campbell liked to fly his private plane to meetings at Fort Meade. On one occasion, I accompanied him and George Grover. Sully was practicing instrument flying using an eye shield. George was the copilot, responsible for our visual contact with the outside world. George actually was reading the New York Times, and I was biting my nails looking for other aircraft from the back seat. **Dick May**

I attended a wedding shortly before my discharge and got stuck in a snowstorm in Poughkeepsie on my way back to NSA. I spent the night with a buddy who worked at IBM. Since I could not get out of Poughkeepsie he set up some interviews; one of them was with Sully Campbell. When he learned that I was at NSA, he would not let me out of the office. I was an experienced programmer and I had NSA clearance to boot. A rare combo. I had no intention of joining IBM, until I learned that my former employer (Western Electric) was going to assign me to a SAGE site in Moses Lake Washington. Poughkeepsie started to look a whole lot better. **Jack McBride**

The Stretch party at Trader Vic's in DC -- flew in Sully's little plane with George Werner, and Sully kept hopping out during taxiing to lift up the tail to point the nose because the brakes didn't work -- the rudder would do it when we were up to speed.

Ken Plambeck

## John Cocke

(May 30, 1925-July 16, 2002)

John Cocke, Chip Wizard From IBM's Research Labs, Dies at 77

(*New York Times*, July 19, 2002, Page B8)

By Steve Lohr

John Cocke, a leading computer scientist whose inventions spanned an uncommon range of computing technology from software to microprocessors, died on Tuesday at a hospital in Valhalla, N.Y. He was 77.

The cause was a long illness, including a series of strokes, said his nephew Norman Cocke.

Mr. Cocke (rhymes with "sock") was the principal designer of the type of microprocessor that serves as the engine of most of today's large, powerful computers and the Apple Macintosh personal computers. Machines using his chip design - a simplification of the hardware, which opened the door to faster computation - are reduced instruction-set computers, or RISC. Throughout his long career as a researcher for IBM, Mr. Cocke was also responsible for a host of other innovations. He was a leader in the arcane but vital field of designing more efficient software compilers - the software that translates instructions written in a programming language understood by human programmers into the vernacular of all computers, the 1's and 0's of digital code. Mr. Cocke also came up with ideas that helped advance fields as diverse as speech-recognition technology and data storage.

In computer science circles, Mr. Cocke was renowned for the breadth of his intellect, his energy, his insights and his unconventional working methods. A former colleague, Paul M. Horn, who had joined IBM's research labs after a career as a physics professor at the University of Chicago, recalled that when he worked on weekends, Mr. Cocke was invariably in the labs. The senior researcher, Mr. Horn recalled, would drop by and engage the newcomer in long discussions of the finer points of unification theory in physics. "John Cocke knew as much about high-energy physics as I did, and it wasn't even his field," said Mr. Horn, who is the director of IBM's research division.



Even after he retired in 1992, Mr. Cocke always displayed "a wonderful childlike curiosity - he was interested in everything," recalled R. Andrew Heller, who collaborated with Mr. Cocke on the RISC technology, beginning in the late 1960's. The RISC chip design, experts say, was a striking example of Mr. Cocke's defining attribute. His deep understanding of both the computer hardware and software, and their interaction, often enabled Mr. Cocke to pierce through the complexity of computer problems with fresh insights. "No matter how hard a problem appeared, he always assumed there was a simpler solution, and usually this led him to finding one," said Marvin Minsky, a computer scientist at the Massachusetts Institute of Technology.

Mr. Cocke, who was seldom in his office, worked by roaming the halls. He was a chain smoker for much of his life, and the best way to find him in the IBM labs, colleagues say, was to follow the trail of cigarette butts in the ashtrays of the offices he had visited, with the freshest ones indicating where he had visited most recently. With his eclectic intellect and itinerant working style, Mr. Cocke often kept dialogues going with people on different subjects that spanned months, even years. "He would start up a conversation with you on some detailed technical subject, plunging right in where he left off the last time he saw you a couple of months earlier," recalled Frances Allen, an IBM researcher who collaborated with Mr. Cocke on compiler research. "It was one of John's traits that took a little getting used to."

Within IBM, Mr. Cocke's eccentric ways were legend, especially his periodic disregard for paychecks and stock certificates. His assistants, colleagues say, routinely combed through his trash to make sure he had not inadvertently discarded things of value. Before he was married in 1989 to Anne Holloway, Mr. Cocke, a longtime bachelor, would often wear the same clothes for a week or so, friends say.

Mr. Cocke is survived by his wife, three nephews and a niece.

Born on May 30, 1925, Mr. Cocke was raised in Charlotte, N.C. His father, Norman Cocke, was the president of the Duke Power Company and a trustee of Duke University. John Cocke's curiosity, which would prove so valuable later in his life, was evident early. As an adult, Mr. Cocke once recalled that when he was given his first bicycle at the age of 6, he dismantled it within a few hours, much to the chagrin of his mother, Mary. Mr. Cocke joined IBM's research labs in 1956 after he received a doctorate in mathematics from Duke, and he remained with the company until he retired.

Mr. Cocke rarely published research papers, but that did little to prevent him from gaining widespread recognition in the field. In 1987, he received the Turing Award, which has been called the Nobel prize of computer science. Among other prizes, he was also awarded the National Medal of Technology, in 1991, and the National Medal of Science, in 1994.

Copyright 2002 The New York Times Company

## Colleagues' Remarks

One of the frequent pictures I often recall is that of our dear old friend John Cocke coming in our office to describe/explain some new design idea of his while he puffs his way through cigarettes. **Bob Blosk**

One thing was omitted [from the NY Times obituary] about this unique individual. He never filed anything. If you sent him a memo or report, it would be placed on top of the ever-growing pile on his desk. The story was that the only way his office would ever get straightened out was for him to move to another one. But he sure was a remarkable colleague back in the Stretch days. **Werner Buchholz**

Steve Dunwell on the (near-impossible) task of managing John Cocke: "John would ask me, 'What am I going to do today?' I'd respond, 'Well John, what would you like to do?' John would say thus and such. Then I'd say, 'That's what you are going to do.'" **(Told by Julia Dunwell)**

Long discussions with John Cocke on everything from computer design to language theory. **Norman Hardy**

My two years in Poughkeepsie were made bearable by a few good friends ... and some unlikely drinking companions at the Treasure Chest: Carl Reynolds, Al Podvin, Elaine Boehm, George Mealy, and a tall man with a deep Southern accent who never seemed to stop talking about machines, John Cocke. I was grateful that these very senior people would allow a nobody to be a fly-on-the-wall at their table. **Larry Josephson**

John really personified the technical meaning of the word "Stretch." Ideas poured from him all hours of the day and night. **Harwood Kolsky**

One evening Bob Miller and I were out carousing, and we went into a bar at the intersection of Spackenkill and Hooker. All the barstools were taken, so we sat at a table. After a few minutes, Bob leaned over, pointing out a man at the bar, and said, "See that guy? That's Dr. John Cocke." Well, I was impressed. He was already a legend at IBM, and this was the first time I'd seen him. John Cocke was talking with two other gentlemen who, it became clear, were application programmers at IBM. They obviously didn't know whom they were talking to, and they were trying to convince John of the merits of programming in COBOL. As time passed, the discussion became louder and more contentious. Finally, John swung around on his stool, looked around the room, spotted Bob and me, and said in a loud voice, "I'm tired of you decimal bastards; these look like binary men." And he came and sat with us for the remainder of the evening. (We never learned whether he recognized us from the project or we really did look like binary men.) **Chris Larson**

I often chatted – no that's not right – I often listened to John expounding on one great idea after another during this time and at other times too. It is true that wherever we ran into each other in Poughkeepsie, Yorktown, White Plains or Fishkill, John would continue a prior conversation at the point where he had left off at our last meeting. He was a most gifted person and made many, many contributions to building IBM. I remember him fondly as the most earnest, friendly, persistent pain in the ass I ever knew in IBM! He will be sorely missed by the Technical World. I miss him as a good friend. I met him shortly after his first stroke and encouraged him to fight it off. He didn't need much encouragement! **George Monroe**

Drinks at Treasure Chest and John Cocke "resting for the night" on my convertible couch at Corlies Manor **Ken Plambeck**

I remember him so well as a young man – his clothes were always covered with burns from his cigarettes. I was amazed when I heard that he had finally married – he truly needed a keeper! **Liz (Mrs. Dura) Sweeney**

Between 1954 and 1956, John was a brilliant graduate student and my close friend at Duke where I was on the mathematics faculty. The same personality traits for which John was famous at IBM were evident earlier at Duke, too. I am greatly saddened by his passing. **George Swift**

I met John during the early days of Stretch and we became quite good friends. There was scarcely a day that we did not discuss some new idea or approach to the architecture of Stretch that he had. His was perhaps the most brilliant mind I have ever encountered. He would come up with all these ideas and discuss them and one day asked me why no one was following through on them. I suggested that he incorporate his ideas in memos and circulate them around the group asking for comments. I guess he didn't realize that all of us didn't have the ability to pick up on his ideas and understand them as fast as he could think of them. There was the time that, lost in thought and leaving the Boardman Road Lab after dark, he walked home and the next morning found that he'd left his car in the parking lot at work. Or the time he was missing for a week and no one could find him. It turned out that he had gone on a skiing trip to a resort in South America for a week and hadn't thought to mention it to anyone. I was privileged to have known him as a colleague and a friend. **Herb Wild**

## Stories

**W**e asked for anecdotes and we got 50 of them. Starting off with a bang (Jim Andrada), then punny (Bill Collier), running to the mildly ribald (John Fairclough), touching (Larry Josephson), historic (Bob Kuenstner), hair-raising (Dick May), proceeding to Cold War-esque (George Monroe) and creative accounting (Herb Wild). Enjoy.

**Jim Andrada** I remember quite a few of the IBMers who came to “visit” [Naval Weapons Lab] i.e., make the damned thing work! (joke), including Ron Staheli, Paul Engler, Roger Kahng and Ken Tooker. Our building was next to the firing line where we tested 5 inch ammunition and we had no extra space, so we put the IBMers “upstairs” in a little glass shack that had been used as a control tower for the airstrip before we built a real one. We even put up venetian blinds for them.

I don't think they realized what we actually did at work outside the computer area. All of us were accustomed to the noise and smoke and shock and had been sort of “trained” to pick our coffee cups off the desk every time we heard the warning whistle that preceded a shot so it wouldn't slosh over. Then, after the blast subsided, we'd put them down again. It was second nature, and we never even thought about it.

I remember to this day the first day we had a test with the IBMers upstairs and of course the little glass shack got the full benefit of the muzzle blast and a great view of the flame and smoke. I think the venetian blinds fell down. Needless to say, a bunch of scared looking guys came racing down the stairs yelling about fire and explosion and smoke only to see a bunch of blase folks sitting around working and drinking coffee and ignoring the commotion.

**Chet Baccari** The most satisfying event to me occurred during my visit to Livermore Lab following the actual four-week installation and IBM's performance testing by my “team” and during the ten-day certification and acceptance period, when Lab scientists also successfully interleaved some of their project problems with our test program runs at different time phases to experience performance. Upon successful completion I met with the second in command of the Livermore Lab, Dr. Sid Furnback, who personally complimented IBM, my team and me for an excellent performance and for meeting their expectations. He then escorted me to a closed large darkened room housing a dormant large computer (not IBM's) and commented that this one (in the room) had been shut down for many months and did not do the job for them. I came home with a grand feeling of gratification and pride in success for a year of long days and nights of hard work that we IBMers had endured on this project.

**Werner Buchholz** Riding a horse for the first and last time on a narrow mountain trail near Los Alamos with Steve Dunwell and nearly falling off into the gorge. (Did not seem so funny then.)

**T. C. Chen** At the first Stretch User's Meeting held in Los Alamos in 1962, which almost became the last, LASL scientists reported on their experience using the machine, and rated it as 2 times 7090, far from achieving the original aim of 100 times the 704. The room fell deathly silent, and I found myself raising the only dissenting voice, challenging their programming methods, particularly their use of programming tricks, which backfired under the new and unusual architecture.

**Bill Collier** At dinner one night in Los Alamos, Jim Havender noted that all computers, from ENIAC [Electronic Numerical Integrator and Computer] on, were known by their acronyms. However, STRETCH was a name that was not formed as an acronym, and Jim said he had an almost complete remedy to propose. For STRETC, Jim proposed “Super Tool, Relentlessly Endeavoring To Compute.” Everyone thought about the “H.” Eric Knutsen offered “Hard” and we all laughed. It was the perfect conclusion.

**Collier #2** Sometime around 1985, I was at a party on the John Burroughs estate over north of Highland, and I started talking with an attractive young woman. I asked, "What's your name?" She said, "Frances Dunwell." I asked her if she were related to Steve Dunwell. She said, "He's my father." So I told her the following story.

One of my coworkers, Jerry Cohen, was in an 8 by 12 cubicle down the hall from my office in the 705 building. One day a man came in and asked Jerry, would he mind if he sat at the empty desk in Jerry's office. Jerry said OK. The man sat there for a couple of months or so. One day someone asked Jerry if he knew who it was that was sitting in his office. Jerry said the man had introduced himself, but Jerry hadn't caught the name, and then, after they had had several conversations, it would have been embarrassing to ask, so no, Jerry did not know the man's name. The questioner said that the man's name was Steve Dunwell, that he had formerly been Jerry's fifth level manager, that he had fallen out of favor, and the reason that he was camped out in Jerry's office was that he had come to work one morning and found his office had been totally emptied out.

I asked Frances if she had ever heard this story. She said that no, she had never heard her father say a single bad word about IBM.

**Collier #3** Remember when IBM had PC retail stores? The corporation invited employees to submit names for the stores. In a dream, the perfect name came to me. I am not making this up. The next morning I submitted an entry suggesting that the stores be named "Watson Stores." This would do honor to both Thomas J. Watson, Sr. and to Thomas J. Watson, Jr. It would also allow the use of this advertising slogan: "Come See Watson Store For Your Future." My suggestion did not win. IBM began its long decline shortly thereafter. No wonder.

**Ed Council** Nothing that we dare print!

**Walter Doherty** The winter of 1961 was bitterly cold and snowy. On an especially cold Saturday, I was asked to work in the High St. office in Poughkeepsie. A manager was supposed to meet me there to open the building. It was close to 30 degrees below zero. He never came, so I used my IBM ID card to open the lock. Once inside I immediately filled out an IBM Suggestion form pointing out the insecure condition of the building. This resulted in my first \$25 IBM suggestion award.

While debugging the Console Command Processor in Kingston there were visitors from the Mitre Corp. who inquired about the security of MCP. I thought briefly, and told them that if I suspected trouble I could destroy the system. I typed in DESTROY \$MCP and the system crashed. They were very impressed. I didn't tell them that I had been trying to find a bug, which caused MCP to crash when any 7-character command was entered.

Another time, while debugging at the Weather Bureau in Washington, DC, E. John Carter was trying to find a bug in the FORTRAN compiler. He went to have dinner. While he was away, either Fran Allen or Ken Plambeck found the bug, added a diagnostic to the compiler to tell where the bug was, and how to fix it, and left the system to tell John Carter what to do to fix it when he returned from dinner.

One fun anecdote from these times [after Stretch, at IBM Research] occurred when a professor at Columbia University told Senators Bobby Kennedy and Jacob Javits that we were doing research on teaching young children to read, which was false. They came to IBM Research along with many IBM vice presidents to see these wonders. Once there, they immediately saw that we were doing no such work and they left. Later that day, the vice presidents returned to partake of a feast that had been prepared for the visit. They were too late. Programmers do not allow such good food to last that long.



**Dr. Barlane Eichbaum** I was a member of the team with 12 engineers under Stretch project manager, Bill Lawrence, who accomplished, what was said “It can't be done” and we did it. With our ferrite memory prototype model of Stretch/Silo we beat out Remington Rand and RCA to win the Stretch/Silo contract. I worked with great engineers and we became a winning team.

A Not So Fond Memory: Instead of being rewarded for my part in helping to make Stretch a success, with the development of key components (as noted in unpublished Silo Technical Memo 13, later partially published as Tech Memo. 33), my contributions were usurped by two other engineers not involved or on the team and they were promoted. When I requested acknowledgment and the opportunity to present and publish scientific papers on these breakthroughs I was denied such a request. There was an investigation conducted through President Thomas Watson Jr. and Director Emanuel Piore, resulting in my being fired by IBM! The “Open Door Policy” started by Thomas Watson, Sr. closed shortly after my visit to Thomas Watson Jr.! This was an unbelievable and sad day for me and my family! Special thanks to good friends like Tom Callinan and Dick Lamy, who gave me support during this time. I prayed for help from God!

**John Fairclough** First day to secretary – “Please get me a rubber” ([UK] English for eraser!)

**George Grover** Before the Stretch project, I had never been outside of the United States. Consequently, our first meeting with Stretch users in England and France was for me something more than “just another business trip.” I had never drunk wine with a meal, and was totally unacquainted with the wonders of French cuisine and, indeed, the wonders of French culture generally.

It is difficult to imagine a better, more spirited mentor on a first trip abroad than Sullivan Campbell. He had a gift for appreciating and enjoying and in general energetically making the most of the uniqueness of each country and culture – its virtues, values, nuances, living styles – being the complete tourist one moment, and then melding in with the citizens the next.

I recall in particular one incident when our schedule had been lengthened, and he said something like “Let's see ... we have to stay somewhere this weekend ...” And then, looking up with sudden insight: “How about Monte Carlo?”

**Jim Havender** Causing (indirectly) the 709 to go down for two days. Prior programmer had shut down power; seeing me, he immediately turned it back on and left. You didn't do that with early vacuum tube computers! I fiddled with the manual console enough to see it couldn't add 2 and 2. I shut down and departed discreetly. Next morning, what do you know? The computer was down, and it stayed that way! The other programmer doesn't remember this; so he'll remain anonymous. (I didn't tell him until years later – about 40).

**Dick Holleran** There were four of us engineers working late second shift, installing the machine in Los Alamos, when the typewriter part of the operator console failed and needed replacement, before morning. The new unit was outside security. The guard had never seen a “Selectric” before and didn't believe it was a typewriter. The lies we told and the subterfuge to get passed would probably land us in Jail today.

**Lloyd Hunter** I [Esther, Lloyd's wife] remember, in particular, my first hearing the name IBM. Lloyd knew about the discovery of transistors in 1948 and Dr. Shockley's work at the Bell Labs in 1949. He set up an appointment with Dr. Arthur Samuel in Poughkeepsie in February 1951 to discuss his idea of putting transistors into business machines. (I think Mr. McPherson from N.Y. City Headquarters was also at the meeting.) Lloyd traveled by train from Pittsburgh and returned home on an evening I was ironing in the kitchen, having bedded down the four children, and listened while he told me about his interviews. He was offered a position with a good salary. I remember him telling me that Dr. Samuel was “rubbing his hands with glee” when he bade him good-bye at the Poughkeepsie train station. From then on, IBM became a very important name in my life.

**Larry Josephson** Jack Garrity was my first manager. Jack helped me make the difficult adjustment from the Eden of the San Francisco Bay Area to the frozen hell of Poughkeepsie. After my first winter, I became very depressed and stopped coming into work. When I didn't answer my phone, Jack drove out to the faraway place in the middle of nowhere off Route 52 where I lived (Holmes, NY) to try to find me. When he described me to my one neighbor, she responded, oh, yes, "the big man in the little car" (I drove a Karmann Ghia). Jack didn't find me that day, but I was deeply impressed that my manager actually cared whether I came into work or not.

**Eric Knutsen** In 1961 I spent lots of time in Los Alamos, supporting the initial Stretch installation. For weekend recreation, Santa Fe and Taos were favored destinations, as was El Paso/Juarez on occasion. One Friday, Jim Havender and I made the 400-mile trip to El Paso in Jim's Volkswagen Beetle. Our tour of Juarez included bullfights, mariachi bands and other attractions. On our Sunday return trip, Jim's VW ran out of gas. After we had been trudging toward the lights of Albuquerque for a while, a friendly local stopped his pickup truck and gave us a ride to an Esso station. He waited while we bought some gas, then drove us back to our stranded car. When he spied the VW, he uttered a string of obscenities, followed by "Effen I'd a known you wuz drivin' a gawd-dam furrin car, I woulda let ya walk!" Jim's attempt to placate the man only added to the drollery: "I bought the car used, so it was really a domestic transaction."

**Harwood Kolsky** One little-known first for Stretch was the use of a Selectric typewriter as a console printer. The golf ball typewriter was not announced as a product until 1961. Whenever visitors came to the machine room in Poughkeepsie, measures had to be taken to conceal or disguise this unannounced typewriter. The engineers did this with a piece of cardboard that fit over the slot on top of the typewriter. I remember one time in 1959, hosting some visitors to the Lab. I was giving a standard descriptive talk when one of the visitors suddenly walked over and picked up the piece of cardboard and looked inside. I thought I would choke. Fortunately, the visitor didn't appear to have noticed anything new or different under the makeshift lid. I looked around at the other IBMers and they were turning pale, but no one said anything.

**Robert Kuenstner** The time when the world famous mathematician, John von Neumann (the founder of the Monte Carlo Method of computer design) was a guest lecturer at the Annex in Poughkeepsie. He was a really nice fellow who tried so hard to get through to us with his explanation of some deep and far advanced mathematical concepts. There were 45 of us "red hot" engineers trying so hard to follow him BUT all of us were hopelessly lost in the first three minutes. We were completely SNOWED. Time Magazine had said that his kind of mathematical genius appeared "every other generation." In those days IBM was a heady brew!

I left the Navy after V-J Day and was quickly reinstated by Bell Telephone Labs. Prior to the war, I had been a technical assistant, working with engineers. Upon returning I carried on as before. I worked with William Shockley, who was developing radar for submarines. This was two years before he became famous.

I worked with Shockley for seven months and then left for school. We got along just fine. However, he was so close-mouthed and intense that I didn't even know he had a doctorate until many years later. Shockley was a private and soft-spoken person. He never socialized with others at work, and kept to himself. I don't think he knew how to enjoy himself. He was surrounded by a jolly bunch of fun-loving partygoers. ("Happy Hour" at a local watering hole was routine on Fridays after work.)

Soon after my departure, Shockley was given a new responsibility. He became Manager of Semiconductor Research. John Bardeen and Walter Brattain joined him, and the trio became a task force. In the fall of 1947 victory was achieved. It's a long story, but dissension broke out and Shockley was sorely riled. His ego eventually fractured the Bardeen/Brattain/Shockley team.

In 1955 Shockley left Bell, and in February 1956 he founded Shockley Semiconductor Lab. This pioneering venture by Shockley was the initial stimulus that gave birth to Silicon Valley. After many incarnations, Shockley Semiconductor Lab became Intel in Palo Alto, California.

As for the original Bell Labs trio of Bardeen/Brattain/Shockley, the first two were credited with inventing the transistor (a point-contact type) in the fall of 1947. Shockley was credited only with the transistor's development, in recognition of his having created the junction type transistor three months after Bardeen and Brattain's earlier success. Shockley's junction transistor eventually won out over the point-contact design.

In 1956, the trio was awarded the Nobel Prize in Physics.

**Chris Larson** One day in the 705 building, there was a loud feminine shriek in the hallway. Everyone jumped up and looked out of their cubicles to see what happened. Down the hall stood Ann Ewing in the doorway of someone's cubicle, attempting to regain her composure after having been pinched [Editor's note: the balance of this story has been expunged in observance of decorum and family values.]

One evening Bob Miller and I were out carousing, and we went into a bar at the intersection of Spackenkill and Hooker. All the barstools were taken, so we sat at a table. After a few minutes, Bob leaned over, pointing out a man at the bar, and said, "See that guy? That's Dr. John Cocke." Well, I was impressed. He was already a legend at IBM, and this was the first time I'd seen him. John Cocke was talking with two other gentlemen who, it became clear, were application programmers at IBM. They obviously didn't know whom they were talking to, and they were trying to convince John of the merits of programming in COBOL. As time passed, the discussion became louder and more contentious. Finally, John swung around on his stool, looked around the room, spotted Bob and me, and said in a loud voice, "I'm tired of you decimal bastards; these look like binary men." And he came and sat with us for the remainder of the evening. (We never learned whether he recognized us from the project or we really did look like binary men.)

**Walter Leach** Aldermaston assignment. One late evening (about 2 AM), assisted engineering in isolating an IF fault they claimed had to be a programming error but turned out to be hardware failure. I had to modify the IF interrupt routine to go into a loop when it was queried, and thus show the engineers where the fault lay.

**Robert Litwiller** Jim Pomerene became one of the first members of my personal "pantheon of genius" when I beheld his wondrous distillation of the Harvest logic and data flow hand drawn, on a single, very large piece of paper! I believe it showed all the key logical relationships, as well as the functions that would be indicated on the operator console. I'm sure Jim remembers doing that piece of art. Art Fitch, Dave Anderson, do you remember it?

**Ed Lowry** I was soundly scolded for stuffing Kleenex into telephones to soften the ringing. I was just making it practical to follow IBM's admonition to THINK, but the offended sovereignty of the New York Telephone Company prevailed.

**Leslie Lowry** The long battleship games across the partitions in 705 while we waited for work. The boss who lost his temper at my failure to debug a problem and swung a kick. The time my husband Ed was barred from time on the Stretch at Los Alamos because he was an alien but finally got in when they realized that I (also an alien) had already spent a month there.

**Dick May** Sullivan Campbell liked to fly his private plane to meetings at Fort Meade. On one occasion, I accompanied him and George Grover. Sully was practicing instrument flying using an eye shield. George was the copilot, responsible for our visual contact with the outside world. George actually was reading the New York Times, and I was biting my nails looking for other aircraft from the back seat.

**Jack McBride** There are two anecdotes that stand out. One was bumping into Norm Hardy at the South Road HoJo one night very late. Norm was eating at the counter and going through a very thick listing. The fan-fold pages were spilling over the syrup dispensers and falling onto the floor behind the counter. The waitress was going nuts. Norm never batted an eye.

The other anecdote relates to Larry Moss, and I have used his line all my life, whenever events get unpleasant. Larry was writing a tape sort and the tape drives were moving in very short, spastic bursts, because the records had not been blocked. I shared my observations with Larry and he told me "If it bothers you, don't look at it." Words to live by.

**George Monroe** Ralph Palmer made the decision to propose the 7090 for the BMEWS [Ballistic Missile Early Warning System] bid rather than "Junior Stretch," which Red [Dunwell] and Werner Buchholz pitched to him. I surmised that Ralph did not wish to squeeze Stretch into a schedule straitjacket, so that Red could continue to expand the technical envelope of the Stretch development effort.

The guy who brought the Stretch 2us [microsecond] Memory into existence was William R. Rave. He should never be forgotten. Bill and I faced Ralph Palmer to report that delivery of the first memory to the 7090 BMEWS program would be late. John Haanstra then said, "I'm sure George will be able to absorb the delay within the 7090 schedule." I agreed with a sick feeling. But we found a way to absorb the delay. We constructed a three deep 37-bit transistor array and continued debugging 7090 instructions that needed to access memory. When the 2us memory finally became operational and was connected to the 7090 model, it worked the first time at 2.4 us. After tinkering and tuning we got it down to 2.1818us and that was it! Anything shorter than 2.1818us caused it to crash every time! I reported this to Sylvania Electric, who were the A/D-D/A Converter and operating program developers and they were horrified! They had developed the program at a timing of 2.4us. We just slowed the clock down in the 7090 back to 2.4us cycle time and they smiled again. Later, after installing systems in Thule, Greenland they were able to improve the program to take advantage of the 2.1818us cycle time.

### **The Russians are Coming ...**

Werner Buchholz and I were interviewed singly [in June 2002] by Dr. Anne Fitzpatrick of the Los Alamos National Laboratory. She is doing a piece on the history of computers. She has been to Russia and interviewed several of the old timers of Russian computing there. These old gentlemen were among the same ones I met with in the Poughkeepsie Laboratory during the brief "thaw" between our countries, when Krushchev visited the U.S. and loved Disneyland. At that time, around 1959-60, IBM had already produced Solid State Computer Main Frames, i.e., the 7090 and 7030, (Stretch) but the Russians were still stuck with "Lampas", (Vacuum tubes). It was an interesting meeting. Each group had its own "ringers," persons who spoke fluent Russian or English but kept their mouths shut until after the meeting was adjourned. Trust was something neither side had yet learned!

I asked twice whether the Russian scientists were working in solid state. Both times, the answer was, "Nyet, Lampas."

It was a very interesting encounter. Everyone was so polite, but very tense. I can't say I learned anything, but even though the Russians were not given a tour of the Lab, they did get to see the 7090 production line in the Main Plant, adjacent to the Lab. I guess we wanted to prove to them that we really were shipping solid state mainframes.

**Andris Padegs** When we were still working at IBM, Werner Buchholz suggested that we should consider writing a paper on elements and concepts of S/360 architecture that originated in Stretch. That would have

been an interesting and worthwhile project. But we could not afford the time then, and it probably is too late now.

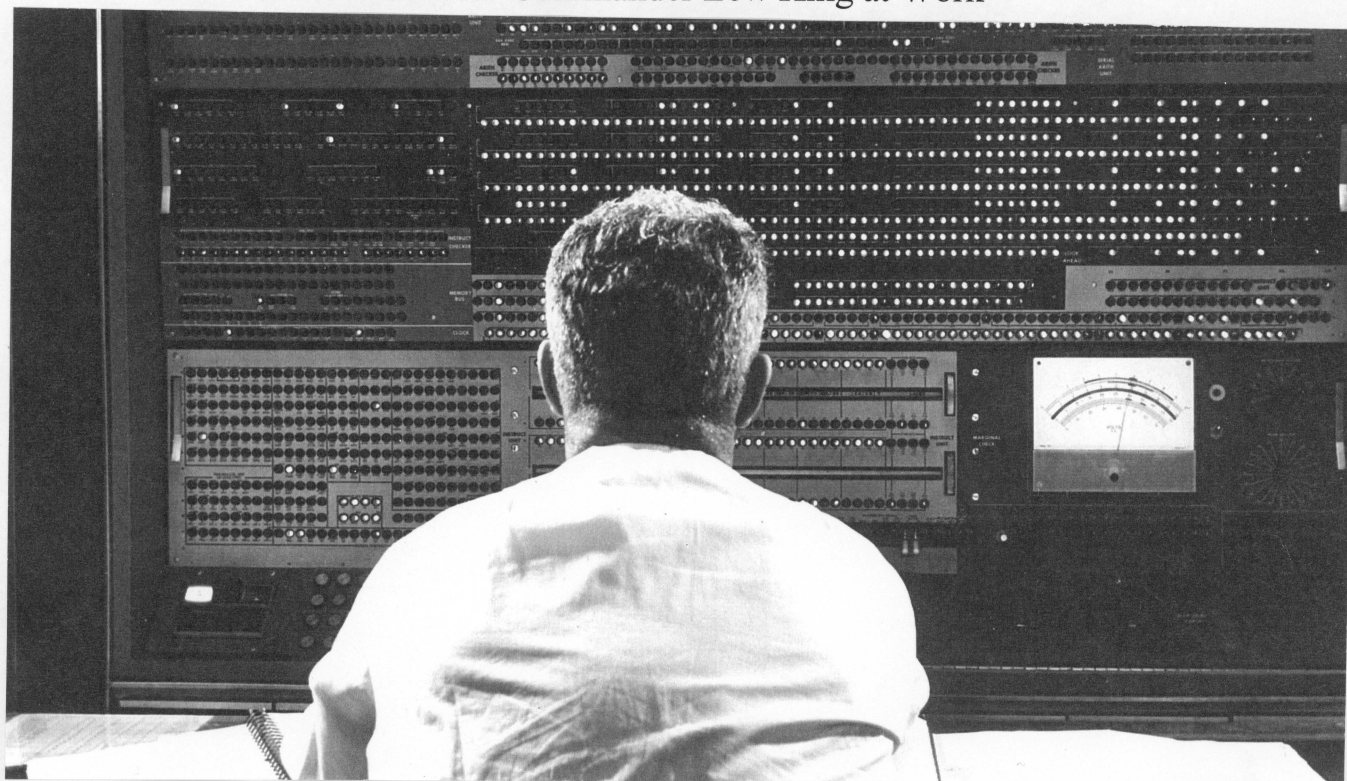
**Gerard Paul** There was a battery operated phone system so we could talk from one end of the computer to the other without shouting. It was in full view, but we didn't use it much – we shouted. One day a visitor thought the battery was used to power the computer. I explained, no not really! But maybe today, who knows?

**Ray Polivka** I still remember meeting with Fred Brooks in my small cubicle in the South Road building. He had to sit on an inverted wastebasket since I was not of sufficient rank to have an extra chair. When the building administrator happened to walk by and saw that, I got an extra chair. Then there was Fred Brooks's pith helmet, whatever happened to it?

**Bob Ramey** My first STRETCH run was an Eigenvalue problem which ran about 10 minutes on the 704. The program was entered on punched cards through the card reader. Pushed "Start" and almost immediately after reading the last card, the "halt" light came on. After a half an hour or so of debugging and poking around on the console, we suddenly realized the program had simply completed successfully! My introduction to 7030 performance.

**Russ Robelen** I remember now and then at night I would go into the big room where Stretch was being worked on to see how things were going. Many times I found Lew King at the console, playing it like a piano, trying to figure out what was going on. On this particular night I found Lew in a very agitated state. It seems he had been at the console for some time and had not been able to figure out, "What the hell was going on." Just after I walked in, Lew in his inimitable style starting verbally abusing the machine. After calling it every explicative he could muster he got up abruptly from the console and walked to the side and looked down the long row of frames. At the very end, unbeknownst to Lew, someone was working on one of the frames and had turned off the power to it. I thought Lew was going to strangle the guy.

Below: Console Commander Lew King at Work



**Russ Robelen on Harvest Delivery** I remember that I got so fed up with the politics regarding the question of when Harvest was going to ship that I decided that the technical evaluation I was doing was meaningless. In April of the year before Harvest actually shipped after five months or so on the committee, in a fit of pique, I asked to be taken off the committee which was agreed to. When I went back up to my old job in the 703 building on Boardman Road my boss was gone and no one knew who I should report to. This really set me off and I sent my letter of resignation to Ty Marcy who was then head of the lab. Ty listened to my story the next day, talked me out of resigning, and offered me the opportunity to go to the IBM Systems Research Institute in New York City the following week. I remember when I left his office he asked me when I thought Harvest would ship. Sort of half joking, I said Christmas. The following year I received a note from Ty, saying that Harvest shipped the first week in January because NSA would not accept the machine on Christmas day.

**Lee Scott** For Chris Larson: do you remember your “DORK” subroutine? [Ed. note: He doesn't.] Dick Lash, who wrote a routine that produced an error message that said “an error has been detected but the program will continue, will continue.” I have often wondered if that subroutine is still running.

But my favorite of all time was Harlo (now Frank) Hertel. My best guess is Harlo was a reincarnation of the Li'l Abner comic strip character Joe Bisffk, who always had a rain cloud complete with lightning over his head. Three incidents come to mind. First, Harlo showed up in Poughkeepsie with a new 1959 Ford. The problem was, he bought it in Texas and it had no heater and now he's living in Poughkeepsie and freezing all his important parts. In Poughkeepsie, the second incident was when Harlo and Jack McBride went from the Church St. parking area to South Road Lab for machine time. Jack reached up and turned on the radio, which immediately got Harlo's attention since he did not have a radio in his car. There was an identical car on the parking lot (with radio) and both cars had the same keys. Thirdly, onsite in Laurel, Maryland, Harlo finally achieved one of his early goals: he bought a Corvette. He got up one Saturday morning, looked out the window and saw a guy painting a racing stripe down the side of his Vette. Yes, again, there was an identical Vette in the lot.

**George Swift Anecdote #1:** During one of the summers, a child prodigy, who had won first prize at a computer fair, temporarily joined Stretch, and I was put in charge of him. The device that won the prize was exhibited on the stage of one of the auditoriums for all to see. It was a checker-playing machine that measured 8 feet by 8 feet by 15 feet high. The reason for the funny dimensions was that the rules of the contest limited the exhibit to an 8 by 8 floor space but said nothing about a limitation on height. A checkerboard was exhibited on the front of the machine with the position of the checkers in lights. There were buttons on each square for you to make your move. The machine was constructed from salvaged materials, and the electronics were done with old telephone switches and relays. When you made your move by pressing the buttons, the machine went into action making a lot of clicking, clanking, and whirring noises, and finally signaled that its move was complete with a very audible bell sound.

The big day came when Dr Samuel's checker playing program (written in Fortran) challenged the prodigy's machine. The auditorium was packed with spectators, many of them standing. The way it worked was this: the machine's move was telephoned to the 704 where Dr Samuel's program was running, and the program's move was telephoned to the stage of the auditorium where it was entered into the machine by pressing the buttons.

As the game progressed, it became apparent that Dr. Samuel's program knew more about checkers than the prodigy's machine, which was sad because the human sentiment was for the youngster's machine to win. But, there came a moment of hope. A position occurred where, if Samuel's machine made a certain move, the prodigy's crowned checker would jump the board clean. Tension in the auditorium rose as Dr Samuel's program took more time than usual to respond – I think we waited almost fifteen minutes. Then, aw shucks, it made a different move.

Even though it lost the checker game, the machine was a remarkable achievement for a high school student, who had the habits and courtesy of a youngster. (When I told one of my puns, he pointed out that I had an “old fashioned” sense of humor.) But, he was mature when working on problems. I will never forget him and his machine.

**George Swift Anecdote #2:** Because of available space, it was customary to share offices. However, a day came when we were to move to an area where there were enough offices so that each person had an office to himself. Thinking ahead, I realized that it was inevitable that sooner or later a new person would join our group, and I wanted to minimize the chance that I would be the first to share. So, before we actually made the move, I measured all the new offices to determine the one with the least floor area. That office, and only that office, also had an inconvenient post in the middle of it. Perfect! I went to Werner [Buchholz] and told him that I preferred that office. Without even going to look at it, he granted my wish. Success! Wrong! It was the first office shared – in spite of the squeeze, the post, and another desk.

**Richard Toepfer** Several of the summer interns lived at 3 Fox Terrace. Visits to New York City, Tanglewood concerts and water skiing on the Finger Lakes were all part of a great experience. I believe it was John Lind who shared my interest in old cars. He had his cousin pick us up in a 1934 Rolls Royce Phaeton for lunch one day. The cousin was dressed in a butler’s livery. The high moment in the caper was being dropped off in front of the main entrance of the Poughkeepsie site, while a bunch of VIP’s stood around gawking at the car, which was enormous. As advertised, it was so quiet you could hear the dashboard clock ticking.

**Allen Walker** In those days, everything was on punch cards. As I remember, the Fortran compiler deck took more than a box of cards. One evening, we were working and someone (I don't remember who), tried to load the complete box of cards into the hopper. The deck fell apart and cards flew everywhere. The cards were not sequenced, except for a few sections, and we spent the rest of the night getting the deck back in order.

**Bob Webster** Working for Sherman [Prosser] was hard. Start at 5:30 AM to get machine time. Work until 2:12 PM and then play nine holes of golf. I usually beat him, but not right before an appraisal.

**Don Whitmore** While bouncing across the New Mexico desert in our rented car, we hit a rock, which produced a pronounced dent in the rear floor of the car. Sherman Prosser left the driver’s seat, got in the back and jumped on the floor until it went back into place.

While playing a game of Cribbage in the lobby of the Lodge in Los Alamos, we watched a skunk enter through the front door, walk the length of the building, and out the back door (on two different occasions).

**Herb Wild** The weekend after a meeting in Los Alamos, when Steve [Dunwell] arranged that our party of four spend Friday and Saturday nights at Bandalier National Park and for us to have dinner at a Mexican restaurant in Espanola, New Mexico. The food was to me so spicy hot I couldn't eat anything but sopiafillas and strawberry jam, though Steve, Werner [Buchholz], and the other member of the party obviously relished it. The next day we rode horses down the canyon on a trail with numerous switchbacks to the Rio Grande and back. On the way down we stopped and dismounted to look at the scenery where the trail ran between the canyon wall on one side and a precipice on the other. When we remounted Steve's horse shied and got close to the edge. Steve scrambled off the horse’s back and fell to the ground. He was a bit shaken but got right back up and we continued on down. We tried to ride around at the bottom of the canyon but found that we really had no control over the horses. They would take you down and then back up, but no side excursions. That weekend we also went to Taos and the Indian Pueblo and Steve had a long conversation with an elderly pueblo dweller he seemed to be acquainted with who had two sons working at an automobile assembly plant in Detroit. [Editor’s note: Steve’s uncle developed Ford’s moving assembly line.]

There are any number of anecdotes concerning our failure to stay within our budget and the charts we put together to convince those concerned that we really weren't over expended. We got very creative, as when Steve countered the concern that we didn't have enough money to pay for release to manufacturing. Steve told them that we wouldn't release, "If you build one you'll know how, and can build as many as you want just like it." This actually resulted in agreement with manufacturing to send a crew up to the lab to help us build the first system. Of course, we finally had to go through a formal release, but we did a great deal of creative financial dancing on that project. In this case the end justified the means.

I also was at the meeting where Steve, objecting to comments by Tom Watson, Jr. characterizing the Stretch program as too costly for the benefits derived, was lashed out at by Mr. Watson. I remember the incident and the words used very clearly. This was in a manager's meeting addressed by Mr. Watson after a tour of the Stretch system just prior to shipment to Los Alamos. I myself narrowly escaped the wrath of Mr. Watson when he saw the Selectric typewriter on the system console and asked whether the typewriter division manager (I think it was Slip Crauer) knew we were shipping it before it was announced. He didn't, but in the hurried phone call I made to him accompanied by two of Mr. Watson's entourage, he sensed that his position would not be enhanced by pleading ignorance. A quick thinker, he gathered from the way I phrased my question that we were both in trouble if he did not support me and he did so heartily. Incidentally, this was the first use of the Selectric as a console typewriter, an obvious choice when the alternatives used moving carriages.

**Russ Wilmot** I remember writing an addressing test for the High Speed Disk Drive that set up such vibrations in the machine that it caused the frame to crack. It was one of those things you like to find out in-house and not in the customer's office.

**Hannon Yourke** See page 395 in "IBM's Early Computers." [Editor's Note: In this and the following four pages, the authors (Emerson Pugh, et al) describe how Hannon invented current steering logic circuits – later called emitter-coupled logic (ECL). Hannon's MIT Masters thesis "involved nonsaturating point-contact transistor devices for flip-flop circuits." This beginning was helpful to Hannon's invention process, as was Bob Henle's prodding, according to the authors.]



# Software Recollections

Eric Knutsen

Here is what I remember. There were three major components of Stretch software:

- A Fortran Compiler
- A Stretch Assembler Program (STRAP)
- A Master Control Program (MCP)

## Fortran

A contraction of formula translating, Fortran was a language used by Stretch customers' programmers to do useful work on the computer. The great advantage of Fortran was that persons of a mathematical bent could readily master its vocabulary and syntax. (Fortran was developed by IBM's John Backus, who actually worked on the Stretch project for a couple of months back in 1956 or thereabouts.)

Fortran was less efficient than "assembler" language in its use of the computer's memory and "central processing unit." Assembler language corresponded closely to Stretch's native machine language – the strings of binary digits (consisting solely of zeroes and ones) intelligible to Stretch's "instruction unit" and "arithmetic logic unit." To get Stretch performing at its peak speed, assembler language was the way to go.

Fortran was called a "compiler" because each Fortran statement generated many machine language instructions.

To your average twenty-something Stretch programmer, using Fortran was like being chauffeured in your aunt's Buick. Writing in assembler language was getting behind the wheel of a Corvette or a Porsche. While it may have been absolutely essential for Stretch customers, Fortran in Poughkeepsie was for wimps.

## STRAP

The Stretch machine language consisted entirely of zeroes and ones ("binary digits" or "bits"). Hence it was unfathomable to all but the truly obsessed. STRAP (Stretch Assembly Program) was called an "assembler" because it translated each line of STRAP code into a machine language instruction. Put in one STRAP instruction, get out one machine language instruction. The advantage of STRAP was that its mnemonics were expressed in English for the most part.

To illustrate this STRAP advantage, here are examples of a single machine instruction telling Stretch to load a number into the "accumulator":

Machine Language: 00011011100100011101001100010011

STRAP Mnemonic: LOAD TAXRATE

The second big advantage of STRAP was that it relieved the programmer of having to keep track of where data were in Stretch's core storage. In the illustration above, "TAXRATE" will be translated by STRAP into a binary address that will, at execution time, correspond to the location in Stretch storage of the tax rate value.

There were two generations of STRAP, namely STRAP and STRAP II. STRAP was a quick version that served as a language for writing other parts of Stretch software, such as MCP. STRAP II was a more robust, full-featured language suitable for use by Stretch customers.

So, if STRAP was used to write Stretch software, then in what language was STRAP written? Whence came the chicken that laid the world's first egg? The answer probably is, it must have been, that the writing of STRAP was a (pun intended) bootstrap enterprise.

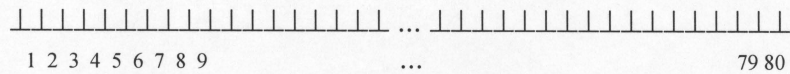
## Writing Software

Before we get to the subject of MCP, the Master Control Program, let's spend a little space reviewing the programming process, the writing of the instructions or software "code."

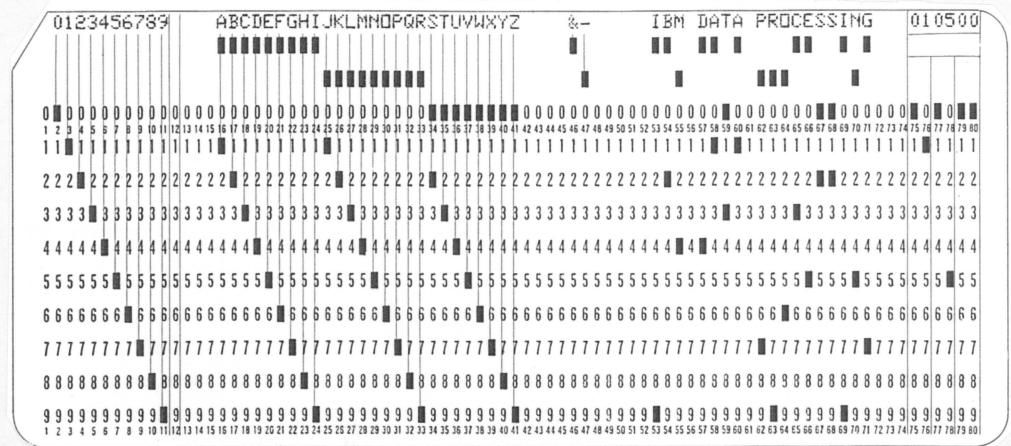
After the preliminary steps of problem definition, analysis, preparation of specifications and flowcharting John or Mary Programmer had to sit down and write code. For this purpose, IBM provided pads of preprinted paper with horizontal lines, vertical score marks and alternate shades of green. These were called "coding pads." (Children, the monitor/mouse/keyboard were still some 20 years in the future.)

Each horizontal line on the coding pad corresponded to a punched card, and the little vertical scores delineated 80 spaces, each space corresponding to a column in the punched card, as shown below.

### A Line in a Coding Pad



### An 80-column Punched Card



At the top of each page in the coding pad were spaces for identifying the program, the programmer, the page number and other data. The programmer then went through the following steps:

- 1) Write code on the coding paper
- 2) Review for accuracy, logic
- 3) Send a stack of coding paper to a keypunching unit somewhere (Or, keypunch it yourself)
- 4) Wait for the deck of punched cards to be returned (the cards usually would be keypunched by one operator, then key verified by someone else)
- 5) Submit the deck of cards for a STRAP assembly run
- 6) Correct the syntax errors discovered by STRAP and repeat step 5
- 7) Conduct a test using test data
- 8) Correct logic errors found and go back step 5. And so on.

Because the written code was keypunched elsewhere, the programmer had to be a meticulous printer, careful to distinguish, for example, the letter Z [Z] from the number 2 [2], the letter O [O] from the number zero [0], letters V [V] and U [U], numbers 1 [1] and 7 [7] and the letter I [I] from the number 1 [1]. (On coding paper, upper case letters were used exclusively.)

It was a far cry from today's interactive PC world, in which "word processing" software instantly draws a squiggly red line under any misspelled word. Still, how many of you readers can distinguish the lower case "L" [l] from the number one [1] in this sentence? (It's best not to use either one in an email address.)

## **MCP, the Master Control Program**

MCP was an early "operating system." It comprised a suite of programs that managed the flow of work into and out of the Stretch computer. The work of Stretches at customer sites consisted mostly of executing application programs. From an MCP programmer's viewpoint, these programs were called "Jobs." (If you were in T.C Chen's group, you may have called them "Problem-Oriented Programs.") Jobs could also be Fortran compilations or STRAP assemblies.

In addition to managing workflow, MCP provided a variety of services.

For application programmers, MCP looked at each Job ahead of time to make sure that any needed tapes were retrieved and mounted. The Jobs' object code decks (the output of STRAP) and data cards would be placed on a tape for speedy input at execution time. Programmers didn't have to be concerned with the physical addresses of tape drives. MCP took care of physical tape drive assignments analogously to STRAP taking care of core storage addresses.

During execution of each Job, MCP would service input-output ("I/O") requests, handling all "interrupts." (Interrupts were signals that something had happened requiring attention, such as the expiration of a timer, the completion of an I/O operation or occasionally a machine malfunction.) If a Job ended abnormally, MCP would provide a "dump," a printed image of core storage for offline analysis. Other examples of MCP services were providing date and time readout, using tape as a buffer (temporary storage) for printed output and handling operator messages.

MCP communicated with computer operators through the Selectric ("golf ball") typewriter built into the operator's console. It was two-way. MCP would tell the operator which tapes were needed and where they should be mounted. When a Job was finished using a tape, MCP would tell the operator to dismount the tape. MCP would alert the operator when more punched cards were needed in the card reader, or blank cards in the card punch or paper in the printer. The operator could provide input to application programs and tell MCP to terminate a Job and go to the next one.

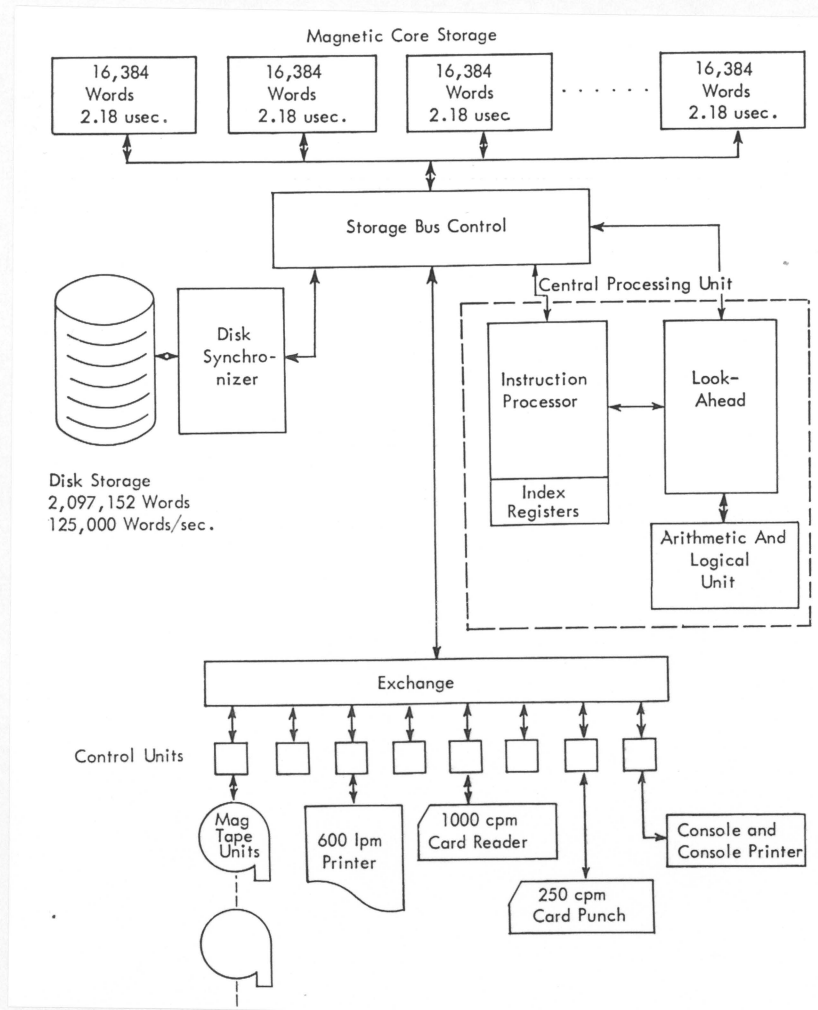
If there was a single, overarching design goal for MCP, it was (as I recall) "Keep the CPU Busy!"

The CPU, or Central Processing Unit, was the engine of the computer. All instructions and associated data had to go through the CPU. To approach the goal of 100 times the speed of a 704, not only did the CPU have to be very fast, but like royalty or a dinner date, it must never be kept waiting idly.

The architects and engineers had built in some powerful features to ensure that CPU waiting time was kept at a minimum, hence its utilization as high as possible:

- An I/O Exchange, which drove card readers, printers and tape drives without bothering the CPU
- Interrupts, which tapped the CPU on the shoulder when some other part of a Job needed attention
- LookAhead, a part of the CPU that ceaselessly, relentlessly looked ahead up to four instructions beyond the one currently being executed
- An Instruction Processor, which fetched instructions and data as advised by LookAhead and got them ready for the Arithmetic and Logical Unit (ALU), which did the real work of the computer, i.e., computing

These and other Stretch hardware components are illustrated in the diagram below.



MCP made extensive use of the Interrupt system to keep programs and data flowing into and out of the computer to keep the CPU busy. For example, if a Job and its associated data were being read in through the card reader, MCP would occasionally interrupt the CPU to fire off another card read instruction to the Exchange, which would not interrupt MCP again until the read instruction had been completed. Since the card reader's top speed was 1,000 cards per minute, that would be at least 1/1000<sup>th</sup> of a minute, or 60 milliseconds, during which a hard-working Stretch CPU could execute about 36,000 instructions, give or take a few thousand.

MCP had its own versions of LookAhead, although they went by other names such as “Job Control I” or “SPOOL” (Simultaneous Peripheral Operations OnLine). The point of these MCP functions was to look ahead at Jobs waiting to be ushered into Stretch core storage. It might be a few minutes or hours before these Jobs would run, but MCP endeavored to have everything (principally, reels of magnetic tape) ready at the starting bell.

Another important MCP feature that helped the CPU to keep busy was its capability to move programs and data to successively faster, more accessible storage media. Consider the example of a STRAP program earlier in this segment. The program moved through the following media stages:

<b>Medium</b>	<b>Characteristics</b>
Paper	Inexpensive, flexible, not machine-readable in the 1960’s
Punched Card	More expensive than paper, flexible, readable by both people and machines, sequential access, bulky, slow transfer rate into Stretch core storage
Magnetic Tape	Machine readable only, sequential access, transfer rate 30 times faster than punched cards, removable, compact storage
Disk*	Random access, more expensive than tape, transfer rate 20 times faster than tape, not removable, subject to access delays up to about 200 milliseconds
Core Storage	Random access, no access delays, most expensive medium, and the only one with direct access to the CPU

\* The program would have been put on the disk if it was used frequently but was too big for core residency.

Stretch customers’ data assuredly went through similar media progressions in the 1960’s, before data collection automation, electronic instrumentation and microprocessors became ubiquitous. MCP was there, ready to take data through appropriate media so the CPU would never (well, hardly ever) be kept waiting.

Lastly, MCP’s Interrupt Handler was an essential tool for keeping the CPU busy. I don’t recall much about it, except that it was always resident in core storage and it was really efficient.

### **Miscellaneous Recollections**

MCP in total had some 35,000 lines of assembler code (12 boxes of cards). It was sometimes necessary to assemble the whole of it in one STRAP run. To ensure that there were no inadvertent replications of symbolic names (a grievous “syntax” error), each programmer had a designated one-letter prefix with which to begin names in his or her own programs. By the time I started work in Poughkeepsie (August 1960), the letter “K” had already been reserved for Roger Kahng, so I had to make do with some other letter. But I cannot for the life of me remember what that letter was.

Documentation of software, explaining how it works, is utterly critical to its maintainability and to management flexibility in reassigning programming staff. Despite its importance, documentation is seldom done thoroughly or well. An MCP tenet was “Sound documentation begins with the source code.” (“Source code” refers to the STRAP instructions.) That meant comments, which were English language explanations of what the source code was intended to accomplish. Comments were placed off to the right of Strap instructions and symbolic names, and began in column 30 or 40 or thereabouts of the punched card. They could also occupy columns 2-72 of a “comment card,” provided the programmer put the proper letter in column 1. (I think the letter was a “C.”) Columns 73-80 of the punched card were reserved for identification and sequence numbers.

The quality of comments varied hugely from programmer to programmer.

Some wrote comments on every instruction line, often paraphrasing the instruction itself. Example: for the earlier STRAP illustration, "LOAD TAXRATE," the comment to the right might read "LOAD THE TAX RATE INTO THE ACCUMULATOR." These programmers were diligent, but their comments were not very helpful.

Other programmers wrote no comments at all. In one memorable case, a pristine expanse of ghastly blank space ran down endlessly through the center of page after page of the printed listing of the author's MCP program. Fortunately, the author was a brilliant programmer whose code was efficient and error-free.

There were a few programmers whose diligence and literacy yielded comments that were paradigms of clarity. Comments appeared at the beginning of each program segment and at critical junctures. They were crisp and explanatory at a higher level than the code itself. I recall Jack O'Connell's comments as being especially lucid.

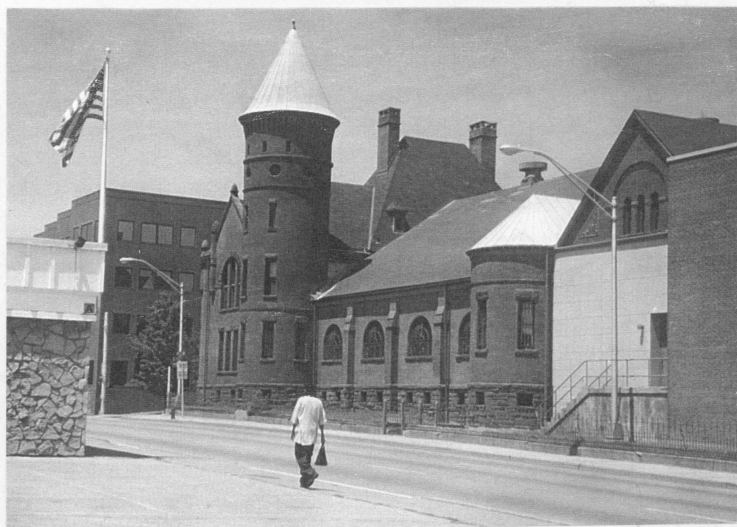
### **The Instruction Set**

A kid in a candy store may have had more fun than an MCP programmer, but it would have been a close call. The Stretch instruction set was so extensive and powerful. This Software Recollections segment concludes with a list of Stretch instructions, 160 in all. Awesome. (See the page following this one.)

### **Reflections from the Vantage of 2002**

Programmers in Poughkeepsie spent a lot of time waiting: for their keypunching to come back to them, for their jobs to be run and for their printed output to be printed and sent back to them. All this waiting was OK as long as the resulting code kept the Stretch CPU busy. Stretch computer systems were priced at \$13,500,000. If you could rent one, the annual rent would have been about three million dollars. (Even at Tom Watson's sale price of \$7,780,000, annual rent would have been almost two million dollars.) Programmers back then could be rented for less than \$10,000 a year, so economics dictated that the computer be kept busy and programmers kept waiting, rather like patients in the waiting room of a busy doctor.

Today, the average person using a computer costs at least \$30,000 a year, often much more. A personal computer can be had for an annualized cost of less than \$500. The economic equation has been stood on its head. Most of us don't wait for our computers any more. They wait for us. And we don't mind that their CPU's are idle most of the time.



For an unremembered period including most of 1961, Stretch and Harvest software was developed in a building behind the armory shown at left. This location, at the corner of Church and Market Streets in downtown Poughkeepsie, came after the 2<sup>nd</sup> floor of the Education Building in the IBM South Road campus and preceded the 705 building in the same campus.

The little stairs at the right were where we stepped up to the challenge of writing software for Stretch. Harvest developers were on the 2<sup>nd</sup> floor. They kept us 1<sup>st</sup> -floor Stretchies in the dark about their mission.

The photo left was taken in July 2002.

# The Complete 7030 Stretch Instruction Set

## Alphabetical Listing of Operation Codes

<u>Mne- monic</u>	<u>Name</u>	<u>Mne- monic</u>	<u>Name</u>
+	Add	L	Load
+	Add	L	Load
+MG	Add to Magnitude	LC	Load Count
+MG	Add to Magnitude	LCI	Load Count Immediate
-	Subtract	LCV	Load Converted
-	Subtract	LF	Load Field
-MG	Subtract from Magnitude	LFT	Load Factor
-MG	Subtract from Magnitude	LFT	Load Factor
*	Multiply	LOC	Locate (same as Select Unit)
*	Multiply	LR	Load Refill
*+	Multiply and Add	LRI	Load Refill Immediate
*+	Multiply and Add	LV	Load Value
*A +	Multiply Absolute and Add	LVE	Load Value Effective
*I +	Multiply Immediate and Add	LVI	Load Value Immediate
*N +	Multiply Negative and Add	LVNI	Load Value Negative Immediate
*N +	Multiply Negative and Add	LVS	Load Value with Sum
*NA +	Multiply Negative Absolute and Add	LX	Load Index
*NI +	Multiply Negative Immediate and Add	LTRCV	Load Transit Converted
/	Divide	LTRS	Load Transit and Set
/	Divide	LWF	Load with Flag
B	Branch	LWF	Load with Flag
BB	Branch on Bit	M +	Add to Memory
BB1	Branch on Bit and Set to One	M +	Add to Memory
BBN	Branch on Bit and Negate	M + 1	Add One to Memory
BBZ	Branch on Bit and Zero	M + A	Add to Absolute Memory
BD	Branch Disabled	M + MG	Add Magnitude to Memory
BE	Branch Enabled	M + MG	Add Magnitude to Memory
BEW	Branch Enabled and Wait	M -	Subtract from Memory
BR	Branch Relative	M -	Subtract from Memory
BZB	Branch on Zero Bit	M -1	Subtract One from Memory
BZB1	Branch on Zero Bit and Set to One	M -A	Subtract from Absolute Memory
BZBN	Branch on Zero Bit and Negate	M -MG	Subtract Magnitude from Memory
BZBZ	Branch on Zero Bit and Zero	M -MG	Subtract Magnitude from Memory
C	Connect	NOP	No Operation
C + 1	Add Immediate to Count	R	Refill
C - 1	Subtract Immediate from Count	RCZ	Refill on Count Zero
CB	Count and Branch	RD	Read
CBR	Count, Branch, and Refill	REL	Release
CBZ	Count and Branch on Zero Count	REW	Rewind
CBZR	Count, Branch on Zero Count, and Refill	RNX	Rename
CCW	Copy Control Word	R/	Reciprocal Divide
CM	Connect to Memory	SC	Store Count
CT	Connect for Test	SEOP	Suppress End of Operation
CTL	Control	SF	Store Field
CV	Convert	SHF	Shift Fraction
D +	Add Double	SHFL	Shift Fraction Left (same as SHFA)
D + MG	Add Double to Magnitude	SHFR	Shift Fraction Right (same as SHFNA)
D -	Subtract Double	SIC	Store Instruction Counter If
D - MG	Subtract Double from Magnitude	SLO	Store Low Order
DCV	Convert Double	SNRT	Store Negative Root
DL	Load Double	SR	Store Refill
DLWF	Load Double with Flag	SRD	Store Rounded
D*	Multiply Double	SRD	Store Rounded
D/	Divide Double	SRT	Store Root
E +	Add to Exponent	ST	Store
E + AI	Add Absolute Immediate to Exponent	ST	Store
E + I	Add Immediate to Exponent	SU	Select Unit (same as Locate)
E -	Subtract From Exponent	SV	Store Value
E - AI	Subtract Absolute Immediate from Exponent	SVA	Store Value in Address
E - I	Subtract Immediate from Exponent	SWAP	Swap
EX	Execute	SWAPI	Swap Immediate
EXIC	Execute Indirect and Count	SWAPB	Swap Backward
F +	Add to Fraction	SWAPBI	Swap Backward Immediate
F -	Subtract from Fraction	SX	Store Index
K	Compare	T	Transmit
K	Compare	TI	Transmit Immediate
KC	Compare Count	TB	Transmit Backward
KCI	Compare Count Immediate	TBI	Transmit Backward Immediate
KE	Compare If Equal	V +	Add to Value
KF	Compare Field	V + I	Add Immediate to Value
KFE	Compare Field If Equal	V + C	Add to Value and Count
KFR	Compare Field for Range	V + CR	Add to Value, Count, and Refill
KLN	Check Light On	V + IC	Add Immediate to Value and Count
KMG	Compare Magnitude	V + ICR	Add Immediate to Value, Count, and Refill
KMGR	Compare Magnitude for Range	V - I	Subtract Immediate from Value
KR	Compare for Range	V - IC	Subtract Immediate from Value and Count
KR	Compare for Range	V - ICR	Subtract Immediate From Value, Count, and Refill
KV	Compare Value	W	Write
KVI	Compare Value Immediate	WEF	Write End-of-File
KVNI	Compare Value Negative Immediate	Z	Store Zero

## Impact on Us

The computer industry was profoundly affected by Stretch's innovations, many of which were adopted in IBM's System/360 and subsequent products. Equally strong for a number of us was the Stretch project's impact on our lives. Here are responses to an engaging survey question:

**“What impact, if any, did the Stretch experience have on you and your life's trajectory?”**

The friends I developed there were more influential than any other life influence outside of my parents – more than high school, or college friends or teachers; more than all later jobs combined.

**Charlie Allen**

I used things I learned on Stretch for almost 30 years.

**Stanley Anderson**

First real management experience and an opportunity to work closely with engineering, which occurred often in later jobs.

**Tom Apple**

Another success story in my IBM systems endeavors and career.

**Chester Baccari**

Focused attention on alternatives to phrase structure grammars, especially for parsing 2-D expressions. Impressed me with how quickly a computer could do relatively complex things if one did not refrain from attempting them because they were “inefficient.”

Impressed me with the utility of forcing computers to communicate in language patterns native to people, rather than forcing people to communicate in language patterns native to machines.

Laid foundation for understanding programs as inherently graph-theoretic, rather than textual, artifacts.

**Karl Balke (LASL)**

Stretch was a fantastic start. It was like going to the moon. Many challenges. Many long hours. A lot of excitement. A lot of joy.

**Orest Bedrij**

The most obvious impact of Stretch to me was assignment to Control Program Development for OS/360, which in turn was an education in large software development project management (how not to?).

**Leo Bennett**

IBM defined for me a way of professional excellence in analyzing a project.

**Lucy Ann Berry**

Very valuable. What to do and what not to do in Computer Architecture, see Buchholz: “Planning a Computer System” and Blaauw and Brooks: “Computer Architecture” Chapter 13, section 3

**Gerrit Blaauw**

Good experience for supercomputer design and components

**Erich Bloch**

Stretch has always lived in my memory as one of the most interesting, challenging, rewarding and enjoyable from a people standpoint. There were none better.

**Bob Blosk**

It confirmed me as a professional computer architect.

**Fred Brooks**

I found that smaller is better. Both before and after Stretch, I enjoyed working on smaller products in total, circuits and logic, plus system debug.

**George Bruce**

The Stretch and indeed the whole IBM experience was a unique and wonderfully formative time in my life. I took advantage of the marvelous IBM-Syracuse Masters Program in Math in addition to my Stretch duties. As a research mathematician, the understanding and computing ability that I got from the Stretch project have been invaluable.

**Bruce Chalmers**

My tenure at Project Stretch was pivotal to me, as I became strongly interested in the architecture of supercomputers and the pipelining principle.

**Tien Chi Chen**

Working on Stretch left me with totally unrealistic expectations about how interesting and exciting a career working for a corporation would be.

**Bill Collier**



The people I met and respected provided the model by which I sought excellence in my entire career.

**Carl Conti**

Challenging assignment to get the memories working!

**Ed Council**

The lessons ... learned from the Stretch project included technical excellence in programming ... and how to deal with adverse situations.

**Walter Doherty**

The Stretch experience did have a great impact on my life's trajectory! My Stretch experience of coordinating with engineers and developing solid state components to meet their needs qualified me to direct groups in applied research in other high-tech companies. Also, enduring the problems of others taking credit or plagiarizing my successes made me realize the hurt feelings and that I should apply the "Golden Rule" when dealing with personnel and crediting or rewarding them for their contributions and creativity. It also made me search into why such things happen, and how to be alert and avoid them. I found that the Bible had the history of such problems and that, if followed, it was the roadmap for a successful and happy life. This led me and my family to accept Jesus Christ as our Savior. And this has given me "The Peace that Passeth Understanding"! I find that God has helped me with my successes in research and development and my life has more meaning when serving Jesus and doing God's work.

**Barlane Eichbaum**

Without it I would be an "also ran." **John Fairclough**

I thoroughly enjoyed my programming experience on Stretch and Harvest, which made every other programming assignment seem not nearly as enjoyable.

**Richard Gowetski**

Working on Stretch software enabled me to continue software development work and consulting for the remainder of my career.

**Larry Grodman**

In joining the Stretch effort, I entered the universe of software development and research at a perfect time, leading to a stimulating and engrossing career.

**George Grover**

Stretch was my start in infrastructure software.

**Ann Hardy**

I learned how a large, well-run company worked. Made lasting and useful friends.

Learned more about computer design. **Norman Hardy**

After my first trip to the BuShips installation and the polygraph, the die was cast. From then on it was spooky accounts for me ... for the rest of my career I was involved in classified data processing applications. The only exception was the one year of social leave to the minority business development group.

**Dick Hatch**

Set me on the course of operating system development (not language or applications)

**Jim Havender**

He enjoyed his IBM experience and was certainly there at the best of times.

**For Bill Heising by his wife Barbara**

I learned a lot about corporate politics **Paul Herwitz**

Better to reach for the stars and only get halfway there, than to only reach as far as your arm.

**John Hipp**

Some great and lasting friendships. Increased my desire to travel and experience other parts of the USA. Probably sowed the seed for our eventual move to San Jose.

**Dick Holleran**

My first machine was the IBM 704. Discovering the Stretch architecture was like Dorothy opening the door into Oz. Bit addressing, instruction look ahead, asynchronous I/O, were but a few of the amazing features of this behemoth. The 7030 stretched my cyber imagination. Later machines, though faster and more capacious, never impressed me as much. I am writing this on a Dell Pentium 4 running at 1.6 GHz, with a 40 Gig hard disk, a color monitor, mouse, an Ethernet card connected to the Internet via a 1 Megabit DSL line. Ho Hum.

**Larry Josephson**

It was the start of a very satisfying career. It made me realize that I liked the work I was doing, and I was good at it, and I liked working for IBM.

**Phil Joslin**

It taught me the techniques of managing a large, complex engineering effort with multiple disciplines. **Larry Kanter**

The Stretch experience demonstrated the effectiveness of a close-knit group in meeting [its] objectives. **Gordon Kerr**

The Stretch experience gave me a shot of self-confidence – in my capacity to learn, to adapt and to live by my wits. It also convinced me (rightly or wrongly) that developing code was exacting and highly consuming work for which, despite a good aptitude, I would be temperamentally unsuited over the longer haul. The most tangible impact of Stretch came later, from personal connections. In 1967, Jack O'Connell, Gul Hira and Sully Campbell provided me a pivotal opportunity – to play an entrepreneurial role in a startup business. **Eric Knutsen**

Stretch had an impact on my career mainly through the interaction with many great people that I met while working on the project. The bright young people that were attracted to IBM went on to design many future machines and software. They bubbled up throughout the computer industry. These contacts proved very important to me. **Harwood Kolsky**

The Stretch experience was good background for other engineering endeavors. **Robert Kuenstner**

Long range friendships with the members of the Stretch development groups, many of which continue to today. **Richard Lamy**

IBM provided an excellent opportunity for learning. Since many of us were new college grads in our first real job, far from home, the Stretch project provided the framework for many lasting friendships and many, many fond memories. Working on Stretch and Harvest also spoiled me, because I wanted to work on nothing but leading edge technology for the rest of my life. **Chris Larson**

Early on, my [Stretch] experience helped me to organize the management of large computer based management information systems efforts for effective execution of project missions. Later on, I had a direct impact ... in bringing a computerized

reservation system into being for the worldwide company operations. **Walter Leach**

I stayed in computer design and test until 1969. **Sydney Lindauer**

Major impact! The large system experience that started on Stretch (and passed by way of 604 and 360 Model 91), got me a move to California in '68 on the ACS project. (Getting to California with IBM was a major objective after returning to Poughkeepsie from Stanford in 1961.) And from California I had great IBM foreign assignments to Paris (1973–1975) and London (1985–1988). Living in those great cities was a tremendous experience, and it fueled our enthusiasm for travel in retirement. **Robert Litwiller**

It led to some excellent opportunities to spend a year at MIT and to develop compiler optimization techniques. **Ed Lowry**

Established some life-long friendships. Detailed simulation work gave me credentials needed to re-enter (in '79) a vastly changed software industry in which most had no knowledge of machine language/operations. **Leslie Lowry**

Confidence to manage complex projects and interact directly with customers **Dick May**

My Stretch experience was a great advantage to me. As a sales guy I was always involved with large complex system environments. As result of my technical background, I was always comfortable dealing with the customer's systems guys who traditionally make life miserable for marketing folks. **Jack McBride**

Enabled me to get overseas and to California, both dreams of mine since my formative years **Bob McConnell**

Thanks to Sully [Campbell] and George [Grover], I got the opportunity to work and live in Europe for six wonderful years. Give me a chance and I will do it AGAIN!!! **Marjorie Merritt**

Set the stage for the future **George Mine**

Nothing surpassed the peaks of satisfaction of the 7090 Ballistic Missile Early Warning System, (BMEWS) and Stretch/Harvest Deliveries.

**George Monroe**

I married a person I met there. I think it cultivated in me a liking for systems design work and large systems concepts

**Barbara Call Myers**

Oh, what a place to start! (Like a rocket launch)

**Tom Myers**

Introduced me to the use of transistors for many applications

**Ernest Newman**

Stretch introduced me to the business of architecture design and the principles of what constitutes good machine architecture – precision, completeness, consistency, mutual integration of all machine functions, and integration of the machine with system software – and I have attempted to impart these principles and the tradition to honor these principles in the architectures and organizations with which I have been associated in the subsequent years. I hope that this has helped extend the life of the S/360 line of machines. But, of course, it also helped the Japanese build their machines to this architecture.

**Andris Padegs**

Mostly wide and continuing contacts in IBM.

**Sam Patton**

It's hard to imagine a better preparation for a career in technical project management.

**Gerry Paul**

Gained experience

**Stan Pitkowsky**

The most I can say is that my compiler experience made me very comfortable about doing architecture.

**Ken Plambeck**

The major impact of the Stretch experience was meeting Ken Iverson and getting interested and later involved with APL. APL became my major focus for the rest of my professional career. It still is.

**Ray Polivka**

I saw the importance of a computer that is always available, never down for maintenance.

**Jim Pomerene**

Emphasized the importance of high quality hands-on project management.

**Robert Ramey**

The Stretch experience is the root of the trajectory of my professional experience.

**Harry Reinheimer**

Well, it almost got me out of the IBM Company at an early age as I related earlier. But at the same time, it offered me the chance to go to the IBM Systems Research Institute, which was an eye opening experience for someone out of the labs. I learned a lot about the computer business that you never get exposed to in the labs.

**Russ Robelen**

Clarified my desire to be involved in real time programming projects, time-sharing, and communication system design.

**Bob Rockefeller**

Emphasizing the human factor in the product development equation for project success

**Joe St. Germaine**

Provided the enhanced programming, test and documentation skills for the rest of my career.

**Lee Scott**

Who knows what affects one's future?

**Elmer Sharp**

Much of my IBM career was involved or was influenced in some way by microprogramming.

**Jim Shelly**

The dedication of the whole team associated with the Stretch program set a model for me that I used through the remainder of my IBM career.

**Richard Siebold**

Many people from the Stretch project had an important impact on my career at IBM ...

Special thanks to Fred Brooks, who always had a plan and a rationale, but was never too busy to listen to (and understand) suggested improvements. Fred could explain your idea better than you did yourself, even when he decided to reject it. Thanks to Gerrit Blaauw, for his humility and ability to turn complexity into simplicity; Ray Polivka, who taught me APL; Bill Collier, who taught me everything I know about multiprocessing interaction; and Ken Plambeck, who has kept up the tradition of precise documentation as long as I have. Thanks to Werner Buchholz for the chapter

“Fingers or Fists,” in the Stretch Anthology. Werner put up with me for many years, retired three times, and then had to come back when we could not get the job done without him. Also, thanks to the following, who have personally managed (nurtured, mentored, and goaded) me in spite of my resistance: Dick May, Bob Perry, Jack Garrity, Claud Davis, and Doug Calvert. Finally, special thanks to Andris Padegs, my manager for over twenty years and from whom I learned more than [from] all the rest. Sometimes it was hard to understand what he said, but no one could write any clearer. **Ron Smith**

Stretch was my first project at IBM as well as my introduction to computers and programming. I thoroughly enjoyed the experience and stayed in the computer business for the duration of my career. **Ron Staheli**

I learned that if a job becomes intolerable, it's probably not entirely my fault. **Charlie Strauss**

I observed that putting an extra feature into hardware for faster execution of the feature might, in turn, result in slower overall computer throughput. There is a principle here that subtly applies to fields other than computers. (Thank you, Stretch, for helping me think better). **George Swift**

My brief experience with the engineers on the Harvest project fired a desire to work on the cutting edge of technology. I was fortunate to realize my goal throughout my career, and was privileged to work on many exciting products with some of the finest engineers and managers in the industry. **Richard Toepfer**

I guess I liked designing machines. I did it for the next 35 years. **Stuart Tucker**

Started me on the way to all of the above. [See page 142 for Bob's biography.] **Bob Webster**

My Stretch experience did have quite a profound impact on my later accomplishments, where what I learned on Stretch worked to my benefit; however, the times when I realized too late that I had overextended myself perhaps could also be traced to a mindset conditioned by the Stretch experience. **Herb Wild**

Stretch set the direction for my career path in IBM because most of my work was in the area of hardware oriented programming. **Russell Wilmot**

It was a great start. **Hannon Yourke**

## Alumni(ae) Biographies

Here we present biographies of 125 Stretch and Harvest project staff as submitted in response to our reunion survey. Most of the staff worked for IBM and primarily in Poughkeepsie. There are four IBMers whose base was Kingston. Los Alamos and Mitre Corporation account for the non-IBM affiliations.

“Biographies” is perhaps a poor choice of words. “Questionnaire Responses” would be more accurate, although less descriptive. Some of you were succinct to a fault; we would like to have heard a bit more from you. Others of you took this opportunity to begin a memoir.

No matter. We didn’t pester you for more details, and hardly ever did we cut material from your submissions. Our editing, to borrow an environmentalist phrase, “rested lightly” on your text. We edited for clarity, format consistency and conventional spelling, punctuation and grammar.

The questionnaire we sent you is shown below, in compacted format. Responses to the questions in italics are reported in other sections of this book, because we judged those responses to be of interest to all readers.

### Reunion Questionnaire

#### A. About you and your family ...

- A1 Your name \_\_\_\_\_ Spouse’s name \_\_\_\_\_
- A2 Your place and date of birth
- A3 Education (degrees, fields of study)
- A4 Number of children
- A5 Number of grandchildren

#### B. Stretch/Harvest (hereafter, “Stretch”) and you ...

- B1 What were you doing immediately prior to working on Stretch? (e.g., job, school, military)
- B2 Who hired you into the Stretch project?
- B3 Which location?  
What kind of work? (e.g., Engineering, Software, Management, etc.)  
Organization? (IBM, LASL, AWRE, Naval Weapons Lab, Mitre, Weather Bureau, etc.)  
Length of employment there? First Year \_\_\_\_ Last Year \_\_\_\_ Still there \_\_\_\_
- B4 What were your principal roles, duties on Stretch?
- B5 Your manager(s)?
- B6 How long on Stretch? First Year \_\_\_\_ Last Year \_\_\_\_
- B7 Your worthiest Stretch accomplishment(s)?
- B8 *Fond and/or vivid memories of persons, events?*
- B9 *Personal anecdote(s)?*

See “Memories,” pp 20-26 of this book  
See “Stories,” pp 34-43

#### C. After Stretch ...

- C1 What did you do after Stretch? Later in life?
- C2 *What impact, if any, did the Stretch experience have on you and your life’s trajectory?*  
See “Impact on Us,” pp 51-55
- C3 Honors, awards, boards, publications, etc.?
- C4 Present activities and interests?
- C5 *Anything else you’d like to tell us?*  
See “Closing Remarks,” pp 148-152

The next page lists the names of the 125 alumni(ae) who responded to the questionnaire.

## Responders to Reunion Questionnaire

(Unless otherwise noted, all responders worked in Poughkeepsie for IBM)

<b>A</b>	<b>F</b>	<b>L</b>	<b>R</b>
Fleming Alexander	John Fairclough	Dick Lamy	Sam Raker
Charlie Allen	Philip Fox	Chris Larson	Bob Ramey
Gene Amdahl	<b>G</b>	Roger Lazarus (L)	Harry Reinheimer
Stanley Anderson	Frank Gagliano	Walter Leach	Russ Robelene
Jim Andrada	Carol Garrity	Ed Lilienborg	Bob Rockefeller (K)
Tom Apple	Jack Garrity	Sydney Lindauer	Ed Rodgers
<b>B</b>	Dick Gowetski	Robert Litwiller	<b>S</b>
Chester Baccari (K)	Larry Grodman	Ed Lowry	Joe St. Germaine
Karl Balke (L)	George Grover	Leslie Lowry	Cas Scalzi
Orest Bedrij	<b>H</b>	<b>M</b>	Lee Scott
Leo Bennett	Ann Hardy	Marla Orr MacKenzie	Elmer Sharp
Lucy Ann Berry	Norman Hardy	Bob Manente	Jim Shelly
Gerry Blaauw	Dick Hatch	Peter Markstein	Richard Siebold
Erich Bloch	Jim Havender	Richard May	Ronald Smith
Bob Bosk	Mike Haynes	Jack McBride	Ron Staheli
Fred Brooks	Bill Heising (sp)	Bob McConnell	Charles Strauss
George Bruce	Paul Herwitz	Marge Merritt	Dura Sweeney (w)
Werner Buchholz	John Hipp	John Miller	George Swift
<b>C</b>	Ed Hofler (K)	George Mine	<b>T-U-V</b>
Bruce Chalmers	Dick Holleran	George Monroe	Richard Toepfer
Marilyn Charap	Lloyd Hunter (sp)	Barbara Call Myers	Ken Tooker
T.C. Chen	<b>J</b>	Tom Myers	Stuart Tucker
Bill Collier	Thomas Jordan (L)	<b>N-O</b>	Sherman Uchill
Carl Conti	Larry Josephson	Ernest Newman	Ed Voorhees (w, L)
Bob Cornelli (M)	Phil Joslin	Leo Notari (K)	<b>W</b>
Ed Councill	<b>K</b>	Jack O'Connell	Al Walker
David Crawford (w)	Larry Kanter	<b>P</b>	Bob Webster
<b>D</b>	Chester Kazek (L)	Andris Padegs	Ronald Weiss
Claud Davis	Gordon Kerr	Sam Patton	Jack Wenner
Walter Doherty	Eric Knutsen	Gerry Paul	Donald Whitmore
Clarke Dowling	Harwood Kolsky	Stanley Pitkowsky	Herb Wild
Steve Dunwell (w)	Robert Kuenstner	Ken Plambeck	Russell Wilmot
<b>E</b>		Ray Polivka	Bill Wright
Robert Eibsen		Jim Pomerene	Leon Wun
Barlane Eichbaum		Sherm Prosser	<b>Y</b>
Maurice Every (w)			Lim Yee
			Hannon Yourke

### Notes:

- w – widow response
- sp – spouse response
- K – Kingston IBMer
- L – Los Alamos staff
- M – Mitre Corp. staff

**F. E. "Al" Alexander**

A2 Fayetteville, West Virginia; 17 December 1926

A3 AB in Math/Physics, BEE, MEE

A4 None

B1 Had recently been assigned to EDS at the Lab Annex

B2 Sullivan G. Campbell

B3 Poughkeepsie, Software, IBM, 1955 to 1989

B4 Harvest diagnostic programming

B5 Clarke Dowling, who reported to Sully Campbell

B6 Do not recall

B7 Plaudits from and a promotion by Sully Campbell

C1 Wrote a simulator of NPL (later, System/360) on Stretch, under Sully, so that the being-defined OS could be run and tested on the being-defined NPL, and then into mundane assignments

C4 Retirement and retirement

**Charlie A Allen**

Shirley C Allen

A2 Bairdford, Pennsylvania, 25 April 1933

A3 BSEE, University of Pittsburgh 1956; MSEE, Cal Tech 1961; PhD EE, Stanford 1966

A4 Seven: four boys and three girls

A5 15 plus one on the way

B1 Attending Pitt as an undergraduate; graduated June 1956, joined IBM June 1956, joined Stretch December 1956

B2 Bill Lawrence was my immediate Memory Group Manager when I joined his group, but he had no real influence on the decision. The project needed warm bodies, and we were "selected" for him.

B3 IBM Poughkeepsie; initially at Boardman Road, Engineering - Memory Development; drive circuit design, 1956-1968 (12 ½ years)

B4 Design of Core Memory drive circuitry

B5 Bill Lawrence, Phil Fox, Don Hallock, Del Elder, Mo Every, Phil Lincoln

B6 1956-1960

B7 Successful development of drive circuitry for Half Microsecond ( Freon Cooled ) and Two Microsecond Main Memories ( PCB Oil Cooled and Air Cooled )

C1 Worked on other IBM memory products, left IBM in 1968 to join Cogar Corp. Later in life, moved to the San Francisco Bay area, operated my own design shop doing contract chip design; retired in 1992 to enjoy life with my wife and our grandkids.

C4 Fiction writing, restoring the American Chestnut tree through cross-breeding, travel

My name is **Gene Amdahl**, my wife is Marian and I have three children.

A2 [South Dakota, 1922]

A3 I have a PhD in theoretical physics from the University of Wisconsin at Madison. My thesis was the design of the WISC, a Magnetic drum computer that featured floating point and overlap of pipelined instruction execution for four instructions concurrently.

B1 This design came to the attention of IBM and they hired me into Poughkeepsie in June 1952. My boss during my stint with IBM was Nathaniel (Nat) Rochester. My earliest work was on simulation of neural networks modeled on a description proposed by Professor Hebb in Quebec.

## Gene Amdahl (Cont'd)

This [work] did not produce results of sufficient interest, so we went on to character recognition utilizing an approach called lakes and bays. This was very successful, but responsibility for character recognition was transferred to Endicott immediately after we demonstrated. I was then given the responsibility to upgrade the 701 to include floating point, since I had experience in that area. I also included indexing, which I discovered could be fitted into the machine's data referencing cycle with no cost in time.

We also were the first to use magnetic core memory. The resulting machine was the 704, a very successful machine financially, as well as its use in the engineering and scientific world. I had also conceived of a number of other innovations that could be introduced, the most significant of which was the I/O channel, for which I never got credit, [because I left] IBM before it was introduced in the 709. The additional innovations were to be included in an upgrade to the 704, and I had the responsibility to define the complete repertoire. The I/O channel, however, was a sufficiently large change that Scientific Marketing under Dr. Cuthbert Hurd would have to bless it.

B4 At this time (late November 1954), I was asked by Nat Rochester to take on the additional responsibility of planning a very powerful new scientific computer to be called Stretch, which would employ the new technology – transistors. I was delighted, and in December I got together with John Backus, the developer of FORTRAN to make certain it would properly exploit compilers. We came up with a word length of 48 bits to provide a more useful floating point precision, and we agreed that we could introduce pipelined instruction execution, including a capability for look-ahead to minimize branching delays without complicating the compiler.

I then went and got the technology capabilities from the developers, Fred Buelow and John Zasio. Their description of the technology was really exciting, they were developing Emitter-Coupled circuits which had unusually fast switching and powerful driving capability! In addition, they provided both true and complementary outputs, so the logic design would be simpler and have somewhat [fewer] levels. (After Stretch was completed I learned that the true and complementary logic outputs weren't feasible and that the impedance of the base was such as to cause 'ringing' and magnetic memory cores had to be strung on the inputs to the bases to solve the problem.)

Using the input from the technology developers, I did the logic design of the arithmetic circuits to determine the approximate cycle time for the machine. I also checked the performance on a number of selected computations to determine the effect of the look-ahead. The results were exciting, for the look-ahead appeared to produce nearly 30% reduction in execution time!

I was then ready to make a presentation to management, and that resulted in being asked to present to the Livermore Laboratory, which I was told had probably already committed to contract with Sperry Rand for a super computer. I never learned whether that was so, but my presentation didn't win a contract there. I was next sent to Los Alamos to present and this [presentation] did result in a contract for Stretch.

At this time I was concerned that the time was running out for getting the [I/O] channel included in the 709 project so I turned my attention to that. I got together with Elaine Boehm and we mulled over the possible demonstration that would be most convincing to Dr. Hurd. We came up with a multi-tape sort, for we felt this would demonstrate the value of not having to move the data records but only the channel control blocks. We programmed the sort and found it so effective that it could perform enough faster than the Sorter-

### Key:

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities



### **Gene Amdahl (Cont'd)**

Collator, the 703, which IBM had developed for the US Treasury, to be able to do it at a lower cost than the 703, even though the expected price of the 709 would be much higher! This demonstration had the desired impact, and the channel became part of the 709 project.

I was then ready to return to the Stretch, which I then planned would also utilize the channel. It was now about June 1955, and I was surprised to be informed that 'Red' Dunwell was to be introduced into the Stretch project. It soon became clear to me that Dunwell thought of himself as being 'in charge' of the project. No one informed me that I was no longer in charge, but I found the situation very unsettling, particularly when he insisted that the front end of Stretch should be separable and be a commercial computer and the back end provide the scientific capability.

I looked that possibility over and concluded there was no way to include look-ahead successfully and meet the cost constraints of the commercial front end, and as well, if the front end were separable the look-ahead would not be nearly as effective for the scientific computations. I could not engage Dunwell in a detailed discussion of my findings, for he seemed so completely convinced this was the only way to do it.

In retrospect I felt he probably thought management might not remain committed to sole scientific product if the much larger commercial market was not addressed, but I never had the chance to explore that with him. At this time (November 1955), I was summoned to a meeting with the Poughkeepsie lab manager, Bud Beattie, and found that the only attendees were Beattie, Nat Rochester and me. The subject of the meeting was a reorganization of the lab structure – to be a matrix organization rather than a project organization. The various functions, such as circuitry, memory logic design, etc., were the columns and the various projects were the rows, all concerned with Stretch. Red Dunwell was to be in charge of system specification column and I was in that column at the row involving logic design. I was mortified, but kept my feelings as concealed as I could.

When they asked for my reaction, I said I had to think about it. As I drove back to my office I had made up my mind. I wrote out my resignation, effective mid-December, and went home and called Ramo-Wooldridge, asking if they would be interested in hiring me. They responded immediately, and we agreed to start me on the first Monday in January. I spent my remaining time [at IBM] working with Elaine Boehm and John Griffith recording as much of the plans for Stretch as we could in that time. It was the most intensive four weeks I have ever experienced, and I think it was for nought!

That is the extent of my Stretch experience!

C1 [Editor's notes: Gene Amdahl returned to IBM in 1960 and was an architect of the System/360 product line. He later was named an IBM Fellow, and briefly headed IBM's Advanced Computing Systems Laboratory in Menlo Park, California.. (He recommended the lab be shut down, which IBM did.) In 1970 he founded Amdahl Corporation in Sunnyvale, California. From an Internet biography: "His plan was to compete head-to-head with IBM in the mainframe market. Most industry analysts considered this to be career suicide and gave his start-up company very little chance of surviving. But survive it did, and actually prospered." Amdahl went on to found three more companies: Trilogy Systems (now part of Elxsi Corporation), Andor Systems, and Commercial Data Servers (CDS).]

**Stanley F. Anderson**      Maureen

A2 Brattleboro, Vermont; June 6, 1931  
A3 BSEE, University of Vermont, 1954  
A4 Four  
A5 Four

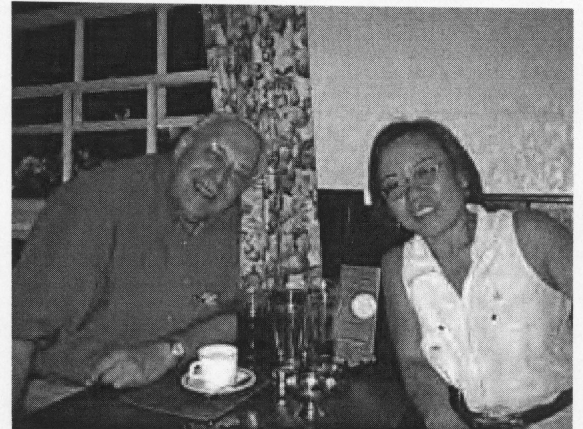
B1 IBM 705 Core memory development, 1954-55; U.S. Army artillery: AA Fire control system technology, 1955-57  
B2 Dick Merwin  
B3 Poughkeepsie, Engineering, IBM, 1954-1984  
B4 Logic design, portions of I-Box; designed the index arithmetic unit and checking, and branch controls  
B5 Robert T. Blosk and Ernie Foss  
B6 1957-1960  
B7 Development of logic design to reduce the delay through arithmetic and other functions so as to achieve minimum cycle time.

C1 IBM: Worked on 7090 improvements; System/360 Mod 91 E Box Manager; Parallel processing studies; ACS (Menlo Park, CA) MPM Design Manager; SPS System (Gaithersburg, MD); assisted Systems Manager, Large Systems (Poughkeepsie); Manager, Technology, SDD Communications (SDD HQ, Harrison, NY); Litigation (L.A., San Francisco); Liquid Crystal Display Systems (San Jose, CA).  
Outside IBM: Design Manager at American Supercomputers (a startup in Sunnyvale, CA); Consultant with Palyn Associates (San Jose); Consultant to Ridge Computers (Santa Clara, CA); Consultant to Pyramid Technology (Mountain View, CA).  
C3 Outstanding Contribution Award (IBM) for System/360 Mod 91 E Box management  
C4 Retired in the foothills of the beautiful Sierras of California. I do some hiking and fishing. I like to travel: Europe, Panama, Alaska and all over the U.S. Avid fan of Stanford University, Sacramento Kings, New York Yankees, San Francisco 49ers, San Jose Sharks. [Have] collected music of the 30's, 40's and 50's. Spend lots of time on the Internet.

**Jim Andrada**      Yukie Andrada

A2 Passaic, New Jersey; October 22, 1940  
A3 BA Harvard 1962  
A4 No kids, two monster Great Danes (170lbs and 200 lbs) and one cat  
A5 None

B1 I was working at the Naval Weapons Lab in Dahlgren, Virginia in 1962-63 in the satellite tracking group, then moved to the systems programming group  
B3 I worked on debugging tools for Stretch Fortran



**Jim and Yukie Andrada  
on a recent pub crawl in England**

C1 I later applied to IBM and Burroughs, and interviewed IBM in Poughkeepsie and by chance interviewed with some of the folks I had known when I was at Dahlgren. So I tore up my application to Burroughs and joined IBM just in time to work on OS/360 with Barbara Myers, Ken Tooker, Jack Garrity etc. in 1964.

**Key:**

**Alumnus/a**, Spouse   A2 Birth Data   A3 Education   A4 Children   A5 Grandchildren   B1 Before Stretch   B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer   B4 Role on Stretch   B5 Managers   B6 Years on Stretch  
B7 Worthiest Accomplishments   C1 After Stretch   C3 Awards, Honors, Papers, etc.   C4 Current Interests, Activities

### **Jim Andrada (Cont'd)**

I transferred back to Boston and worked on PL/I, code and go Fortran etc, then joined the IBM services group and spent several years developing customer applications, then moved to White Plains in Airlines Industry Marketing and worked on storage marketing in the reservation system environment. Then I moved to San Jose and did competitive marketing for a while. In the mid 80's I was asked to go to Japan for 90 days to manage a storage announcement for Asia. The 90 days turned into six years, I got married, and to this day our home language is Japanese. We moved back to the US at the beginning of 1993, together with the Great Dane we'd had in our second floor Tokyo apartment. I worked for IBM a couple of more years and retired. Total IBM time = 31 years, all because I worked on Stretch.

I'm still working as a consultant. While I was in Japan I had worked on developing alliances with some of the Japanese companies. I've been representing one of them in a lot of joint development we're doing with IBM in the magnetic tape area.

C4 Work, walking the monster dogs, work, doing what my wife tells me, work, and playing tuba in a couple of community bands (photo at [j-e-andrada.com/xms2000](http://j-e-andrada.com/xms2000))

### **C. Thomas Apple** Dorothy M. Apple

A2 Oaklandon, Indiana November 15, 1931

A3 Degree: BS 1956 Purdue, Math and Physics

A4 Six (5 boys, 1 girl)

A5 14 (11 girls, 3 boys)

B1 Working at MIT Computer Center, where IBM had a small group staffing two shifts of a 704 computer and took on small consulting/programming projects, e.g. we worked with Harvard on Sputnik tracking programs

B2 I forget, maybe Paul Herwitz. I was one of first people hired in programming, with George Grover, in fall of 1958.

B3 IBM Poughkeepsie, Programming, 1958-1987. I'm not sure which building, ended up at High Street.

I left to help institute software product test in 1961 after the Fox Hill programming conference.

B4 I had built a 709 simulator at MIT and was asked to develop one for Stretch, as we didn't expect to get a Stretch machine until late in the cycle. I became the manager of a small programming support group that included machine operators. Later on, as demand for time increased, I recommended and we acquired a 709 to accommodate the demand for simulator time. I ran the machine room as well. Later, I recommended that we take on a shift of Stretch time to help debug Stretch and debug the Stretch software. Later, we also used Stretch time in Kingston, as Stretch manufacturing evolved.

B5 Paul Herwitz

B6 1958-1961

B7 Development of simulator; running of computer rooms. The things I was most pleased with were: 1) A very clever technique in the simulator of taking advantage of the extra 4 bits in the 709 to decode an opcode only once and thereby dramatically speed up the simulator. 2) Simulation of a disk drive on tape, which required developing knowledge about tape processing few people had. 3) Pressing Erich Bloch to let me take over a shift of Stretch, which in the end significantly [accelerated] the debug efforts on the Stretch hardware, using the power of Polaroid photos of the huge console and single stepping up to the point of a hardware bug.



**DPD Applied Science Staff at MIT Compton Lab with 704 Computer – 1957  
L-R; Tom Apple, John Rossini, Dick Hatch, Jack Blackburn, Martin Greenberger**

C1 Went to Product Test for three years, developed Alpha/Beta testing, and developed some hardware for measuring software. Then moved to 360 where I set up a group to develop hardware for measuring 360 software performance. Later, became Programming Center manager in Poughkeepsie (11/65), then same in San Jose, then Lab Tech Ops Manager, then IS manager for GPD, then Manufacturing Test Manager, overseas assignment in Mainz (with some other staff jobs along the way). I retired in 87.

C3 Two patents for hardware. One involved a machine that was used to develop usage data about code execution, which later was used in other projects for hardware performance enhancements. One Outstanding Contribution Award for IS work.

C4 Family. Reading. Observing politics from a distance.

**Chester Baccari**

Anne Silk Baccari

A2 Ossining, New York; March 22, 1924

A3 BEE 1950, R.P.I. Major in electronics and UHF techniques.(Tau Beta Pi, Sigma Xi, IEEE member)

A4 Four children (one son, three daughters)

A5 Three granddaughters

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

### **Chester Baccari (Cont'd)**

B1 Graduated Ossining High School 1941 as Class Salutatorian. Elected to the National Honor Society, National Forensic League. Won RPI Math award, Bausch & Lomb Science award. Upon US Air Force entry (March, 1942), attended and graduated from the Capital Radio Engineering Institute, Washington DC. Assigned to study radar at Camp Murphy Florida for three months. Was trained in Ground and Airborne Radar, Radio Teletype, etc. (achieved the Military 953 highest SPEC Tech. Level). Became an instructor at the Radar School, teaching officers at the Boca Raton Radar school.

Then after six months, volunteered for overseas. Served two years in South Atlantic and African Campaigns – Honorable Discharge 1946. Enrolled in RPI June 1946. BEE Degree 1950. Joined the IBM Poughkeepsie Engineering Lab upon graduation. Chosen to attend the IBM Engineering Training Class 1035 at Endicott Lab (nine-month course learning the theory, design, performance, and maintenance and company experiences of all IBM machines.) I then returned to Poughkeepsie. Did lab work improving the design and speed of the 604 Electronic 20/40 Program step Calculator, which included circuit and hardware improvements to the Reader Punch machines and higher speed electronic program steps. I received a patent award for redesign of the Geneva Mechanism and 604 control and circuitry, which significantly increased calculation speed in the system. Later, I helped redesign the 607 and the transistorized 609.

Then went to Project High and worked for Harold Ross and Larry Sarahan on the Arithmetic Elements and Clock Timing circuits of the central Processor of the SAGE XD-1 System prototype design (shipped to Dr. J. Forrester (MIT "Lincoln Lab"). Promoted to lead a Project design group for the production level versions and Product Releases to Manufacturing, etc. and field ECs to MIT (XD-1). By 1954, began working for Mr. Dick Whelan, General Manager of the Kingston Complex and planned the final Assembly and Final Test Operations for the SAGE Production systems.

I was promoted to Manufacturing Division Manager of SAGE Final Systems Assembly and Test in the Kingston Plant Lab, which included guiding the new SAGE "Field Engineering" Division under Ralph Sampson, planning a new kind of field systems engineering/maintenance operations with new field maintainability and diagnostics and reliability measurement techniques.

Then, after successful shipment of the first SAGE to McGuire Air Force Base, I was promoted to Division Manager under Ralph Sampson of all the SAGE eastern coast IBM installations at Air Defense Direction Centers: McGuire, Stewart, Bangor, St Petersburg, Montgomery and two systems at the Syracuse Air Force Combat Center. These were the first seven systems to become operational sites for Air Defense of the U.S. SAGE network.

B2 I was hired by Steve Dunwell in October 1960.

B3 IBM Kingston, engineering management, 1950-1985

B4 When the Stretch project requested Kingston Engineering assistance to help design and implement a set of recommendations for Stretch Program Improvements (10/26/60, Corporate Audit Report file memo from W.D. Winger) I was interviewed by Mr. Dunwell. I then left SAGE to join Stretch in their systems engineering challenges. Ed Hofler also joined us in this effort. Ed and I had the responsibility for improvements and engineering changes to the Stretch Los Alamos machine and machines K1-K6, the Kingston production systems. We were asked to evaluate needs and divide the responsibilities. Ed took on the hardware aspects, and I the Systems Software, Systems Plans and Controls, Systems Reliability and Maintainability, Field Installation and CE training. These areas related to my SAGE design and Systems Management, Manufacturing and Field experience.

### **Chester Baccari (Cont'd)**

My first major task was generation of a comprehensive and complete set of machine and system level documentation and specifications, which were needed to reestablish relations with and support from Plant, Manufacturing, System Test and Product Test, Quality and IBM Field Customer Engineering. Assisting me for 7030 Maintenance Engineering and Planning were C.A. Branson (Plans and Controls), W.M. Tomas (Reliability and Maintainability) and L.R. Notari (Installation and CE /Field Activities).

Acted also as a Project Office, hired directly and/or enlisted and authorized the services for and coordinated resources of the Kingston Plant test and quality groups and all necessary Kingston Lab reliability areas: Systems Computational Analysis, Reliability Analysis and Diagnostic Programming and Kingston technical services areas of Division Manager F.A. Weber: Technical Publications, Computer Center Services (704/705), E.C. Drafting and Records. My office was accountable for all related cost aspects and the coordination of all those systems related design activities supporting Stretch. Most of these groups and expertise had worked with me on the SAGE effort, which highly expedited their attention and cooperation and whose design capability I highly respected. This fostered their excellent cooperation and I am proud to say was a tremendous factor in the IBM 7030 System success story.

B5 Ed Hofler and I reported first to Steve Dunwell, then later to Max Paley for technical cognizance, but always reported directly to Kingston Engineering Lab Manager H.E. Cooley

B6 1960-1963

B7 Our successful August 1961 delivery and installation at Lawrence Radiation Lab and then the AWRE Stretch delivery in 1962 in Aldermaston, UK. Kingston Stretch FSD assumed full responsibility for manufacturing and delivering Stretches, including Lawrence Radiation Lab (LRL), AWRE in England, the Weather Bureau, Mitre, Naval Weapons Lab and CEA, the French Center for Atomic Energy. We were honored to employ the disciplines and systems management techniques we successfully developed on the SAGE program for the US Air Defense Command (29 systems).

C1 After Stretch I went to General Products Manufacturing (VP Mr. Bud Thue) headquarters as manager of systems engineering. I was charged with overseeing the proper utilization of computer resources installed at all GPD plants. Later to SPD (Mr. Warren Lind), and then to World Trade Americas and Far East headquarters in White Plains for similar functions.

C3 The honor given me to represent IBM in the mid-1950's in the SAGE Project Office in New York City. This [office] included top level representatives from the major contractors (VPs, Generals etc.), Bell Labs (Modems /Radio etc.), AT&T Long Lines Division. Boeing (missiles), MIT (air defense model analysis etc.), ADC (operational needs), Air Force, Navy and US Military Intelligence. It regularly met to report, monitor and coordinate all program progress and resolve actions in problem areas. My job was to represent the FSD president in engineering, manufacturing and field aspects and obtain resolutions therein. This experience served me well in my later responsibilities on Stretch and certainly helped me appreciate the importance of system design coordination. This SAGE work offered me opportunity to work with the entire array of air defense IBM computer systems to systems communications and networking from radar nets among direction centers and intelligence sources, analog to digital displaying and correlation of data and controlling military action including command and combat control. This experience gave me insight to see truly what is required of systems in a central computational and network environment and the vast importance of computer systems reliability and performance reliability, which our IBM computers successfully demonstrated later, when they became operational for the military.

C4 Retired 1985

#### **Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Karl G. Balke**      Barbara  
A2 Chicago, Illinois, September 1933  
A3 BS, Mathematics  
A4 Five  
A5 Eight

B1 I had spent a year at Lawrence Livermore Labs working on a chemistry program for Les Baumhoff. Los Alamos Scientific Laboratory (LASL) hired me to work on STRETCH, but I spent my first year or so there working on ALGAE because the STRETCH hardware and software were not yet far enough along.

B2 Ed Voorhees

B3 Los Alamos. Software. LASL T-1. 1958-1962.

B4 Programming language (COLASL) and compiler design and development with Glenn Carter

B5 Ed Voorhees

B6 1959-1962

B7 A programming language that may have met its design goal of allowing physicists untrained in computers or programming languages to read and understand the physical and mathematical work that the authors were doing and make trenchant comments on the plausibility of the results.

C1 Designed programming languages, developed compilers at Computer Sciences Corp. (CSC). Thought about software metrics at Burroughs. Learned about software consulting at Compata. Created early precursor to Software Diagramming. Ran an independent consulting practice. Published "Software Diagramming" with Jack Murphy. Worked with CASE [Computer aided software engineering] and software process at what was GTE Government Systems when I left it. Founded The Diagrammatic Programming Corporation, acted as chief technical officer until retirement.

C4 Retired. Supporting IT needs of a hospice volunteer department.

**Orest Bedrij**      Oksana Bedrij  
A2 Western Ukraine, May 24, 1933  
A3 BS Electrical Engineering, M.S. Humanities, Ph.D. Physics;  
A4 Three  
A5 One

B1 IBM hired me when I was in school

B2 Steve Dunwell hired me into the Stretch project

B3 IBM Research, Poughkeepsie, Bldg.701; Stretch Planning, Engineering; 1956-1968

B4 In the beginning research and planning, later design and implementation.

B5 W. Buchholz; O. MacSorley, E. Bloch, R. Fletcher

B6 1956 to 1960

B7 Every job was great

C1 IBM 8106 and 1410 [machines], Caltech (JPL) Pasadena Ca., System 360. Left IBM after 12 years (1968) to do basic research on the unification of physics and investment banking.

C3 Listed: Who's Who in the World; Who's Who in America; Who's Who in Science and Engineering; Who's Who in Finance. Served on various boards. Published three books and a number of papers.

C4 I have been working for the last 34 years on the unification of physics (the final theory), also I am writing a book, and do investment banking.

**Leo T. Bennett**      Joan C. Bennett

A2 Olean, New York, September 1932

A3 BA, Mathematics, SUNY Albany 1954; graduate work in Math at U of Pennsylvania, U of Delaware

A4 Five children

A5 Six grandchildren

B1 Immediately prior to Stretch, I was working for RCA Defense Electronics Products on the Ballistic Missile Early Warning System. I was responsible for all the software for the BMEWS Central Computer and Display Facility at NORAD in Colorado Springs. Prior to that, I was working for the Department of the Air Force at Eglin AFB programming software for flight path and trajectory calculations for toss bombing.

B2 I was hired into Stretch by Sully Campbell in Poughkeepsie.

B3 Poughkeepsie IBM in 1962.

B4 In Stretch, I wrote the Programming Systems Analysis Guide (PSAG) for the Stretch Master Control Program.

B5 Jack O'Connell.

B6 1962 to 1963.

B7 As a 'Johnny-come-lately' to Stretch, my only major accomplishment was the MCP PSAG.

C1 I moved to OS/360 in 1963, working for Gul Hira, then managed Scientific Computation, Engineering Automation Architecture, and Component Manufacturing Systems in Fishkill before leaving IBM in 1971. After a brief diversion in a business enterprise, I landed at Digital Equipment Corporation in Maynard, MA in 1974. Managed Central Engineering Services, (including CAD development and operation, PC layout, design drafting, and engineering records) until decentralization in 1980. Then joined the Colorado Springs Storage Manufacturing Staff as Director of IT for Manufacturing. Retired from DEC in 1992 on the early retirement offer. Consulted at MCI for a couple years, then really retired.

C3 My most notable award was to be among the recipients of the 1989 LEAD (Leadership and Excellence in the Application and Development of

Computer Integrated Manufacturing) Industry Award from the Society of Manufacturing Engineers. This award (was presented to Digital Manufacturing in Colorado Springs for the highly automated manufacturing process for the RA90 disk storage device. I was responsible for the manufacturing control and data base software for that process.

C4 Presently actively retired in Colorado, indulging in golf, travel, hunting, fishing, camping, RV'ing, hiking, square dancing, etc. Spend a month or so every year in the Mesa, Arizona area.

### **Lucy Ann Berry**

A2 Boston, Massachusetts; June 25, 1937

A3 BA, Emmanuel College, Boston; MPM, Carnegie Mellon University, Pittsburgh

B1 School

B2 Sherman Prosser

B3 IBM Poughkeepsie, Software coding testing, documentation, early 1960's

B4 Documentation of Stretch Assembly Program (STRAP), some coding and testing

B5 Sherman Prosser

B6 ? (memory is slipping)

B7 I was allowed to share in the coding and testing. This was my first job.

C1 Stone & Webster Engineering; Federal Reserve Bank of Boston; Family responsibilities

C4 Retired

### **Key:**

**Alumnus/a**, Spouse    A2 Birth Data    A3 Education    A4 Children    A5 Grandchildren    B1 Before Stretch    B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer    B4 Role on Stretch    B5 Managers    B6 Years on Stretch  
B7 Worthiest Accomplishments    C1 After Stretch    C3 Awards, Honors, Papers, etc.    C4 Current Interests, Activities



**Gerrit A. Blaauw**

Paula Albarda

A2 The Hague, Netherlands; July 17, 1924

A3 PhD Harvard University, Engineering Science and Applied Physics, 1952

A4 Six

A5 Thirteen

B1 Mathematical Centre, Amsterdam, 1952-1955

B2 Arthur Samuel, IBM

B3 Poughkeepsie, Engineering, IBM

B4 Architecture of Hardware

B5 Steve Dunwell, Werner Buchholz

B6 About 1957-1960

B7 Hardware Architecture, as related in: Buchholz: Planning a Computer System, and Blaauw and Brooks: Computer Architecture, Chap. 13, section 3.

C1 Work on IBM System/360, University Twente, the Netherlands 1965-1989

C3 Fellow IEEE, ACM Computer Pioneer, Member Royal Netherlands Academy of Sciences.

Foreign Associate National Academy of Engineering of the USA

C4 Retired, many interests, such as genealogy, science and faith.

**Erich Bloch**

Renee

A2 Sulzburg, Germany; January 9, 1925

A3 BSEE

A4 One

A5 Two

B1 Magnetic core logic at IBM

B2 Dunwell and Merwin

B3 IBM Poughkeepsie, Engineering, 1952-1984

B4 Engineering Manager

B5 Steve Dunwell

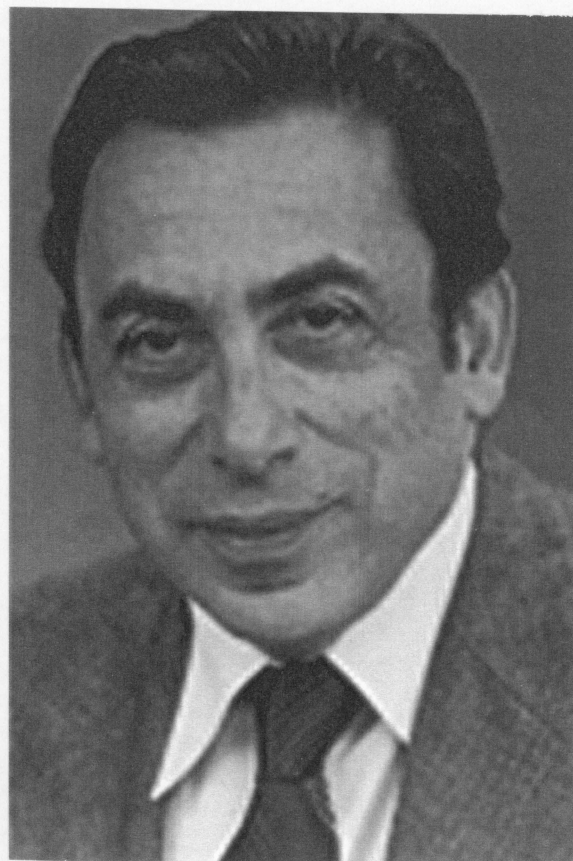
B6 1958-1962

B7 Get the sucker delivered

C1 IBM VP Tech Personnel; Manager of SLT

Program; Director, National Science Foundation

C4 The Washington scene.



**Erich Bloch, circa 1960**

**Robert (Bob) Blosk** Dale

A2 Montreal, Canada; October 10, 1929

A3 BSEE Catholic University, Washington D.C. 1950; MS-Math University of Michigan, 1962

A4 Three. Two married daughters, one single son

A5 Four, all in high school

B1 1953-55: Field Engineer on IBM 702. Helped build and test lab model in Poughkeepsie and chaperoned field installations. 1955-57: Preliminary design work on proposed new computers.

B3 Not sure who first hired me onto the Stretch project ... may have been Ernie Foss or Dick Merwin or ? to do hardware design engineering on Stretch in the Poughkeepsie lab. With IBM, 1953-1990

B4 Principal role: Manager of Instruction Unit hardware design, build and test. Early work on memory bus for Stretch system and patent for same. B5 Principal Manager throughout the project was Erich Bloch, although for the earlier period I think it was Ernie Foss and for a later period I worked directly for Steve Dunwell for a while.

B6 1957-1961

B7 Successfully managing the design team for the Instruction Unit, being one of the leaders of the round-the-clock build/test teams and finally installing the world's largest [and fastest] computer in Los Alamos and completing customer acceptance tests.

C1 One year at University of Michigan getting an MS in Math compliments of the new IBM fellowship program. Then back to Erich Bloch's new domain in the Components Division helping him coordinate the different locations working on the development of SLT technology. Then volunteered to work on another Stretch program, relabeled the ACS program in Menlo Park California. After 3-4 turbulent years on that project, it was terminated and all the people went their separate ways.

I went down to San Jose Lab and worked in Machine Technology area for a few years mostly coordinating San Jose product needs with the Components Division technology offerings.

Then started a new career in the IBM Litigation organization formed to fight all the West Coast antitrust cases brought by Memorex, etc. Enjoyed an interesting and exciting time with top lawyers and a wide variety of IBM folks. After successes in three trials and casework on the East Coast and Europe, finally returned to the mundane life in the Development Lab in San Jose.

Finished my IBM career in the Magnetic recording head technology area and assisting in the development of thin film heads. After 40 years, retirement looked awfully attractive, so I took my leave of dear old IBM on March 30, 1990.

C3 Nothing special, a few recognition/achievement awards but mostly the personal satisfaction of having worked with great people on the best technologies/products.

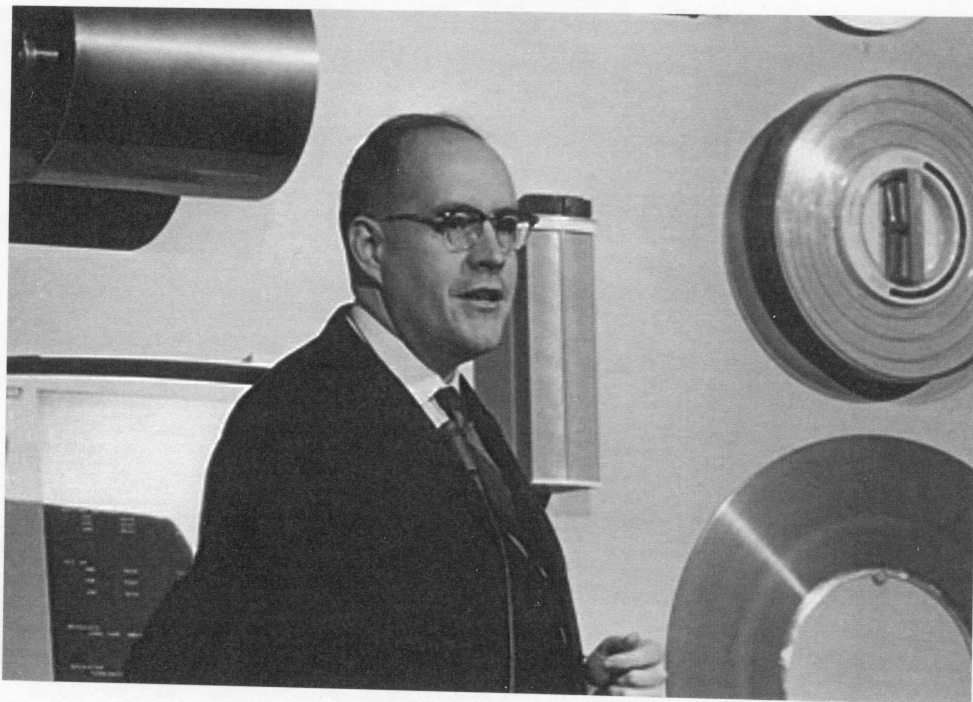
C4 Now enjoying retirement in the Sierra foothills between Sacramento and Lake Tahoe, CA. Still jogging (every other day now) and doing a little golfing, sailing and travelling with a wonderful wife/companion.

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Fred Brooks** Nancy Greenwood  
Brooks  
A2 Durham, North Carolina; April  
19, 1931  
A3 AB Physics, Duke; MS and  
PhD Computer Science, Harvard  
A4 Three children, seven  
grandchildren

B1 Graduate school (Harvard)  
B2 Steve Dunwell  
B3 IBM Poughkeepsie,  
Architecture (Systems Planning),  
1956 to 1965  
B4 System Planning (Architect)  
B5 Werner Buchholz  
B6 1956 to 1960  
B7 Interrupt System (with Dura  
Sweeney), Stretch Programmer's  
Console, Harvest Adjustments

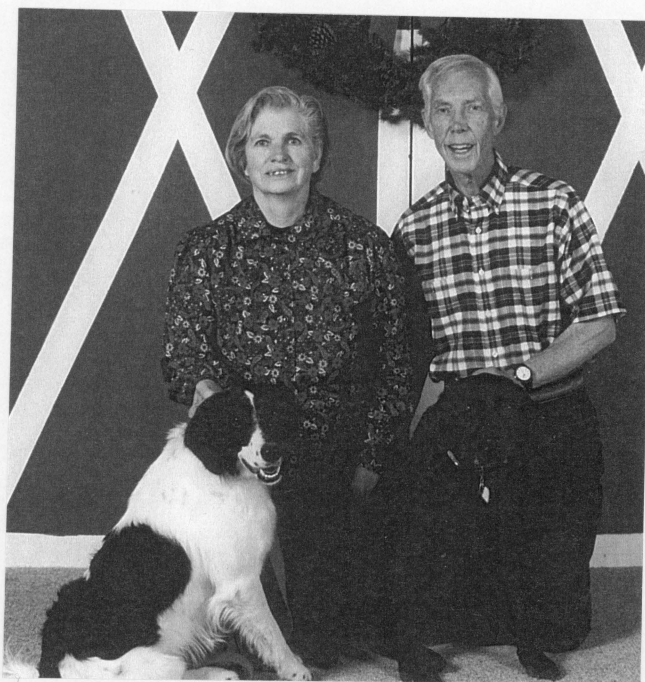


**Fred Brooks, ca. 1960**

C1 IBM research, System/360 project, OS/360 project. Founded UNC Department of Computer Science  
C3 National medal of Technology, ACM Turing Award, National Science Board  
C4 Still teaching in the Department of Computer Science at the University of North Carolina.

**George Bruce** Rosemary  
A2 January 8, 1926, Winter Haven, Florida  
A3 BS in Physics and Electrical Engineering,  
MSEE, PhD (IBM Fellowship)  
A4 Nine  
A5 Lots

B1 Another IBM job  
B2 Ralph Palmer  
B3 IBM Poughkeepsie, Engineering, 1950-1987  
B4 1) Circuits: Solid state/Tape drive. Management  
2) Storage: Exchange and 2 us Management  
B5 1) Bob Henle and Joe Logue, Dick Merwin  
2) Phil Fox and Moe Every  
B6 1956-1960/61  
B7 Surviving



**Rosemary and George Bruce, Christmas 2001**

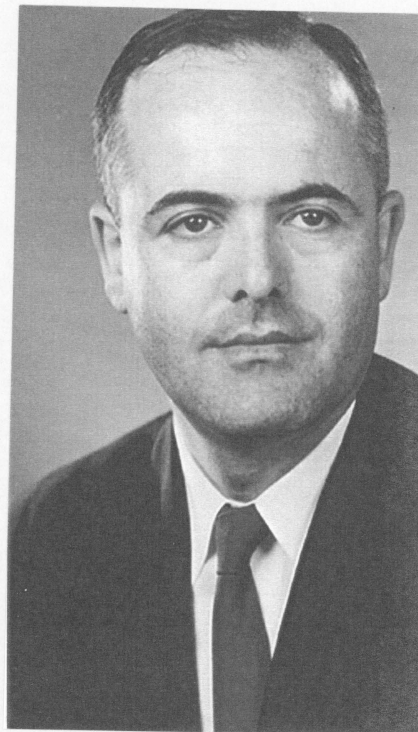
**George Bruce (Cont'd)**

C1 1962-1964: PhD at Purdue on Fellowship; 1964-1973: IBM OPD in Lexington, KY; 1973-1987: IBM in Boulder, Colorado.

C3 Paper on 2 microsecond memory with Ed Council and Charlie Allen

C4 Retired. Skiing, mountain climbing, enjoying animals on our small ranch here in Colorado. Also painting (oils), flying, running

**Werner Buchholz** Ann  
A2 Germany - October 24, 1922  
A3 PhD, Electrical Engineering  
A4 One  
A5 Two



**Werner Buchholz, ca. 1960**

B1 Worked on IBM 701, 702, other planning projects.

B2 Steven Dunwell

B3 Poughkeepsie, Engineering Planning (later known as Systems Architecture), IBM Poughkeepsie, 1949-1989

B4 Planning Manager

B5 Steven Dunwell

B6 First Year 1956 Last Year 1959

B7 Helping Dunwell get the project started.

Chief author of book on Stretch architecture.

My wife would say: Inventing the word "byte."

C1 Various IBM assignments until retirement.

**Bruce L. Chalmers** Patricia A. Chalmers

A2 Dubuque, Iowa; July 29, 1938

A3 A.B. Harvard '60, M.S. Syracuse '63, Ph.D. Stanford '67 (all Mathematics)

A4 Two (both born in Poughkeepsie)

A5 Six

B1 School

B2 Not Sure

B3 IBM Poughkeepsie, Software, July 1960-July 1967 (Grad. School - IBM Fellowship)

B4 Worked on "assignment of index registers" for Fortran compiler

B5 Fran Allen

B6 July 1960-September 1963

C1 After Stretch I went to Stanford (initially supported by a research assistantship arranged by a phone call by Sully Campbell and then later by an IBM fellowship, for which I owe many terrific people at IBM, who supported my efforts) and obtained a Ph.D. in mathematics. After several failed attempts to get a job with the math group in Yorktown Heights, I accepted an offer for one year (with a leave of absence from IBM) here at the University of California, Riverside (UCR). After one year I tried again to get a job with the IBM math group, but that attempt also failed. I have been at UCR for the past 35 years. I love my job and doubt that anything short of death will retire me.

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

### **Bruce Chalmers (Cont'd)**

C3 I have about 80 math articles published in various research journals.

C4 I work with people in various parts of the world (e.g. Poland, Italy, Florida) and of course the ability to e-mail papers back and forth (using TEX) is an incredible help.

### **Marilyn Charap** Stanley Charap

A2 Brooklyn, New York, August 17, 1935

A3 B.S., Math

A4 Two

A5 None

B1 Working in the IBM Research Computing Center programming for members of the research staff

B2 On loan to the Stretch project from the Computing Center.

B3 IBM Lamb Estate, Software, 1959-1963

B4 What were your principal roles, duties on Stretch?: writing SPOOL [Simultaneous Peripheral Operations OnLine]

B5 Jack Garrity, Gul Hira

B6 1960-1962?

C1 Research Projects: "teaching machine," linotype. Raised a family

### **Tien Chi Chen** Pearl

A2 Hong Kong, November 12, 1928

A3 ScB in Chemistry, Brown University; MA (chemistry), Duke University; PhD (Physics), Duke University

A4 One

A5 Two

B1 I joined IBM Research Laboratory in 1956, and was Staff Mathematician and Manager, Programming Staff, Department of Mathematics before joining Project Stretch in 1960.

B2 Dr. Sullivan Campbell, Manager, Stretch Programming.

B3 IBM Poughkeepsie; as Manager, Problem-Oriented Programming reporting to Dr. Sullivan Campbell; 1956-1984

B4 To study and demonstrate the ability of Stretch in Problem solving.

B5 Dr. Sullivan Campbell, Manager of Stretch Programming

B6 1960-1964

B7 While studying the programmability of the Stretch machine, I spent a year trying to understand its unusual architecture, and its performance implications. After the episode at LASL described elsewhere, I wrote Hints to Better 7030 Programming in the 7030 Performance Characteristics manual, and assisted in the Stretch Improvement Program.

C1 I participated in the development of the IBM System 360 Model 92, and lectured widely on its overlapped design. I joined The Chinese University of Hong Kong, became Head of United College there and Professor of Computer Science and Electronics.

## Tien Chi Chen (Cont'd)

C3 At IBM: two Outstanding Contribution Awards, five Invention Plateau Awards. In IEEE: IEEE Fellow, IEEE Centennial Medal, Associate Editor, IEEE Transaction on Computers. Wrote about 70 professional publications and own 12 US Patents.

C4 Teaching General Education part-time at the Chinese University of Hong Kong and writing books on the subject.

**William W. Collier** Yasuko Hatano-Collier

A2 April 28, 1935; Sidney, Ohio

A3 A.B. Harvard College 1960, Mathematics; M.A. Syracuse University 1964, Mathematics; M.S. Syracuse University 1986, Computer Science

A4 Two home grown + two stepkids

A5 Three step-grandkids

B1 I had just finished college, which had been interrupted for three years in the army.

B2 I remember interviewing with Paul Herwitz. I also remember George Grover picking me up the first day of work after orientation in the 701 building. Liked him a lot immediately.

B3 Hired in to IBM Poughkeepsie, software; at IBM 1960-1993.

B4 Worked on MCP. Later, on the nine-pass compiler. Then 360, then ... , then retired in 1993 as part of a massive downsizing.

B5 Jack Garrity was my first manager. This was on MCP. Later, I worked for Marla Orr MacKenzie on the compiler.

B6 1960 to 1963

On Stretch the characters 0 through 9 on tape mapped into 1 through 10 in memory. The 1 through 9 translated naturally, but an exception had to be made to translate the 0 to 10. (I may have some details amiss here.) The straightforward solution was to look at each character separately. Jim Havender came up with a routine, consisting of five instructions and three constants, which handled 8 characters at a time. I said it could be done more concisely. I obsessed for six months over the problem. While I was sleeping, the answer came to me. I checked it out the next day. One final tweaking and I had a routine that solved the problem using only four instructions and one constant.

Back in the old days, no such thing as a linkage editor existed. If you wanted to run two programs together, you compiled the two programs together and then ran them. The problem was that there could be name conflicts between the two programs, resulting in multiply defined symbols. Clarence Johnson told me that he once wrote two programs to run together. In the first program he used the names ALPHA, BETA, GAMMA, etc. In the second he used Roman numerals: I, II, III, IV, etc. When he compiled the two programs together, he got (much to his astonishment) a multiply defined symbol. What was it? (Answer below.)

One day I heard Jack Bishop laughing really hard in his office some distance away. A moment later he came over to my cubicle and showed me a comment line (which I had forgotten about) on some code I had written to map names to memory for the Fortran compiler. It said, "do (something or other) to prevent the clash of symbols."

(Answer to previous story: Greek letter Chi is sometimes written XI, which equals 11 in Roman numerals.)

C1 After Stretch there was 360. If the Stretch instruction set was the Amazon River rain forest, then the 360 instruction set was Death Valley, except maybe in one single instance. Our goal at one time was to write an operating system that would take up only 2K bytes of an 8K memory. One program I wrote was called by nine other programs, each of which required a distinct subset of functions to be performed. I created a string of bits for each calling program that defined the functions to be executed.

### Key:

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

## **William W. Collier (Cont'd)**

I could have used ALR, BC (six bytes) to test and branch on each bit and also to advance the bit string for the next test, but I found I could use one BXLE (branch on index low or equal) instruction and do the same thing in only four bytes. I heard a rumor later that management considered adapting this technique to the entire operating system. It didn't happen, because the technique was not general enough.

C3 Back in the 1960's Edsger Dijkstra wrote a one-page paper in which he showed that you could write a program (using just load, store, test, and branch) that would accomplish the essential function of the Test and Set instruction or the later Compare and Swap instruction. I found an improvement on the algorithm and submitted it for patenting. Ron Smith reviewed the patent and found a further improvement. We ended up jointly patenting his version. Working with Ron, I came to appreciate his tenacity, intelligence, and competence.

In the 1970's I was at a meeting at which Ron described IBM's plans for its first multiprocessor system. Someone asked a question about what interactions you could see when two CPU's read or wrote the same data at the same time. Ron responded to the questioner and the meeting went on, but when I thought about it later, it dawned on me that Ron, despite knowing almost everything about CPU's, had not directly answered the question. It seemed to me that this was a really interesting problem and that, given the program that Ron and I had patented, I should be able to figure out the answer. I decided that I would solve the problem and publish the results in a technical report within two years.

I became obsessed with this problem and worked on it for a period of about fifteen years. OK, there were timeouts for divorce, midlife bachelorhood, hiking all the 3500 foot peaks in the Catskills (almost all of them solo) twice in 9 months to get both the summer and winter badges, and finally remarriage, but still it was a long time.

Here is the clearest example of the depth of my obsession. Yasuko (second wife) had an automobile accident and a year later needed an emergency operation to treat the adhesions formed after the surgery to deal with the accident. At 3 in the morning I was in Vassar Brothers Hospital waiting for the surgeon to come out of the operating room. I was too anxious to sleep, too nervous even to read a magazine. Finally, I picked up a piece of scratch paper and began making notes on the current problem I was working on. At this point I relaxed, and all distractions vanished. (Yes, the surgery was a success.)

There were enough setbacks and detours in the project to provide the plot for a very bad made-for-TV movie, but in 1992 Prentice-Hall published "Reasoning About Parallel Architectures" (see <http://www.mpdiag.com/rapa.html>).

Then IBM asked me to write programs to check whether or not IBM systems obeyed the IBM architecture. I found that the IBM machines visibly executed some read operations before [the] logically preceding write operations (as allowed by the IBM architecture). But I also found that a supposedly compatible Hitachi machine performed write operations nonatomically (which violated the IBM architecture).

This earned me an invitation to present my results to the Lab Director. After my pitch I stayed behind to answer a few questions. When I left, I found almost the entire audience in the hallway grouped around Ron Smith; they weren't willing to ask questions in front of the Lab Director, but they were eager to find out from Ron what the heck I had been talking about. It seemed to me that with this work I had at last made a significant contribution. Nine months later I was downsized.

## **William W. Collier (Cont'd)**

At least the corporation allowed me to take the software with me. And IBM was one of the first big companies to license the completely rewritten software from my company.

Publishing a book has left me with some considerable sense of satisfaction with life. If I have not achieved as highly as I once dreamed, I know at this late age I achieved more than I had any right to hope for. It is also gratifying to know [that] numerous companies are using the algorithms described in the book to test multiprocessor systems. And the book is one of only 35 books listed on the computer architecture site maintained by the computer science department of the University of Wisconsin (see <http://www.cs.wisc.edu/~arch/www/>).

C4 I cannot bring myself to say that I am retired. I will only say that I am living the life style of a retired person and enjoying it. I read the New York Times thoroughly and catch Dilbert and Doonesbury in the Poughkeepsie Journal. I watch the BBC News and Jim Lehrer on PBS, Larry David on HBO, SpongeBob SquarePants on Nickleodeon, Andy Dick on MTV, and Jon Stewart on Comedy Central. I am grateful every night that I do not have to go to work in the morning. Joints and muscles now veto running. Instead I walk up and down a steep hill with a backpack holding 35 pounds of sand, juggle with weights on my wrists, and swing our cat around in a box. And still I gain weight. Memorial Day weekend Yasuko and I went to the city and saw two museum exhibits and four movies that will never light up the local multiplex, and we ate in a Vietnamese, an Afghan and a Mexican restaurant.

I have heard that writing an autobiography teaches one a lot about oneself. Just writing these stories and then comparing them with what others have written leaves me appalled at my own idiosyncrasies. Almost everyone focuses on the people they worked with. Not me. The things I most wanted to write about were the times when I got something as perfect as I could make it, anywhere from a silly program to a book.

### **Carl Conti**

Marjorie

A2 Ravenna, Ohio October 12, 1937

A3 BS Physics

A4 Three

A5 Two

B1 School

B2 Jim Pomerene

B3 IBM Poughkeepsie, Engineering, 1959-1991

B4 TAA design, Harvest

B5 Bob Meade

B6 1959-1961

C1 Stayed at IBM, eventually became IBM Senior VP and Group Executive, Enterprise Systems.

C3 Cache memory OCA, Trustee of Case Western Reserve University, Trustee of Clarkson, Commencement speaker CWRU, 1984

C4 Chairman of the Board, Adaptec (ADPT)), Member Executive Council University of Central Florida College of Engineering.

### **Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities



**Bob Cornelli** Madeline

A2 London, England; August 28, 1937

A3 BA Math, Bowdoin College '58

A4 Two daughters

A5 None yet

B1 Mitre, 7090 systems programming

B2 Transfer within department.

B3 Mitre -- Poughkeepsie for a while, then Bedford, Software 1959-1969

B4 System Programming

B5 Mike Peskin

B6 1961-? (no later than 1965)

B7 Buried in the mists of memory.

C1 More systems work for Mitre, then on to banking software since 1969

C4 Still working, building financial cash management systems.

**Ed Council** (no spouse)

A2 Born March 12, 1931 in Southampton County, Virginia

A3 BSEE, The University of Tennessee

A4 Two (both work for IBM, in Poughkeepsie and Pittsburgh ... at least as of 6/4/02)

A5 None

B1 Joined IBM in 1956. First assignment was in Research on ferrite core memory for work on the high speed and medium speed memories for what became the Harvest and Stretch systems.

B2 Support group to Stretch (Memory)

B3 IBM Poughkeepsie, Engineering, specifically memory development, 1956-1989

B4 Supported Stretch in development, debug and test of the memories used, specifically the 2 microsecond oil cooled memory, High Speed Harvest (0.5 microsecond), and Exchange Memory for Stretch.

B5 Dave Crawford, Bill Lawrence, Ralph Partridge, Bob Wheylan, Bill Rave, George Bruce, Moe Every et al.

B6 Memory support for complete project

B7 Debug and delivery of the Exchange Memory for the first Stretch system was the most memorable, involving 3-shift operation and resolution of many technical problems.

C1 Spent entire professional career with IBM, mostly in the Mid-Hudson Valley. Worked in both engineering and management on a number of memories for System 360, 370 and others. I was Product Program Manager for the early bipolar semiconductor memories and held management and engineering jobs in Components Division and in GTD before retiring in 1989.

C3 nothing special

C4 Enjoying retirement

**David J. Crawford** (Deceased April 15, 1991)      Jean (who submitted this)

A2 Newark, New Jersey; April 16, 1922

A3 BEE, MSEE from MIT

A4 Three children

A5 Five grandchildren

B1 Memory development

B2 It was an organizational change

B3 IBM Poughkeepsie, Engineering, 1950-1984

B5 Philip Fox

B6 1955-?

**Claud Davis** Virginia Davis

A2 Calhoun County, Mississippi, on a one-family farm, August 23, 1924

A3 I graduated from Oklahoma A&M in 1950 with a BSEE, and from Harvard in 1961 with a Master of Science in Applied Mathematics

A4 Two, Stephanie Davis and Claud P. Davis

B1 John deVeer and I were designing and building the 7074, the replacement for the 7070

B2 I do not think that I was ever hired into Stretch but did farmed-out work for the project.

B3 I was in the Poughkeepsie Laboratory from May 1952 to 1973; next in Fishkill until 1981, then to HQ in White Plains until July 1, 1989.

B4 My major work on Stretch was determining the most efficient codes

B5 My manager made no lasting impression. I do not know his name.

C1 After Stretch I went to Harvard for one year then joined Fred Brooks's team to define what became the 360 System. Following that I led the engineering team that defined and built the FAA 9020 System. Then I joined the team that defined and built the 360 model 67 System. Next, I worked with Dick Case's team in defining the Future Systems Architecture. (This System FS was never built as a product but bits and pieces of the architecture appeared in later machines, even to this day.) Next I went to Fishkill, where my team of six put the 360 dataflow on one bipolar chip. To do this we increased the density by a factor of ten with no changes of process (the line). Then to HQ until retirement in 1989.

C3 IEEE Life Fellow Elected for contributions to the design and development of the FAA Enroute Flight Control System. Elmer A. Sperry Award For conception, design and delivery of the FAA Enroute Flight Control System. IEEE Simon Ramo Award For contributions to computer system design. Several Outstanding Contribution Awards

C4 I do volunteer community work: I have been active on the Board of Managers and treasurer of the Brookmeade Nursing Home in Rhinebeck for 13 years. I am active in my church. Other activities are fishing, traveling and home upkeep.

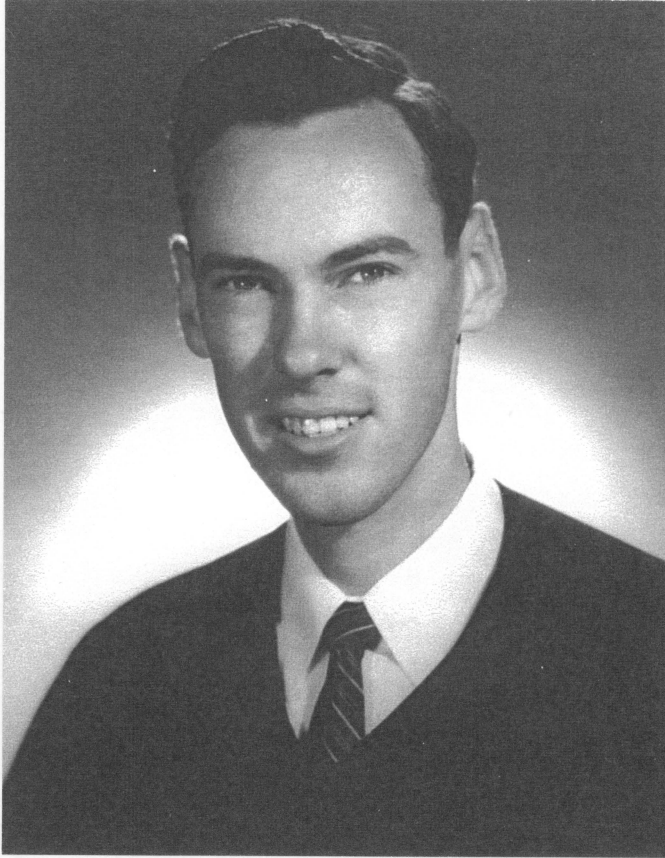
**Walter Doherty** [who wrote this in the third person] was born on Sept. 24, 1936 in Jackson Heights, Queens. He graduated from Regis HS, Manhattan College (BS in Mathematics), and NYU's Courant Institute (MS in Mathematics). He married Peggy McAnanly in 1958. He taught mathematics at Canterbury High School in New Milford, Connecticut for two years. They then moved to Putnam County in 1960 when he joined IBM Research. He has resided in Mahopac, where he and Peggy raised their six children, since 1961. Their son, Jim, is an Advisory programmer for IBM Global Services in Poughkeepsie. Their son, Joe, is an engineer at IBM in Fishkill. Their daughter, Marge Momberger, is a Senior programmer at IBM Research in Yorktown.

**Key:**

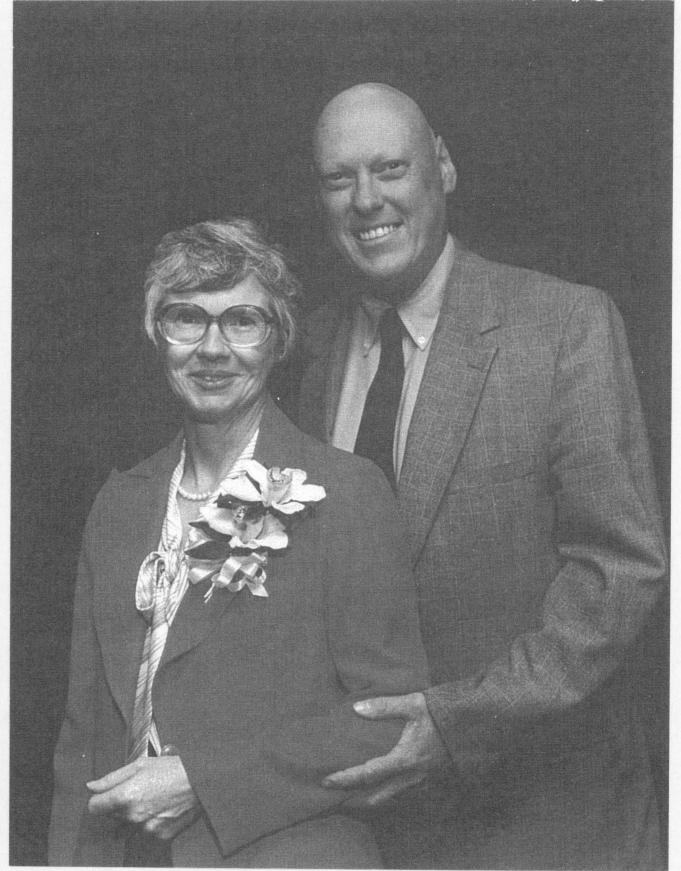
**Alumnus/a**, Spouse    A2 Birth Data    A3 Education    A4 Children    A5 Grandchildren    B1 Before Stretch    B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer    B4 Role on Stretch    B5 Managers    B6 Years on Stretch  
B7 Worthiest Accomplishments    C1 After Stretch    C3 Awards, Honors, Papers, etc.    C4 Current Interests, Activities

### **Walter Doherty (Cont'd)**

Walter has been active in his Community, starting St. John's Choir in 1961 and directing it for six years. He has been a tenor in it for 41 years now. He has been President of St. John's Holy Name Society, and of the Nocturnal Adoration Society. He was one of the founders of the Boy Scouts at St. John's and Secretary of the Mahopac Library Board of Trustees during the first expansion of the Library in the early 70's. He has been one of the founders of the retreat movement at St. John's, and active in their Respect Life Society. He is also a member of the Friendly Sons of St. Patrick.



**Walter Doherty in 1958**



**Peggy and Walter in 1985**

He was with IBM Research from 1960 until 1993. He was hired into Herman Goldstine's Mathematics Department at IBM Research as an Application Programmer to write FORTRAN programs for the 704 to support IBM's Scientific Research. In 1961 he was placed on loan to the STRETCH Project in Poughkeepsie where he worked on the dispatcher and the Command Processor of MCP with Gul Hira, Joe St. Germaine, Laura Adams, Roger Kahng and Jack Garrity. George Grover managed the work and offered Walter a permanent position there, which was declined. Walter learned STRAP and effective assembly language programming from T.C. Chen and Ray Polivka.

In 1962 he worked with Peter Markstein, Jim Havender, Bob Ramey, and Joe Harry on developing a multiprogrammed version of MCP to be run on the 7030 that was supposed to come to Yorktown. It was based on the prototype work of Ted Codd, Cas Scalzi, Betty McDonough and Ed Lowry which was reported in Communications of the ACM 2(11): 13-17(1959). Walter wrote the relocatable loader and the Command Processor. This multiprogrammed version of MCP was completely compatible with the original MCP, and ran about 15% faster in uniprogrammed mode, and 2.5 to 3 times faster in multiprogrammed mode.

## Walter Doherty (Cont'd)

They never did get a STRETCH at IBM Research as the one destined for them was sold, either to England or to France. They were asked to come to Poughkeepsie to discuss this more efficient version of MCP with a small group of about 3 senior managers of STRETCH software. When they arrived they were immediately taken into an auditorium to speak to the whole project about it. Peter Markstein gave a marvelous talk on what had been done. This made it harder to kill that work. I suspect that it was killed because IBM had already decided not to pursue STRETCH any further and didn't want improvements like this made visible. Walter used this work as the basis for his Master's thesis at NYU's Courant Institute in 1965. It was called "Multiprogramming on a digital computer". Max Goldstein was his thesis advisor.

The lessons Walter learned from the STRETCH project included technical excellence in programming, wonderful, thoughtful treatment by people he admired such as T.C. Chen, Peter Markstein, Joe St. Germaine, Jack Garrity, etc., and how to deal with adverse situations.

Walter next worked on the development of an experimental Computer Based Instruction System at IBM Research in 1963 and 1964, and then worked with Vern MacMillan of Endicott to develop IBM's first Computer Assisted Instruction (CAI) system product for the 1401, 1440, and 1460 and 1448. Walter wrote the interpreter and editor, Coursewriter I, while Vern wrote the I/O subsystem. This became IBM's first Type 1 Time Sharing system. Through the winter of 1964/65 they commuted weekly between Endicott and Yorktown, writing the design specifications based on Ralph Grubb's prototype ideas, developing and debugging the code, and taking it through product test to be delivered on time in March, 1965. Only three bugs were found by Walter and Vern during the product test period. Product test didn't find any. No other bugs were detected after the system was delivered. Wayne Wengert also helped with this work while Jean Lesser wrote the user manuals. Walter also completed three courses and his Master's thesis at NYU in this time.

Then came the years of working on TSS/360, CP/CMS, and MVS/TSO. Walter was able to study their performance and significantly improve it on many occasions. In 1966 he took a sabbatical at MIT's Lincoln Labs with Oliver Selfridge in the Psychology Dept., which Oliver had founded. Oliver is also credited with coining the term "Artificial Intelligence". Oliver convinced Walter to study people from that point on, and focus on their performance as a result of using IBM's systems. He also introduced Walter to Doug Engelbart and his brilliant work as the Director of the Stanford Research Institute project to Augment the Human Intellect. Doug invented the mouse, windows, hyperlinks, and computer conferencing in 1963. This changed the whole focus of Walter's career to focus on human productivity and the factors that influenced it in Interactive Systems. This work is summarized in an invited paper in the 25<sup>th</sup> anniversary issue of the IBM Systems Journal, vol. 25, nos. 3 / 4, 1986, "Computing as a tool for human augmentation". Walter was offered the job of managing the systems programmers at MIT in 1966. He rejected this offer. Many years later, Bill Kehl, who had made the offer, said it was the best move he didn't make.

After returning to IBM Research, he became the manager of Computer Usage Measurement And Evaluation (CUMAE, which is the name of the ancient Greek Sybil of Cumae, who is painted on the ceiling of the Sistine Chapel in Rome, and who specialized in delving into mysteries). In 1970 Walter had the first IBM home terminal, a 2741 typewriter. Extension 1704 at IBM Research was actually in Walter's bedroom in Mahopac, which often confused the telephone company when there were problems.

He spent the summer of 1971 at IBM Research in San Jose, CA where he improved the TSO scheduler with several concepts learned from the TSS work.

He spent 1975 on sabbatical, teaching at IBM's Systems Research Institute in New York City. One night during that time, about 3AM, he awoke to realize that the System/360 model 168s they were using at Yorktown for TSS/360 had much larger memories than the earlier machines had.

### Key:

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

### **Walter Doherty (Cont'd)**

So he changed the table driven scheduler on the floor system from home to allow the estimated working set size of programs to approach the lifetime size of the program instead of between 100ms. to 1 second windows. This immediately eliminated 2/3 of all the I/O in the system since all of the TSS/360 I/O system was done through the paging mechanism. The next day, the large scale computing users at Yorktown, were ecstatic because their programs were completing 2 to 3 times faster than before. He couldn't wait to tell Dick Kelisky, Director of Computing Systems, what he had done. Dick chewed Walter out thoroughly because he had just committed to eliminating TSS from IBM Research. Walter had no knowledge of that since he was away on sabbatical. He wrote an IBM Research report called "Scheduling TSS/360 for large memories" to describe that work.

In May, 1975, Walter was asked by Al Weis to come to England, France, and Germany to study the European Labs Computing Network to improve TSO response time. The same user oriented measures were used as were developed by Walter at IBM Research. This led to immediately improving the TSO response time by a factor of 3 throughout ELCN.

In 1981 the user oriented measures concerning the effectiveness of computing, which Walter had developed, were adopted by IBM worldwide to justify new equipment. This had the immediate effect of changing the slope of the growth of computing for the Research Division to be much steeper. At the same time IBM Marketing began using these same measures to sell very much more computing equipment.

In 1982, Walter worked with Ira Fuchs, Director of Computing at CUNY and Sema Marks, from Columbia University to connect IBM's VNET network to the University world's BITNET network. This opened IBM to the outside world of computing for the first time. This also led to the development of guidelines for the use of personal computing by IBMers on IBM's computers.

From 1966 until 1993, Walter was active in SHARE, GUIDE and SEAS. He found the SHARE organization especially to be filled with talented technical people who wanted to help improve IBM's systems and had the skills to do it. By working with IBM's customers in SHARE, Walter found the most effective way to influence IBM's products. In the 1975 SHARE meeting in Los Angeles, Walter contributed 2 papers to the Productivity project, "Measurement and Management of Interactive Computing" and the "Fine Wine List from the Hacienda Inn in Los Gatos, CA". On the 10<sup>th</sup> anniversary of the REXX language, at the SHARE meeting in Anaheim, Walter rented a bus to take Mike Cowlshaw, the author of REXX, and other REXX advocates to dinner at the REX restaurant in Newport Beach, CA.

Walter was an Adjunct Faculty Member at IBM's Systems Research Institute, a Distinguished Visitor for the IEEE Computer Society, and a National Lecturer for the ACM (Association of Computer Machinery). He managed IBM's Scientific Systems Support Laboratory at IBM Research. He received Outstanding Contribution Awards for the design of IBM's first Computer Assisted Instruction System Product, for developing scheduling strategies for IBM's Interactive Computing Systems, for Technology Transfer, and for his response time studies. He also received the Data Processing Division President's Merit Award for contributions to IBM's interactive computing products. He specialized in the human - computer interface and in human productivity from 1967 until 1993.

### Walter Doherty (Cont'd)

As a result of that work he received more than 9,000 requests to lecture, but could only give 1500 + lectures in 150+ Universities and 300+ Corporations worldwide. Two of the most memorable were the keynote address to the 1<sup>st</sup> International Conference on Computer Workstations, sponsored by the IEEE Computer Society in San Jose, CA, in 1985, and the keynote address to the Science Conference in Stockholm, Sweden in honor of Gerd Binnig and Heinrich Rohrer who had just won the Nobel prize in Physics the day before for their scanning, tunneling microscope. The evening of the IEEE keynote address, Walter had dinner with Oliver Selfridge, Doug Engelbart, Gordon Bell, the primary architect for DEC, and Alan Kay, the first Apple Fellow. In the discussion afterwards, it became obvious that Gordon Bell had no idea that IBM 3277 display terminals, which were channel connected, could operate at 1,000,000 bits per second. IBM marketing normally paid for Walter to give these lectures since they found it much easier to sell computers as a result. It has been estimated that IBM derived several billion dollars in sales from this work.

Walter was on the advisory board for Computing at Marymount College in Tarrytown and was an advisor to the U.S. Congress from 1990 until 1992 on Intellectual Property Law as it relates to Computer Software.

In retirement, Walter pursues hobbies of 11 grandchildren (all within ½ hour of Mahopac), genealogy, music, golf, and good wine. He is also a tenor with the Chorus of Westerly in Rhode Island, where Walter and Peg and their family have a home near the ocean and within 25 minutes of 25 golf courses, and managed to sing in 5 shows with Barry Manilow at Foxwoods.



**A Photo of Walter Doherty (top row), Peggy (below Walter) and Their Family at a 1999 Reunion**

#### Key:

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Clarke Dowling**      Fran Dowling  
A2 Cambridge, Massachusetts  
A3 BA, Psychology, Math  
A4 Two  
A5 Five

B1 IBM 702 - diagnostics

B2 J. Pomerene

B3 IBM, Poughkeepsie, engineering and programming, 1952-1989

B4 Diagnostics

B5 Bill Wolensky

B7 Harvest reference card. All codes on one sheet. (no magnifying glass necessary, but good eyes helped)

C1 Stayed at IBM

C4 Bicycling on St. Simons Island, waterbiking on the Great Sacandaga Lake in the summer; grandchildren

Reflections on **Steve (Red) Dunwell** during and after his STRETCH leadership. Submitted by Mrs. Stephen W. (Julia) Dunwell

T.J. Watson, Jr. makes an apology to Red Dunwell! Unheard of! Dunwell had directed Project STRETCH, which gave IBM the world's most powerful computer, the "supercomputer"! Watson, after STRETCH, had put Dunwell under a cloud. As a salesman/CEO, Watson felt [in 1961] that he had to lower the price of STRETCH because its performance, although spectacular, was not up to contract. The occasion [of the apology] was the IBM Awards Dinner of March 1966.

I quote from IBM Historian Emerson Pugh's book *Building IBM, Shaping an Industry and its Technology*:

Seeking to right a wrong and to bolster the morale of working in the big machine area, Watson took the unusual step of devoting most of his remarks at the awards dinner to one award winner. Applauding Dunwell's appointment as an IBM Fellow – highest recognition for technical achievement in the company – Watson said Dunwell's work on STRETCH and many other machines had made him a "major contributor to the success of this business." Then noting that "things" had happened during the last few years "that haven't been as fair to Red Dunwell as they might," Watson said "I just thought I would take the opportunity of publicly trying to correct the record ... I have unwittingly been a major contributor to the headaches of Red Dunwell. So a confession is good for the soul." It was vintage Watson. Quick to anger and quick to punish, he was also prepared to correct an error and take corrective action.

Project STRETCH was also vintage Dunwell. Inspired by confidence in him from men he admired, Cuthbert Hurd and Ralph Palmer, and challenged by the bold and courageous goal, he took it on. He hired brilliant people such as Sully Campbell, Erich Bloch, T.C. Chen, Werner Buchholz, John Cocke, Harwood Kolsky and many others. He always credited the TEAM for success.

In the years between STRETCH and early retirement in 1975, Dunwell produced COURSEWRITER, the first timesharing software marketed by IBM.

After retirement, it was vintage Dunwell, one might say. Inspired by an ideal – we do not destroy our cultural heritage – he took on a volunteer effort to prevent demolition of an 1869 landmark and to

**Steve Dunwell (Cont'd)**

breathe life into it as a cultural center for theater, dance and other performing arts. Dunwell was Chairman of the Board, Executive Director, General Manager and "Chief Cook and Bottle Washer." There was no staff save his wife Julia who did Program and Publicity. People were saying "Fools rush in ..." Today, Dunwell is widely known among the movers-and-shakers as the man who saved the Bardavon Theater. For his three-year "Herculean effort" Dunwell received the County Executive's Arts Award and represented Dutchess County in the Governor's Arts Award.

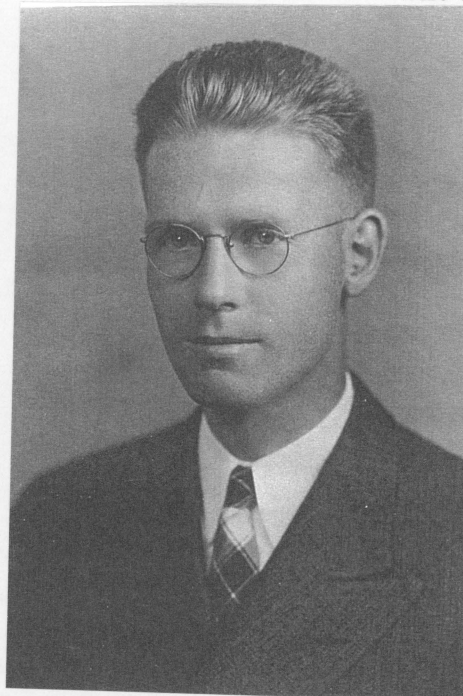
Undertaking another bold initiative, Dunwell in 1980 established a computer timesharing company and laboratory to search for a universal computer language capable of replacing all computer languages then in use. He developed a strong interest in APL during these years. In 1986, he produced a monograph, "The Design of a Universal Computer Language." He called his APL-based language "AUL." Steve put his heart and soul into AUL, working seven days a week while in his 70's! He believed that AUL was IBM's "Roadmap to the Future." IBM under John Akers was not interested. But vindication came in 1996 when Joe Gensheimer, then Chief Counsel of the IBM Mainframe Division wrote to me:

"... it is clear that if IBM had adopted his ideas in the early 1980's, Microsoft and others would never have trounced IBM ... We are seeing some of his ideas coming into play as users seek a common Internet language."

The AUL project had given Red great satisfaction. To him, meeting challenges was the "Elixir of Life."

In March 1994, Red Dunwell lost the one battle he could not win: death of prostate cancer. However, to the end he knew he had had a good life, thanks to IBM, to his career in Poughkeepsie, and to family and friends.

Julia Dunwell (Mrs. Stephen),  
wife of one great guy!



**Julia McClure Dunwell and Stephen Warner Dunwell, Photos Taken circa 1945**

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities



**Robert Eibsen**

A2 Union City, New Jersey; December 12, 1924

A3 BSEE from Rensselaer

A4 Four children

A5 Four grandchildren

B1 Prior to Stretch, worked on model 750 Design.

B3 IBM Poughkeepsie, Harvest engineering

B5 Jim Pomerene

B6 1957-1959

C1 Stayed in large processor design through 1962. Attended SRI, 1964. Systems performance evaluation, using simulation 1966. Continued with various performance measurement and evaluation jobs, including hardware and software systems. Retired 1/31/89 to lots of yard and home maintenance work plus Sunday sailboat racing (member of Ensign crew, Chelsea Yacht Club).

**Dr. Barlane R. ("Ike") Eichbaum** Beatrice May Roth Eichbaum Proverbs 31: 10-31 "A good wife who can find? She is far more precious than jewels!" Happily married for 52 years.

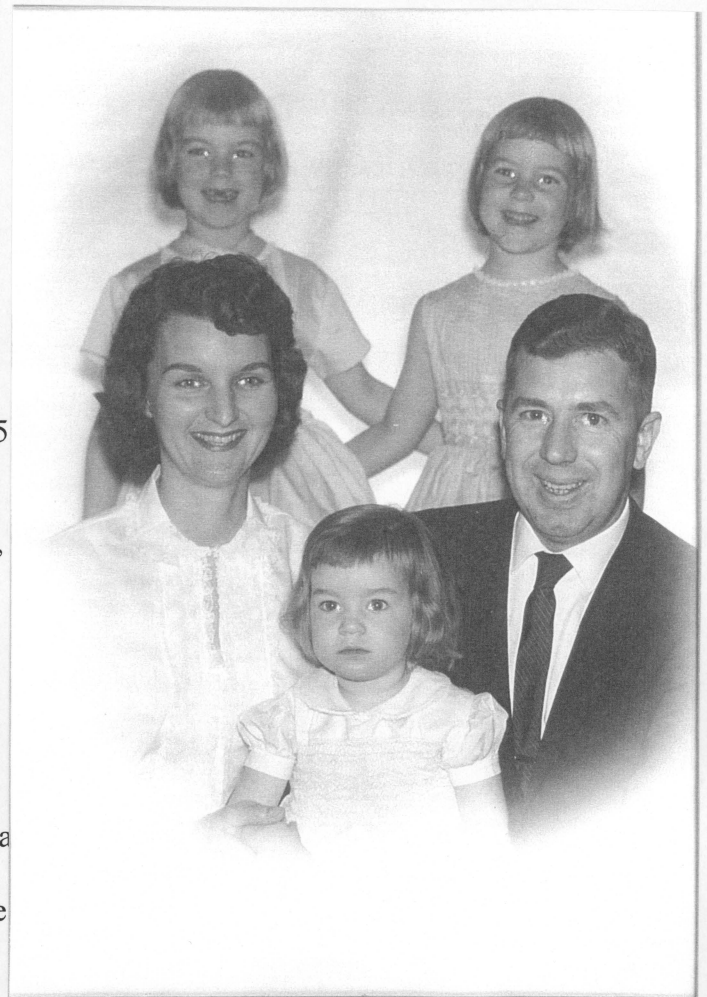
A2 New Brunswick, New Jersey; September 1, 1926

A3 B.S. Rutgers Univ. Ceramic Engineering, 1951; MS, Texas Univ. Ceramic Engineering, 1953; Ph.D., Rutgers Univ., Solid State Materials Engineering. 1956; BA (eq), Temple Univ., Business Admin., 1965. Several other short term courses at: Universities of Colorado, Michigan, Maine, Nevada, TMCC and other company courses, 1956-95

A4 Three Daughters; Susanne Bashista, Virginia Anderson and Nancy Radford.

A5 Five Grandchildren; David, Jimmy and Kristen Bashista, Tim Anderson, and Brian Chapin.

B1 As a child and growing up I lived in Milltown, New Jersey, and graduated from New Brunswick High School in 1944. Worked at Raritan Arsenal Ordnance while in high school (during WWII) and prior to military Service. Served as B-29 Gunner in WWII. Received B.S. and Ph.D. from Rutgers Univ. 1951 and 1956, MS Texas Univ. 1953. While a Graduate Fellow and Research Assistant at Texas and Rutgers Universities did electronic materials research. While on the US Signal Corps Program, performed Research on Advanced Electronic Solid State Components. Won three Awards for original materials component research.



**Top, l-r: Susanne, Virginia  
Next: Bea and Ike Eichbaum with Nancy  
Photo circa 1960**

## **Ike Eichbaum (Cont'd)**

B2 Hired into Stretch Project by Mgr. John Gibbons, who was later VP of Research & Engineering  
B3 Performed R&D in Research Laboratory at Poughkeepsie, NY, and was assigned to the Stretch Feasibility Team of about 13 engineers, under Bill Lawrence. My duties were to develop the memory, matrix switch and logic ferrite cores required for the Stretch/Silo Computer.

Organizations were IBM Research Lab. doing studies for Stretch military project which resulted in prototype hardware for which IBM was awarded the contract to build 2 Stretch Computers, Harvest, and also use the new technology in the next generation Commercial 7000 Series Computers.

B4 I was responsible for the research and development of the high speed ferromagnetic memory cores (both 50-80 and 30-50 toroids), logic components and the ferrite matrix switch cores, which were required for the high speed circuitry of this Super Computer. In order to accomplish this I coordinated my research with the requirements of the electrical engineers assigned to different functions who included Dick Lamy, Ed Council, Greg Constantine, Dick Booth and Bill Lawrence (Project Manager).

B5 My managers were; Dr. John Gibbons and William Lawrence; later, Bill Hymes in the Product Development Lab.

B6 1956-1959

B7 1) Working with Ed Council, I was responsible for the development of the high coercive force square loop ferrite 50-80 and 30-50 memory cores needed to obtain the higher switching speeds at lower drive current so transistors could be used.

2) Developed ferrite matrix switch cores used by Greg Constantine to increase the speeds with lower drive currents, with less Eddy Currents and heating. The previous permalloy cores costs were about 70 times what these cost, and could not function at the higher speeds.

3) Also developed a technique to make square loop, special shaped logic cores for Dick Booth and Dick Lamy. These developments were originally reported in Silo Technical Memo 13, which was not published with these developments cited, as I had written it.

C1 Then, I was hired by the Aeronutronics Division of Ford Motor Company, through Gene Amdahl, formerly with the IBM Stretch Group, and was rewarded there, with the doubling of my salary and the opportunity of building my own Solid State Group of Engineers to develop high speed memories and many other solid state and microelectronic devices for military and space programs. God was good! Later, Bob Noyce of Intel (maker of Pentium memories) offered me the position of heading up their memory group, but I could not take it at the time. I bear no malice to those who caused my family to suffer through this period. Aside from my gaining through problems that I had at IBM, I hired a technician from IBM, to assist me in development of BIAx memory cores into production. His name was Charlie Sciandra, and he was told by one of his bosses at IBM that he only had an Associate Degree and was too short to get very far at IBM. Well as part of my department; Charlie, Vic Columbo, a technician and I worked as a team developing the high speed non-destructive read BIAx memory elements, developed a special press and used spray drying technology to put these into production. Then Charlie was promoted and successfully headed production and was promoted to Production Engineer. He was then interviewed by Control Data and became their Memory Core Production Manager, with hundreds of employees reporting to him. He was hired for what he knew and his performance at Aeronutronics! There is an old saying, "Don't judge a book by its cover," or "Don't judge people's technical abilities by their calling cards!"

At Aeronutronics we developed: high speed BIAx non-destructive read-out memory cores, a very high speed thin film memory, CRYOSAR & Ferroelectric memories, and integrated circuit technology for military and space equipment including the Apollo spacecraft memory. My department developed a thin film memory that was 10 times the speed and operated on one tenth the power of any memory on the market at that time, and received an NSA contract. We also developed many other electronic solid state sensors and equipment for ARTOC, the Shillelagh IR guided missile, and other military applications.

### **Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

### **Ike Eichbaum (Cont'd)**

I then became the Staff Assistant to the director of the Philco Research Lab, Director of AMP Development Lab, Gulton R&D and Lear Enterprises Research Director. Then I joined the US Bureau of Mines Research Lab. in Reno, Nevada and ran several research projects in extractive metallurgy, digital process automation and environmental studies to clean up mine wastes and mine waste waters at Superfund sites.

Since coming to Reno with Bill Lear, my family has become one of the founding Families of Reno Christian Fellowship Evangelical Church, which is one of the largest churches in the area teaching Biblical principles and accepting Jesus Christ as our Savior. I John 1:9, "If we confess our sins, he is faithful and just, and will forgive our sins and cleanse us from our unrighteousness." Being a Christian and having my family members accepting Christ as Savior is the most important of all the successes in my Career.

C3 Honors and awards: Suggestion Award Certificate #1881, Raritan Arsenal, Oct. 31, 1949; Edward Orton Fellowship and Texas University Scholarship, September 1952; First award, Foote Minerals Award Program, December 1955, "Dense Ceramic Bodies of Low Firing Shrinkage" - made with the mineral spodumene; Third award, Ferro Enamels Award Program, 1955, "Phosphorescent Porcelain Enamel;" ERAD Award at IBM for Inorganic Magnetic Disc Coatings for High Density Memory Storage, 1958; Citation Award, Materials in Design Engineering Contest, "New Ferrites (Cadmium Manganese Spinels) Boost Computer Speeds," May 1959; Ford Motor Co. Award of \$7,000 for "Ferrite R&D and Setting up BIAx Production," March 6, 1961; Ford Motor Co. Award of \$6000 for the Development of a High Speed Thin-Film Memory System and obtaining a \$500,000 NSA contract, 1962; Commendations from editor of Insulation Director/Encyclopedia for preparation of section on "Ceramic Insulation," March 29, 1968; Bonus award for aiding in setting up Lear Enterprises, Wm. Lear Enterprises, Reno, Nevada, April 25, 1969; Award for Assisting with Alternate Anode Pilot Run, 1994 at USBM.



**Bea, Nancy, Virginia, Susanne and Ike  
Eichbaums's 30<sup>th</sup> Wedding Anniversary (1980)**



**Bea and Ike Eichbaum  
50<sup>th</sup> Wedding Anniversary**

### **Ike Eichbaum (Cont'd)**

Listed in Who's Who in Electronics Industry, 1961; Who's Who in the East, 1966-1968; Who's Who in Commerce and Industry, 1967; Royal Blue Book, Great Britain; Dictionary of International Biography, Great Britain; Who's Who in the West, since 1968; American Men and Women in Science, since 1965.

[Editor's Note: Dr. Eichbaum has held numerous positions in community and church organizations. He has authored more than 50 publications, including books, articles, papers and presentations. Details furnished on request]

C4 I retired from the Research Center of the US Bureau of Mines in Reno, Nevada in 1995, and my wife and I continue to be active in Reno Christian Fellowship Church, of which we have been Founding Members since 1972. We are involved with other Christian Organizations like Cannon Beach Christian Conference Center, Oregon, where we can spread The Gospel. Also, active in local homeowners association and many local civic and regional issues important in the Reno area. Most important, we are active with the affairs of our family and do have many family get-togethers which we and they enjoy. We also attend many reunions, weddings, anniversaries etc. around the country, to keep in touch with our friends, and have done much world traveling and taking cruises between North America and South America.

### **Maurice A. "Moe" Every**

I am E. Anne Every, Moe Every's widow. Here's the information needed for the Stretch history.

Moe was born in Binghamton, NY on 06 August 1928. He graduated from Tri-State University in 1952 with a degree in electrical engineering. He had four children (Brian, David, Maureen and Leanne) by his first marriage and two stepchildren (Suzanne and Craig Horning) from our marriage. These six children have presented Moe and me with nine grandchildren. Moe passed away on 09 February 1996.

Moe spoke often of the people he worked with in the early IBM years. I know he was hired into the project at Poughkeepsie. My favorite story is the one printed in Emerson Pugh's "Memories That Shaped an Industry," p.176:

"... Moe Every had already earned a reputation as a person who got difficult jobs done. More a student of people and organizations than technologies, Every nevertheless had a quick grasp of essential issues and could hold his own in arguments with the best engineers. A man of earthy humor and saltier language, he was unflappable and confidently stubborn in his decisions. One otherwise calm engineer recalls standing on Moe Every's desk, shouting down at him, in an effort to get his attention and convince him to change a decision."

**John Fairclough** 1<sup>st</sup> Margaret (deceased) 2<sup>nd</sup> Karen

A2 Thirsk, Yorkshire UK; August 23, 1930

A3 BSc EE

A4 Three + two

A5 Five

B1 Worked in Brooklyn for Ferranti Electric Inc

B2 Max Paley

B3 IBM Poughkeepsie, Engineering, 1957-1986

B4 Logic design of interrupt system and third level logic circuit

B5 Ernie Foss, Erich Bloch

B6 1957-1959

B7 Invention of third level logic circuit

### **Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

### **John Fairclough (Cont'd)**

C1 IBM after Stretch, 1959-1986: UK Laboratories – Project Manager, 1959-64, Laboratory Director, 1964-68; Director, Data Processing, Marketing and Services IBM UK Ltd, 1969-70; Lab Director, Raleigh NC, 1970-72; VP, Communications Systems, 1972-74; Chairman, IBM UK Laboratories Ltd., 1974-82; Director, Manufacturing. and Development and Chairman IBM UK Laboratories Ltd., 1982-86

After IBM, 1986-present: [In 1986 John was appointed Chief Scientific Adviser, Cabinet Office to Prime Minister Margaret Thatcher's government where he was concerned with reshaping national science policy. He held this position until 1990, when he was made a "Knight Bachelor." Sir John then served as Chairman, Rothschild Ventures Ltd., from 1990 to 1998. At present, he is Chairman and non-executive Director of a number of public companies.]

C3 More than 20 awards and honours from British universities and professional organisations. Author and co-author of more than 20 publications. Holder and joint holder of four patents

### **Philip Fox**

Lucile

A2 Syracuse, New York, November 16, 1920

A3 MSEE

A4 Two

A5 None

B1 Magnetic core memory development

B2 Stretch absorbed my organization

B3 IBM Poughkeepsie, Engineering 1946 to 1982 (retired from E. Fishkill)

B4 Memory and circuit development

B5 M. E. Femmer, J. C. Logue, R. Henle

B6 1955 to 1959

B7 Greg Constantine's load-sharing matrix switch, which utilized the best power transistors available from Stretch semiconductor development to drive core memories. In this development, Greg ignored the management edict that transistors would be developed that could handle enough power to drive memories directly. That never happened.

C1 MST circuit development, then semiconductor device design.

### **Frank Gagliano**

Fran

A2 New York City

A3 BS Math.

A4 Three

A5 Four

B1 IBM at 590 Madison Ave, Math/Programmer

B3 IBM Poughkeepsie, Harvest software

B4 Harvest Assembly Program (HAP)

B6 1958-1961?

B7 Installing and having NSA accept Harvest at Fort Meade

C1 DP sales in the NFM Navy programs Wash. D.C ... Sales rep in Sacramento, Ca ... Sales, federal programs for IBM Global Network. Retired from IBM. Now work for AT&T global network.

**Carol Garrity**      Jack Garrity  
A2 New York, NY; May 21, 1934  
A3 BA Math 1956, St. Joseph's College for Women, Brooklyn, NY  
A4 Four  
A5 Five

B1 Service Bureau, New York City, 704 Customer Programming  
B2 Paul Herwitz  
B3 IBM, 425 Park Ave., NYC; Software, 1956-1960  
B4 Strap  
B5 Sherman Prosser  
B6 1959-1960  
B7 Son born Aug 7, 1960  
C1 Homemaker, Poughkeepsie Town Councilman

**Jack Garrity**      Carol Garrity  
A2 Massachusetts, October 24, 1925  
A3 BA Math, Physics  
A4 Four  
A5 Five

B1 Service Bureau, New York City  
B2 Paul Herwitz  
B3 IBM Poughkeepsie, Programming, 1957-1990  
B4 MCP  
B5 Gul Hira  
B6 1957-1963  
B7 MCP

C1 Poughkeepsie, Rochester, Washington, Houston, Poughkeepsie, Kingston

**Richard B. Gowetski**      Marilyn  
A2 Kittanning, PA September 5, 1936  
A3 BA, Mathematics  
A4 Two  
A5 None

B1 US Army  
B2 Tom Apple  
B3 IBM, Poughkeepsie, Software (Harvest - Alpha compiler), 1960-1994  
B4 I was responsible for generating Harvest object code for the Alpha compiler.  
B5 Tom Apple, Fran Allen  
B6 1961-1963 (2 ½ yrs)  
B7 Seeing the Harvest project through system testing to the end of the contract

**Key:**

**Alumnus/a**, Spouse   A2 Birth Data   A3 Education   A4 Children   A5 Grandchildren   B1 Before Stretch   B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer   B4 Role on Stretch   B5 Managers   B6 Years on Stretch  
B7 Worthiest Accomplishments   C1 After Stretch   C3 Awards, Honors, Papers, etc.   C4 Current Interests, Activities

**Richard B. Gowetski (Cont'd)**

C1 Because of my having the DoD clearance, I was one of three who were drafted as Systems Engineers in the Washington Special Operations Branch office to support Harvest. I spent seven years in the branch as an SE and SE manager after that. After which, I transferred to the Federal Systems Division in Gaithersburg, Maryland and spent the next seventeen years there in application development and systems integration management positions working on DoD contracts. I spent three years in Sydney, Australia setting up commercial systems integration in Australia and then spent my final four years with IBM working in commercial professional services in Bethesda, Maryland.

I think Fran Allen talked to us about a 6-9 month temporary assignment at Ft. Meade, Maryland sometime in the summer of 1962. With the exception of the three years we spent in Australia, I have spent the last 40 years in the Washington area.

C4 I have become a civil war buff with plenty of battlefields to visit, from Gettysburg to Richmond. I still do occasional consulting in a web site development environment for a friend with whom I worked at IBM in the mid-nineties.

**Larry Grodman     Bernice Grodman**

A2 New York City; Jan. 23, 1934

A3 BS mathematics; MS applied mathematics

A4 Two sons

A5 Five

B1 Scientific programming at IBM Research Laboratory; logical design at the Product Development Laboratory at IBM

B2 Paul Herwitz

B3 IBM Poughkeepsie, Software, 1959-1960

B4 Operating System Development

B5 Paul Herwitz, Gul Hira

B6 1959-1960

B7 I/O Processing by the operating system

C1 Programmed Stretch at Mitre Corp. for four years, then staffed and managed the software division of a consulting firm in London, then consulted for Auerbach Corporation. Started own software and systems education, training and book publishing firm (QED Information Sciences, Inc.) in 1971 and served as president for 25 years. QED was acquired in 1996, when I retired.

C3 Published an article on sorting techniques for a British technical encyclopedia.

C4 Several volunteer projects; international travel

## George A. Grover

A2 Ottawa, Illinois; July 8, 1929

A3 B.A. Amherst College – physics major, English minor; NYU graduate school of mathematics, one year

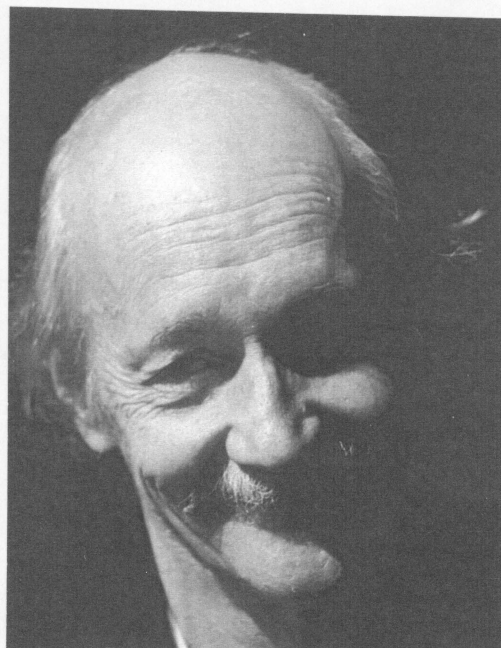
A4 Five

A5 Six

B1 From 1954 to 1958, I worked as an application designer and programmer in the IBM Scientific Computing Center, a Service Bureau operation on Madison Avenue in New York City.

B2 Bill Heising hired me as the first programmer on the Stretch software development project.

B3 I was hired in 1958, initially to work in what then was called Applied Programming, at 425 Park Avenue. During 1959, the project was transferred to Poughkeepsie, and I went with it and stayed with Stretch until 1962. My last year in Poughkeepsie was 1976; and I retired in 1995, concluding a 40-year career in IBM.



**George Grover, Recent Photo**

B4 My principal role on Stretch and Harvest was managing all of the IBM development programming for Harvest and also that of the Fortran compiler for Stretch, and the common compiling system which we used to support both Stretch and Harvest.

B5 Bill Heising was my manager initially, during a period when I worked on the design of the Assembly program. After the project had been moved to Poughkeepsie, a time came when Paul Herwitz became manager of all Stretch programming, and under him I was responsible for technically leading the Assembler and the Control Program groups. Shortly after that, when I became manager of Harvest programming plus FORTRAN, my manager became Sullivan Campbell.

B6 1958-1962

B7 The most critical problems that I could see at a fairly early point were how to deliver the software supporting the hardware on time and, in the case of Harvest, how to get customer agreement on specifications as to what would be done, and also the customer's agreement to sign a new contract, the initial one having expired.

We had a lot of talented and motivated individuals in our team, but we did not have much experience in producing complex software. I was in my first management job ever, and the same was true for most of the managers on the team. So we all had to “learn and do” concurrently. I was fortunate in being able to enlist the services of a strong management team.

In the end, the two most critical problems, along with many others, were pretty much solved through the tremendous skill and efforts of all who were involved and, in the case of the schedules, with a little bit of slippage help from our hardware brothers.

C1 After the Harvest-Stretch project, I managed a small group responsible for the design of all IBM software for the 360 computer family, which replaced our entire existing product line of the time. This job carried with it a high level of responsibility, technical interest, and difficulty--particularly in the light of the huge shortage of programmers. In the year I held the post I was unable to find a satisfactory solution to this problem, as had been my predecessor and as was my successor. But it was a fascinating year.

### Key:

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities



## **George Grover (Cont'd)**

I next went to Australia for 2 years (great living experience for self and family) to start up IBM's first scientific computing center there.

Upon returning to Poughkeepsie, I took a staff job aimed at helping establish and coordinate advanced technology programs in all of the programming centers. In this capacity I pulled together the first overall strategy on programming, and later worked with getting programming strategies at each of the individual programming centers. In what I think of as this middle part of my IBM career, at various points I also managed staff groups on productivity and quality, and one on security.

Then in 1979 I initiated a career change that turned out to be very positive. I sidestepped out of management entirely, and joined a Systems Network Architecture (SNA) design group (another member of which was Dick May). This was followed in 1982 by my joining the Communications area in the Research Division, where I worked on many interesting problems until retiring in 1995.

In Research, I made extensive contributions to the design of the architecture for IBM's Advanced Peer to Peer Networking (APPN) products. I was one of a five-person team in Research that implemented the first APPN product on the IBM System 36. During this period, my efforts included designing algorithms for:

1. Deadlock free flow control for APPN.
2. APPN Control program to Control Program synchronization processes for System 36.
3. Automatic designing of near least cost physical networks.
4. Calculated and developed mathematical proofs for absolute queuing (buffer) bounds for a variety of high bandwidth switching structures.
5. Nondisruptive route switching in SNA networks.
6. Nondisruptive route switching for APPN sessions in mobile networks.

C3 Awards: Outstanding Technical Achievement Award and a Supplemental OTA Award, both for S/36 Advanced Peer-to-Peer Networking.

Papers included the following titles:

1. Buffer Size Requirements Under Longest Queue First
2. Windows in the Sky - Flow Control in SNA Networks with Satellite Links
3. Standoff and Standoff Resolution in Deadlock Free Networks with Virtual Circuits
4. Problems and fixes of OSI multi-link procedure standard
5. A Full Duplex DLC Protocol on Two Links
6. High Availability Process for Networks (HAPN)--Nondisruptive VR Switching
7. Mentor: An Algorithm for Mesh Network Topological Optimization and Routing
8. IDNX Network Topology Design (INTD) - User's Guide
9. Implementing System/36 Advanced Peer-to-Peer Networking
10. Efficient Hop by Hop Buffer Class Flow Control Schemes

C4 Retirement has provided the opportunity to explore more deeply some other quite different interests. I have spent a fair amount of time writing poetry, a lot of time reading all sorts of things, a fair amount of time bodyboard surfing in deep waves in Long Island and Puerto Escondido and Ixtapa, Mexico, and thought a lot and written some in a new field called cognitive neuroscience--the use of the concepts of computer science in the study of the information processing of the human brain. And I spend more time with my children and grandchildren

### **Ann Hardy**

A2 Chicago, Illinois; April 20, 1933

A3 BA – Pomona College, California. Liberal Arts.

A4 I have two daughters, Pamela and Jennifer.

B1 I was working in IBM Research before the Stretch project.

B2 Sullivan Campbell hired me.

B3 I worked in Poughkeepsie until 8/61. Then worked on Stretch at Livermore from 1/63 – 1/66.

Worked in software including Fortran compilers and editors at both Poughkeepsie and Livermore.

B4 My principal roles were in software. Included time on Harvest at NSA.

B5 My managers were Dick May and George Grover.

B6 I was on the Stretch project from 1959 – 1961.

C1 Left Livermore for Tymshare, where I wrote their operating system for the SDS 940. I then became VP of the Business Unit responsible for all the networked products – the 1970's versions of online airline reservations, home banking, etc.

C3 I am currently on the Board of the Charles Babbage Foundation, whose mission is to preserve the history of the industry.

C4 I am currently Chairman, CEO and President of Agorics, Inc., marketing security software. (My days with IBM at NSA still haunt me!).

### **Norman Hardy**

A2 Pomona California; February 8, 1933

A3 BA in math from Berkeley, 1955

A4 Two

A5 None

B1 Lawrence Radiation Lab, Livermore California

B2 Sully Campbell

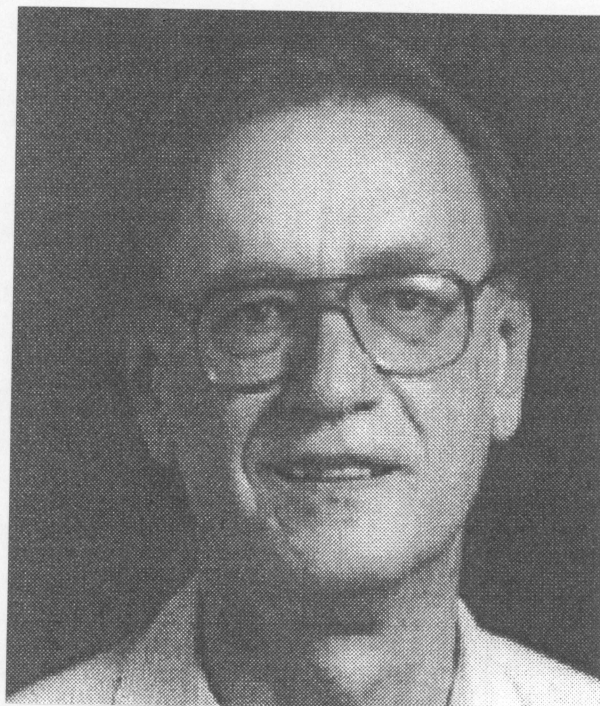
B3 IBM, Poughkeepsie, 16 months

B4 Software, application analysis, Benchmarks

B5 Paul Herwitz

B6 16 months

B7 Monte Carlo benchmark



**Norman Hardy (from his web site)**

C1 Returned to Livermore. Worked once again for IBM on ACS project

<http://www.cs.clemson.edu/~mark/acs.html>> at Sand-Hill road in CA; worked at Tymshare

<<http://www.scripophily.net/tymshareinc.html>>. Developed Tymnet while there. Architect for Keykos

<<http://www.agorics.com/Library/keykosindex.html>>. Now at Agorics <<http://www.agorics.com>>.

C3 Two papers have had some significance, I think: 1) KeyKOS Architecture

<<http://www.agorics.com/Library/KeyKos/architecture.html>>

2) The Confused Deputy: <<http://cap-lore.com/CapTheory/ConfusedDeputy.html>>.

C4 Still write code and update my web site.

### **Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Richard C. (Dick) Hatch**

Mary Margaret Hatch  
A2 Boston, Massachusetts;  
January 28, 1934  
A3 Harvard A.B., Social  
Psychology; Boston University  
A.M., Sociology  
A4 One  
A5 Zero

B1 IBM Applied Science  
Cambridge, MA  
B2 Tom Apple



**Mary Margaret and Dick Hatch on "Turtle Patrol," Vero Beach, FL**

B3 IBM, Stretch Software Simulator for 704, 709,7090 Poughkeepsie; Technical Liaison with (Harvest Customer) Wash, DC, Poughkeepsie 1958-1960, Wash, D.C. 1960-1963 (1963 transferred to IBM FSD as SE supporting Harvest/BuShips)

B4 Software ... Specification, Design, Implementation, Test, Document; Harvest Customer ... Assistance, Coordination, Mollification

B5 Tom Apple, Paul Herwitz, Sullivan Campbell

B6 1958-1966

B7 Software Simulator, Keeping Harvest System Customer placated through numerous delays and overruns

C1 1964-1966 DPD Systems Engineering Manager; 1967-1968 DPD Marketing Manager; 1968-1970 DPD Branch Manager; 1971-1973 FSD Manager of Information Systems Dept, Government Contracts; 1974-1975 ICBO Markets Development Director; Social Leave; 1975-1987 NAD Consulting Marketing Rep, National Federal Marketing

C3 Just a lot of DPD honoraria.

C4 Presently retired in Vero Beach, Florida where I am active teaching and coaching in the local Seniornet personal computer training facility. In addition, I volunteer a couple of days a week with the local Public Safety Dept. doing beach and boat patrols and other odd jobs as required. I also serve (reluctantly) as pc guru to many of my fellow condo residents and now believe that the DPAT should be given to all prospective pc purchasers.

**Jim Havender**                      Connie (ex)

A2 New York City, August 9, 1935

A3 SB/SM EE '57 MIT

A4 None, one stepdaughter

B1 Programming at Yorktown Research, implemented KWIC Index program (has anybody still living heard of it?) [Ed. Note: It's Key Word In Context]

B2 Was on assignment from Research Lab. Reported to Paul Herwitz in Stretch.

B3 Poughkeepsie, Software, IBM Research Division

B4 Input SPOOL program.

B5 Paul Herwitz/Jack Garrity

**Jim Havender (Cont'd)**

B6 1960-1961 (best recollection)

B7 SOPS Emulator

C1 1410 Operating System, OS/360, Education Industry, Instrument Systems, Group Staff.

C3 Corporate Outstanding Contribution Awards for Scheduler and Queue Manager.

C4 Home maintenance, Gardening (mostly Hostas), Sailing, Skiing, Tennis, Piano, Hiking, Travelling, Cruising.

**Munro K. Haynes (Mike)**

Regine (Gina)

A2 Elmira, New York December 10, 1923

A3 BS Physics, University of Rochester, 1947; MS EE, University of Illinois, 1949; PhD EE, University of Illinois, 1950

A4 Three

A5 Five

B1 IBM Research on Magnetic Cores for memory and logic. See Emerson Pugh's books

B2 Not applicable

B3 Poughkeepsie

B4 Not applicable

B5 Not applicable

B6 Not applicable

B7 Not applicable

C1 Continued working for IBM, Worked in Research, Corporate HQ, Boulder and Tucson. Retired in Tucson after 38 years.

C3 PhD Thesis contained first published description of coincident current switching of magnetic cores, Member Sigma Xi, Fellow of IEEE, Registered Professional Engineer State of Colorado, IBM Outstanding Contribution Award, IBM Eighth Level Invention Achievement Award, 10 published papers, 38 issued US Patents.

C4 Was instrument rated private pilot for 22 years, now fail medical exam. Volunteer assistant in University of Arizona Control Systems Lab. Still active in Choral Group singing. Active bicyclist.

**Bill Heising** Barbara (who responded for Bill)

A2 Newark, NJ September 4, 1923

A3 Bachelor's in Chemical Engineering, Cornell; Master's in Physics, Columbia

A4 Four

A5 Three

B1 IBM

B3 IBM Poughkeepsie

B8 George Grover's name brought instant recognition

C1 Worked and retired in Dallas. Sorry, Bill's memory has been pretty much erased due to extra radiation. He did recognize a number of the [Stretch] names and has patchy memories.

C3 Several, which I am afraid got lost in our last move

C4 Nursing home therapy, unfortunately. Lung cancer, in remission. Parkinson's, radiation-induced dementia. A sad list.

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Paul Herwitz**            Gisela (died in 1999)  
A2 Cincinnati, Ohio, June 10, 1923  
A3 BA, MA, PhD all in mathematics  
A4 Two girls – Andrea and Evelyn  
A5 Four girls – Sarah, Carrie, Mindy, and Emily

B1 IBM Service Bureau Corp, Washington,  
DC, programming the IBM 650 drum computer  
B2 Probably Red Dunwell and/or Bill Lawless  
B3 IBM Poughkeepsie, Software, 1955-1987  
B4 Hardware algorithms for Harvest; later became  
manager of the group  
B5 Bill Lawless and later Sully Campbell;  
B6 I think it was 1956 to 1962 or 1964  
B7 A 600 page patent with two engineers



**Paul Herwitz, circa 1960**

C1 After I left Stretch programming (1962 or 1964) I went to Gardner Tucker's staff in Research, then Jack Bertram's department (big computers), then to Corporate Personnel (how to decide whether a programmer is "exempt"; I wrote the "Brown Book" and the "Blue Book" (for any of you who remember those days!). The Personnel assignment began officially in 1979 and ended (for me) when I retired in 1987.  
C3 On the Editorial Board of the IBM Programming Book Series. After IBM: local school board for 9 years; BOCES for 9 years (overlapping 6 years); president of Homeowners Association (four or five years); Town of Cortlandt [New York] Conservation Advisory Council for 11 years; PC consulting for about 4 years.  
C4 Billiards, golf; retirement community just over a year

**John A. Hipp**            Claire L. Hipp  
A2 Brooklyn, New York, December 19, 1925  
A3 BEE Electrical Engineering  
A4 Three  
A5 Three  
B1 Product Field Engineer on 702 and 705 Systems  
B2 Erich Bloch  
B3 Poughkeepsie, Engineering, IBM  
B4 Project Manger, VFL Unit then Project Manager LASL 7030 Build , ship, install and test system.  
B5 Erich Bloch  
B6 1956-1961  
B7 Successful design, build, test, release to Mfg. of VFL Unit and build, test, ship and install of LASL 7030  
C1 Program Manager, System/360 Mod 50, Prod. Eng. Mgr Europe, Mid. East, Africa. Mfg. Research, Yorktown Heights, etc.  
C4 Elected Commissioner North Bay Fire District, Master Gardener Univ. of Florida, Lions International, Lowery Electronic Organ student.

**Edward V. Hofler** Brenda  
A2 Bronx, New York, April 13, 1926  
A3 BA Math, Colgate; BSEE, RPI  
A4 Three children  
A5 Ten grandchildren

B1 Transferred from the SAGE program within IBM

B4 Principal assignment: Establish a product development team for the announced 7030 program. Incorporate design changes to raise the performance level closer to the original design targets. Follow through on delivery to Livermore and Los Alamos systems, negotiate acceptance test on upgraded systems. Provide engineering support to manufacturing, marketing, field engineering, legal and contracts for the duration of the Stretch program. Generate proposals for possible post Stretch systems.

B5 Steve Dunwell, Max Paley, George Monroe, etc, etc.

B7 Delivery and successful acceptance test of first upgraded production 7030 system at Aldermaston. Also, the most stressful and gratifying. A big plus was the opportunity to work as a team with marketing, contracts and legal on each of the sales. Most satisfying was working with the outstanding professionals such as Sully Campbell, T.C. Chen, Jim Pomerene, Paul Herwitz and Peyton Williams.

C1 Custom Systems- FAA, NASA, Airlines, etc, launched the IBM Japan Laboratory, Lithography Systems for FMS at Fishkill, Corporate EP&T Staff.

**Dick Holleran** Ruth Ann  
A2 Pittsfield, Massachusetts; July 9, 1932  
A3 BSEE, RPI; MS in Mathematics, Michigan University  
A4 Four  
A5 12

B1 US Air Force

B3 IBM Poughkeepsie, Engineering, 1954-1991

B4 Logic design on the I-Box (instruction unit) for the central processor. Later, managed I-Box, Exchange and Lookahead design team

B5 Bob Blosk, Bob Fletcher

B6 1957-1961

B7 Completing the design, making it work and successfully shipping and installing the machine. The I-Box and its Lookahead partner were a "first" in pre-fetching instructions and operands.

C1 Managed development of the S/360 model 70 CPU. Transferred in 1965 to IBM San Jose, where I managed DASD (direct access storage device) control unit projects. Retired from IBM in 1991. Managed a couple of disk drive programs for Conner peripherals in 1992 and 1993.

Probably sowed the seed for our eventual move to San Jose.

C3 IBM Master's degree program at the University of Michigan. Several Outstanding Contribution awards at Poughkeepsie and San Jose. Invention Plateau awards.

C4 Retired: Golf handicap 12, digital photography, travel, lots of family activity with kids and grandkids

**Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Lloyd P. Hunter** Esther K. Hunter (who provided all the information. Lloyd is currently an Alzheimer's patient in a nursing home.)

A2 Wooster, Ohio; February 11, 1916

A3 B.A. degree from the College of Wooster in 1938; B.S. from M.I.T. in Physics and Mathematics in 1939;

D. Sc. from Carnegie Institute of Technology (now Carnegie Mellon) in Physics, December 1942

Father of five children (one daughter then four sons)

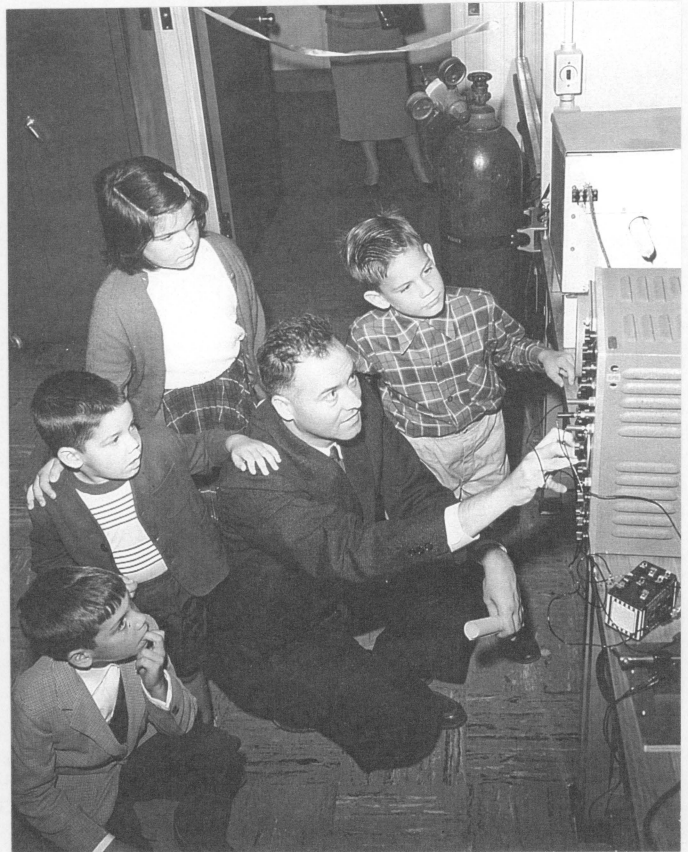
Grandfather of eight (six grandsons and two granddaughters.)

B1 From 1939 -1951 Engineer at the Westinghouse Electric Laboratory in Pittsburgh doing research. '44 -45 assigned to the U. of Cal, Berkley, Radiation Labs to work on Isotope Separation. '46-49 assigned to Oak Ridge National Lab to work on Power Reactor Development and radiation damage. '49-51 Research on radiation effect on solids, microwave magnetron development, and on Radar components.

1951 -1963 IBM Research and Development of Semiconductor Components for computers. Hired by Dr. Arthur Samuel in June 1951 to work as a Research Scientist in the IBM Research Laboratory in Poughkeepsie. (Della Penna House, once a pickle cannery). 1957-58 on loan to the N.V. Philips Laboratory in Eindhoven, The Netherlands doing research on X-ray Anomalous Transmission Dec. '58 Named Resident Manager of the Research Lab on Boardman Road.



**Lloyd Hunter, Age 36 (1952)**

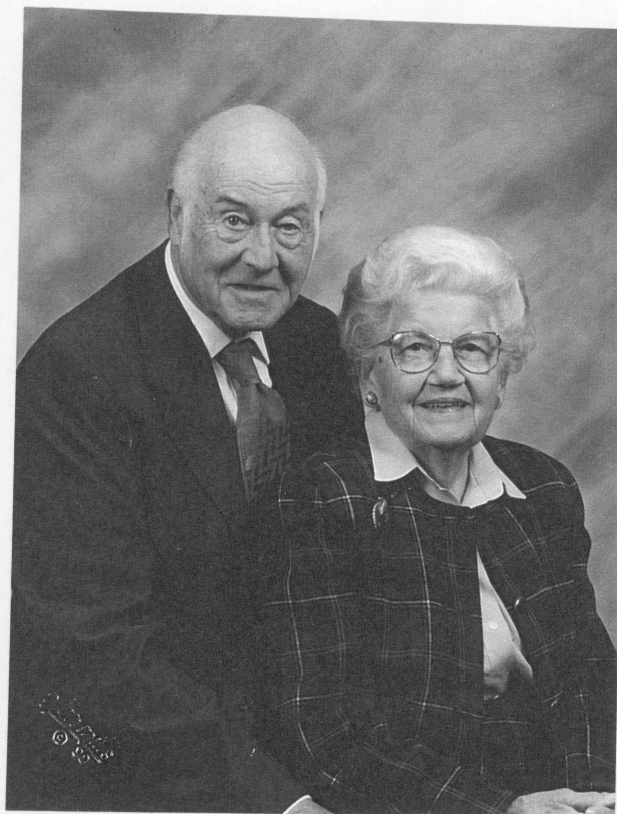


**October, 1954: Lloyd Hunter demonstrates Boardman Road Lab equipment to his four Oldest children on "Open House Saturday"**

**Lloyd Hunter (Cont'd)**

C1 1963-1981 Professor of Electrical Engineering at the University of Rochester. He worked in areas of Solid State Electronics and Ultrasound Scattering '68-67 On a sabbatical leave for a full year at the IBM Lab at San Jose, California.

C3 Honorary Societies: Phi Beta Kappa, Sigma Pi Sigma, Sigma Xi, Phi Kappa Phi; Professional Societies: Fellow, American Physical Society, Fellow, IEEE. Publications: *Handbook of Semiconductor Electronics* (McGraw-Hill); Author of six chapters and Editor (1956, '62, '70 Editions), *Semiconductor Phenomena and Devices*; Contributor of more than 10 articles in the *Encyclopedia of Science & Technology* (McGraw-Hill) 1962, '68, '75, '8x; Numerous articles in Journal Publications: Physical Review, Proc. of IEEE, IBM Journal Of Research & Development, Solid State Electronics, Journal of Applied Physics, Physics Today.



**Lloyd and Esther Hunter  
(Most recent photo)**

1997: Lloyd Hunter, now retired, was invited back by IBM for a day of honoring a former colleague. With him is Joan Paggi Morezzi, who was his secretary the entire time he was with IBM (1951-1963). She did all the typing for the manuscripts of his books and articles

**Thomas L. Jordan** Christine (deceased)  
A2 Nashville, Tennessee; September 28, 1920  
A3 BA, MA, PhD in Math, Physics at Vanderbilt University  
A3 Four children  
A4 Seven grandchildren, Eight great grandchildren

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities



**Thomas L. Jordan (Cont'd)**

B2 Bengt Carlson

B3 Los Alamos, Software, LASL, 1953-1983 (Consulted until 1990)

B4 As with every computer I worked on, I helped users obtain the maximum performance

B5 Bengt Carlson

B6 From beginning to end

B7 Assisting users to get the ultimate performance out of the computer

C1 Continued to work on computers of the day until 1990

C3 Parts of many classified reports. Star wars, etc.

C4 Helping offspring

**Larry Josephson**

A2 Los Angeles, California; May 12, 1939

A3 BA, Linguistics (Minor in Mathematics), UC Berkeley

A4 Three Children

A5 Two Grandchildren

B1 School, Senior at Berkeley

B2 Sully Campbell

B3 IBM Poughkeepsie

B4 Programmer Trainee

B5 Jack Garrity, Leo Bennett

B6 1962- 1963(?)

B7 Learned this magnificent machine from a great instructor, Barbara Call. Barbara was a laid back but effective teacher who didn't take herself too seriously and laughed heartily at my jokes. I was very proud that my student program ran successfully. Shortly after, I was assigned to the OS/360 project, at that time the largest endeavor since the building of the Pyramids.

C1 After serving two years' hard time in Poughkeepsie (no place for a single urban man), I managed to get a transfer to Time/Life, the elephant's graveyard for those IBM didn't know what to do with: the impossibly neurotic, the terminally depressed, the professional complainers, the lovable misfits. A born and bred Californian, I found my true home in New York City where I have lived ever since.

After two memorable years at Time Life, I left IBM for a \$40/week job as an announcer at Pacifica/WBAI, an obscure FM station full of misfits, complainers, and neurotics of the left persuasion. When most of the staff walked out over a dispute about coverage of the Vietnam War, I inherited the morning show, and the rest is history. I found my true calling, talking on the radio.

WBAI became the switchboard of the sixties, where sex-drugs-and rock and roll, flower power, and the antiwar and anti establishment revolutions were amplified. I became famous in the small world of Volvo-driving, white-wine-drinking, pot smoking liberals and radicals. Everyone at WBAI thought it amusing that I left IBM for that impoverished milieu, everyone but my mother, who thought I was crazy to give up the security of a large paternalistic corporation. I've never regretted it for a moment, although I do miss my IBM friends and my pension.

### **Larry Josephson (Cont'd)**

After 35 years, I'm still talking on the radio, now on NPR stations. And I am still involved with computers, thanks to Bill Gates and his magic blue screens. From my STRETCH days I know what all those hexadecimal numbers mean: trouble.

C3 I won the Peabody Award, the highest in broadcasting, for my work with Bob & Ray. I still distribute their work on CD and cassette ([www.bobandray.com](http://www.bobandray.com)). I've taught programming and radio production at NYU, and The New School, and am now fitfully pursuing a Certificate in Teaching English as a Second Language, as a possible retirement job. For me, retirement would be like living in Poughkeepsie. I hope to die at my desk.

C4 I am still a radio producer, heading a nonprofit, independent production company, the Radio Foundation I started 25 years ago. In addition to Bob & Ray, I do a series of Jewish Holiday specials for public radio, conversations with a wonderful and wise Rabbi, Ismar Schorsch, who is Chancellor of the Jewish Theological Seminary. They can be heard at [www.whatisajew.org](http://www.whatisajew.org)

Interests include good food and wine, music (opera and classical), art and revival films, falling in love, falling out of love (married twice and still looking).

### **Phil Joslin (none)**

A2 Melrose, Massachusetts; November 22, 1938

A3 Bachelor of Arts, Harvard, 1960, Physics major

A4 None

A5 None

B1 Attending college

B2 I don't remember, but I think he had a Polish name.

B3 IBM Poughkeepsie, Software Development (aka Programming), 1960-1991

B4 Developed 704 and 709 simulators (software) for Stretch. Developed a program called Update30 to maintain the Stretch OS.

B5 Tom Apple

B6 1960-1962

B7 Learning how to write complex programs

C1 I spent 31 years with IBM, mostly managing software development projects in the Washington DC area. Now I run my own consulting business in Portland Oregon, where I specialize in developing custom databases (Access and SQL Server) for my clients.

C3 Eventually I achieved a promotion to Senior Technical Staff Member. At the time, there were only about 250 of us in IBM. It was in recognition for my leadership in developing what was then one of IBM's most popular and successful program products – called ISPF (Interactive System Productivity Facility).

### **Lawrence (Larry) Kanter** Peggy Kanter

A2 New York City, New York, March 3, 1925

A3 MEE (RPI), BEE (RPI), MBA (MIT)

A4 Two

A5 Four, plus two great grandchildren

B1 Working on Ralph Palmer's staff at headquarters

B2 I think John Haanstra assigned me to the Harvest program.

B3 IBM Poughkeepsie, Management

B4 As I recall, Jim Pomerene was the System Manager, and I was Assistant System Manager.

B5 Jim Pomerene

### **Key:**

**Alumnus/a, Spouse** A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Larry Kanter (Cont'd)**

- C1 Program Manager 7094, System Manager Model 91/95, Large System Manager, Manager of IBM's SBS Engineering effort in Washington, D.C
- C3 Outstanding Technical Contribution, 7094; Outstanding Contribution, Model 91/95; Outstanding Invention Award, Data Synchronizer
- C4. Enjoying life to the brim

**Chester Kazek**      Jane Kazek

- A2 Chicago, Illinois, October 21, 1926
- A3 BS in Math, BA in Theology
- A4 Three
- A5 Seven grandchildren and two great grandchildren

- B1 Working in the computer division at Los Alamos
- B2 Bengt Carlson, my superior
- B3 LASL Los Alamos, Software, 1951-1982
- B4 Project director to write a One-Pass Compiler using Polish Algebra. One IBM employee (don't remember his name) worked with us.
- B5 Bengt Carlson
- B6 1961-1964
- B7 The "IVY" compiler.

- C1 Worked on CDC computers
- C3 Ed Rosse Award
- C4 Deacon in the Catholic Church

**Gordon Kerr**      Grace Kerr

- A2 New York, NY
- A3 BSME United States Merchant Marine Academy
- A4 Two children
- A5 Three grandchildren

- B1 Diagnostic Programming in Poughkeepsie
- B2 Paul Herwitz
- B3 IBM Poughkeepsie, Software - STRAP II Group.  
Total time with IBM in various locations: April 1951 to May 1989
- B4 Wrote the Output Routine of the Stretch Assembly Program (STRAP II)
- B5 Sherman Prosser
- B6 1958-1960
- B7 Keeping Sherman happy
- C1 Following Stretch I was assigned to the Pan Am Airline Reservation System involving modifications to the 7080 processor and 1301 disk drives. With the advent of System 360 I became involved in performance analysis, which continued in projects at Poughkeepsie, Boca Raton and Raleigh.

**Gordon Kerr (Cont'd)**

C3 Informal Laboratory Award - Instruction Trace Technology development. Informal Laboratory Award - Enhancements to the Trace Tape selection process.

Publications: *Why Diagnostic Engineering?* G. L. Kerr 6/12/56, Paper delivered at IBM Engineering Symposium at Syracuse University.

*Diagnostic Programs, Purpose and Fundamental Concepts* G. L. Kerr 6/16/58 Technical Note TN 00.11083.283.

*Testing Error Detecting Circuits* G. L. Kerr 6/18/58 Technical Note TN 00.11083.285

*The Requirements for a Field Monitor* S. R. Dickstein, G. L. Kerr Paper delivered during a performance symposium at Yorktown Research Lab 1966.

*A Chronology of the Discovery and Repair of Water Damage to a 9020 System.* P. P. Hennes, G. L. Kerr, D. J. Petrolino 9/3/70 Technical Report TR 00.2098.

*Floating-Point Unit Cycle Generator.* (Disclosure No.BC8-84-0204) G. L. Kerr May 1986.

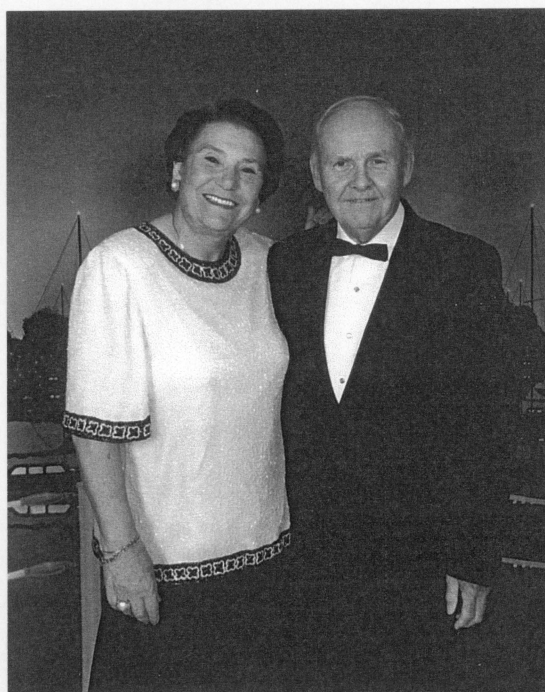
*A Floating-Point Performance Model for a RISC Based System.* T. B. Genduso, G. L. Kerr, J. R. Rodriguez March 3, 1988.

IBM Faculty Loan Assignment 1973-1974 Acting chairman of Vassar College computer center.

C4 Interested in digital photography. In the process of scanning and organizing family photos accumulated over the years. The objective is to burn a family photo history into CD's for the grandchildren. Grace and I take yearly cruises and occasional trips to Las Vegas and Biloxi to test mother luck.



**Gordon and Grace Kerr, "Then"**



**Gordon and Grace Kerr, "Now"**

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Eric Knutsen** Gail Antony Knutsen

A2 Brooklyn, New York; January 21, 1939

A3 BA, Mathematics; MBA

A4 Two, Rick and Christopher and two beautiful daughters-in-law, Frances and Nuar

A5 One, Olivia Gail (also beautiful)

B1 Senior at Yale; before that, 1959 summer job in software at IBM Kingston, simulating (on a 704) the AN/FSQ-7 (Army-Navy Fixed Special Equipment) SAGE II (Semi Automatic Ground Environment) computer. SAGE II was never actually deployed, but we did simulate it.

B2 George Grover

B3 IBM Poughkeepsie, software, 1960-1967

B4 Wrote and tested the "Job Control IV" software module (processor for application programs just prior to their execution); debugged MCP; provided on-site support at Los Alamos, New Mexico (LASL), Aldermaston UK (Atomic Weapons Research Establishment) and Bedford, Massachusetts (Mitre Corp.); wrote a user's manual for MCP.

B5 Gul Hira, then Jack O'Connell

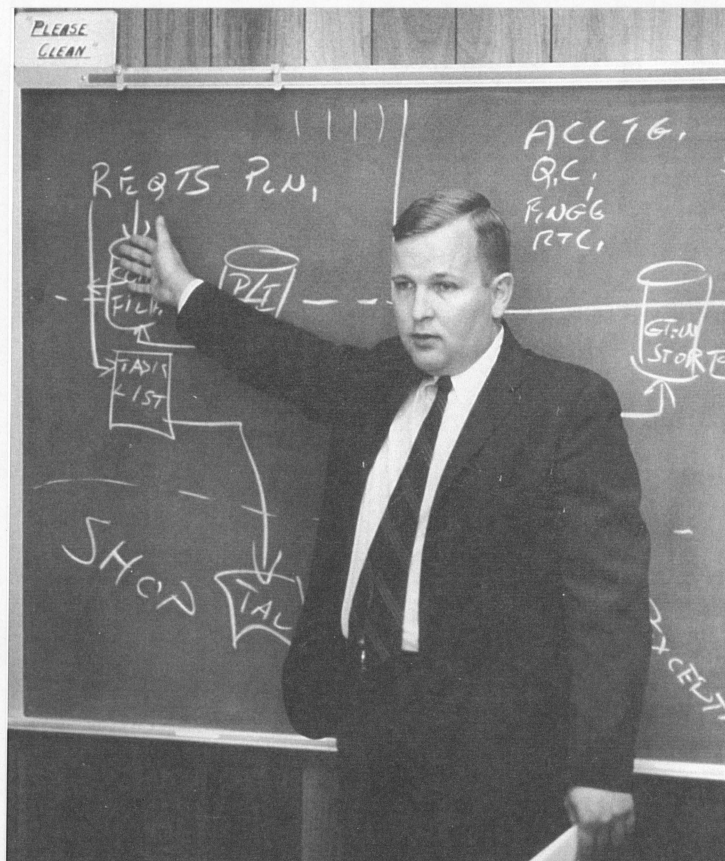
B6 1960 to 1962 plus summer of 1963

B7 To enable the Naval Weapons Lab to acquire a smaller, affordable Stretch machine, I reduced by some 33 per cent the core storage required for MCP, by placing some of the program modules on the disk, and using a relocatable loader written by Laura Adams Bensley and Bill Collier's Disk Fetch module to bring them into an overlay area while they were needed. With John Nash, an IBM UK Systems Engineer, devised a small tape-to-print program that stole occasional CPU cycles from MCP, thereby saving AWRE the cost of acquiring a 14xx computer for offline printing.

C1 In August 1962, I took a leave of absence from IBM and entered Harvard Business School's two-year MBA program, receiving an IBM fellowship in the second year. Then a three-year stint at IBM's Advanced System Development Division in Yorktown Heights, New York, as a Market Planner, later Project Manager for an online manufacturing product pilot that we installed (for customer demos) in IBM's new tape plant in Boulder, Colorado. (Thus, in 1966-67, I was an OS/360 "customer." Never saw so many software manuals!)

In July 1967, a month before Gail produced our second son, I left IBM to join Sully Campbell, Gul Hira, Jack O'Connell and a few others in Graphic Sciences, a startup company headquartered in Danbury, Connecticut. It was formed to commercialize a new fax technology. Concurrently, we also entered the custom software and computer leasing businesses in New York City. From 1967 to 1969, an exuberant stock market period, we had four public offerings that multiplied the Company's capitalization a hundredfold.

While helping Jack to grow the software business, I noticed that many of our clients and other companies were getting mediocre results from computerization, stemming from unwise project selection, flawed execution and other management difficulties. I decided to get into consulting, focusing on management of information technology (IT).



**Eric Knutsen in 1966**

## Eric Knutsen (Cont'd)

In 1970 I formed Knutsen Associates, a management consulting and software firm that employed Gail, others and me intermittently for the next 28 years. During 1972-73, Knutsen Associates (then mostly Jack O'Connell and I) helped a growing company acquire its first computer system, including databases, computer applications and an IT staff. Dick Nolan at the Harvard Business School drew on the project to develop case studies that were used to instruct students in the challenges of managing IT.

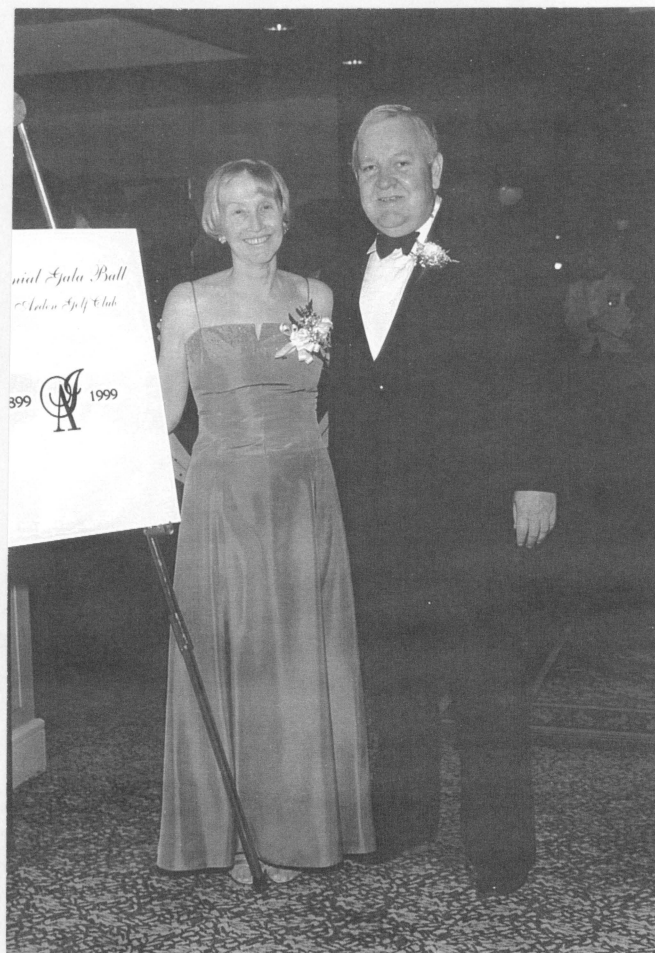
In 1975, I began an eight-year association with Cresap, McCormick and Paget, a New York City-based international management consulting firm. Later (1985), I joined Gartner Group, an IT research and consulting firm that ex-IBMer Gideon Gartner serendipitously had started a mile from our home in Connecticut. I was the company's first management consultant.

At both Cresap and Gartner I did a wide variety of consulting studies – IT strategy, connecting IT to business strategy, management assessments, major project reviews, IT organization, in/outsourcing, IT vendor/product evaluations, and so forth – on four continents, for more than 150 client companies and government agencies, ranging in size from the US Postal Service to a small, family-owned photo archives business.

From 1985 to 1996, I participated and watched as Gartner and its consulting arm grew rapidly and globally. (Worldwide revenues in 2001 were almost a billion dollars.) I left Gartner Group and full-time employment in 1996.

C4 I'm making up post-remunerative life (never call it "retirement") as I go, like Harrison Ford's movie character, Indiana Jones. Current interests include writing various historical books and booklets; theatergoing; designing, building and enjoying our second home in Woodstock, New York ("Colony of the Arts"); volunteer math tutoring for high school students; watching our granddaughter grow and enjoying the company of family and friends.

Below: Gail and Eric Knutsen in 1999



## Harwood G. Kolsky          Frances

A2 Portland, Oregon, 18 January 1921, raised in Kansas

A3 BS and MS, Physics, Univ. of Kansas, MA and PhD, Physics, Harvard University

A4 Four children

A5 Three grandchildren

B1 When I began working on the Stretch project I was an Associate Group Leader in the Theoretical division at LASL. We solved physics problems numerically using hand calculators and IBM punched-card machines. The first stored program machine I used was the Bureau of Standards SEAC. We were also one of the first customers to use the IBM 701 in 1953.

## Key:

Alumnus/a, Spouse   A2 Birth Data   A3 Education   A4 Children   A5 Grandchildren   B1 Before Stretch   B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer   B4 Role on Stretch   B5 Managers   B6 Years on Stretch  
B7 Worthiest Accomplishments   C1 After Stretch   C3 Awards, Honors, Papers, etc.   C4 Current Interests, Activities

### **Harwood G. Kolsky (Cont'd)**

B2 I was recruited by Stephen W. Dunwell; my first manager was Donald Pendery.  
B3 Poughkeepsie. Product Planning department, part of the Data Processing Division (marketing). Before joining IBM I was a member of the Mathematical Planning Group, a joint effort between IBM and LASL. After joining IBM, I continued as a member of the Group on the "other side of the table". I was at LASL from 1950 to 1957, and later a consultant. [Retired from IBM in 1986]



**Harwood Kolsky, circa 1961**

B4 My principal duty was product planning as a liaison between the Stretch engineers and marketing. I participated in architectural discussions, in particular questions of performance. I was often called on to host many scientific visitors and potential customers who came to Poughkeepsie.

B5 Donald Pendery, Dura Sweeney

B6 At LASL 1955 to 1957. At IBM 1957 to 1959.

B7 Worthiest Stretch accomplishment: John Cocke and I did the first timing simulations of Stretch using IBM 704 assembly language. This had a real impact on the design by pointing out timing problems and proving that a special half-microsecond memory was not needed.

C1 In 1959 I became assistant manager of the IBM Federal Systems Division office in Omaha, on a project for the Strategic Air Command. Following this I was at FSD headquarters before being named manager of the systems science department at the San Jose Research Laboratory in 1961. In 1962 I headed an advanced technology group in the ASDD at Los Gatos, California. I joined the IBM Palo Alto Scientific Center when it was formed in 1964 as manager of the atmospheric physics group. Later I headed projects in programming languages (e.g. Vector Fortran), microcoding, and digital image processing.

C3 I was named an IBM Fellow in 1969. Served on the IBM Corporate Technical Committee at Armonk, 1974-75. Also headed the Board of Consultants for the IBM European Scientific Centers for many years. Published over 30 papers and was member of three professional societies.

C4 In 1985 I joined the newly formed UC Santa Cruz Computer engineering department as a visiting professor. In 1986 retired from IBM and began a new career as a full-time professor. I managed research projects, taught courses in computer architecture and computer history. Retired from UCSC in 1996. I still manage to keep busy.

**Robert C. Kuenstner**      Janet J. Kuenstner

A2 Chatham, New Jersey, January 7, 1924

A3 Bellevue Radio Material School, 1944 graduate Navy Radio Technology; Lafayette College, 1950 BSEE; Carnegie Institute of Tech, 1956 MSEE

A4 Five

A5 Nine

**Robert C. Kuenstner (Cont'd)**

B1 I had already been with IBM 4 ½ years before transferring to Stretch. Previously I'd worked on the AN/FSQ-7 SAGE Program, Project High.

B3 IBM Poughkeepsie, Engineering, Seven years (in three locations), January 1953 to January 1960

B4 I did the logical design/checked out the following: the Table Extract Unit, the I/O Scanner for the Basic Exchange Section and the Central Control Unit for the Memory Bus. I also led the layout group that did Double Circuit Boards.

B5 Jim Pomerene

B6 May 1957 to January 1960

B7 The above named units performed well and accomplished their purpose.

C1 I left IBM and Stretch in January 1960 for a teaching assignment in India. After returning from India I resumed my engineering career. I worked for a number of defense-related companies. Later, I designed equipment in the civilian sector. This included a big effort with U.P.C. scanners. Also there were assignments doing designs of aircraft flight recorders/simulators, point of sales registers, medical life support units for operating rooms and other interesting devices.

C3 My designs achieved their set goals and were well received. That was ample recognition.

C4 I am an avid reader and always have a book going. Since 1950 I've kept a list to avoid getting books from the library that I've already read.

**Richard Clarke Lamy      Gloria Bernice Patton Lamy**

A2 Toronto, Ontario, Canada; June 30, 1928

A3 BSEE, Electrical Engineering (Communications) 1951, Michigan State University

A4 Five

A5 Eleven

B1 I first joined IBM as an engineer after graduation from Michigan State University in 1951. I began work in the Endicott Development Laboratory in July, 1951. I was assigned to the Vestal Laboratory to work on the BDHSA Project. This was a "Secret Project" at the time and the founding program for the future IBM Federal Systems Division. I worked as one of the first Component engineers in the Laboratory, 1951 thru 1952. The system was for the USA Air Force. I was assigned to the commercial IBM Development Laboratory in 1952, where we were the design group for the IBM 650 Computer. In this project, I was responsible for design of the computer Operational Display Panel, and the power supply system incorporation and P/S supplier liaison, and the power distribution design and layout for the entire machine, 1952 and 1953.

After completion of the IBM 650 design and its release to production, I did research in high speed, Non Destructive Read Out (NDRO) magnetic core technology. Several IBM patent applications resulted from this work, and eventually patents were issued to IBM. 1953. In the fall of 1953, I was transferred by IBM to their High Street Laboratory in Poughkeepsie, NY to work on the SAGE computer prototype. In this position I was responsible for the magnetic core development and improved reliability of these magnetic core components for use in the LRI and GFI radar system components. After the completion of this project, I resigned from IBM in the summer of 1955, to take an engineering design position at Hughes Aircraft Corp. in Culver City, CA. I documented the reasons for my leaving to the Manager of the IBM Poughkeepsie Laboratory, at his request. My comments and ideas presented in this memo led, I believe, to the opportunity for me to be rehired by IBM Poughkeepsie, after negotiations with Max Paley in 1956. I was working at Hughes Aircraft, Culver City, CA in their Ground Systems Laboratory. We were designing the 1st Artillery Control Computer for the U.S. Army, utilizing "Phased Array Radar" and digital computer systems, for Command & Control.

**Key:**

**Alumnus/a, Spouse** A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities



## **Richard Clarke Lamy (Cont'd)**

B2 I was approached by Max Paley to return to IBM

B3 Poughkeepsie, Engineering Research in high speed magnetic core memories for STRETCH, Bldg. 701; [Retired from IBM in 1970]

B4 I was assigned to work in the STRETCH high speed memory group. In this capacity, I continued Non Destructive Read Out (NDRO) high-speed magnetic core device development. In addition, I did the memory logic and I/O Channel system design planning.

B5 Phil Fox and William W. Lawrence.

B6 1956-1958

B7 Memory and I/O Channel system design planning. Research and development in the high speed NDRO magnetic core technology at IBM. This resulted in receiving eight issued US Patents for these efforts at IBM (and the IBM Patent Award when the program was first started by IBM).

C1 IBM Bank Program development group. Development of the "Aneba System" to do real time statistical evaluations of the magnetic bank check numeric characters to make machine readability of checks a reality (Character Recognition), 1958 and 1959 (Poughkeepsie). Manager of Circuit Technology in Machine Technology Dept., 1959 to 1963 (San Jose, CA). IBM 1620 Mod II development group. Developed a system and logic design for the 1620 Mod II computer to operate at 10 microseconds. (This design used the 12 microsecond memory from the original 1620 computer and accomplished the 2 microsecond performance without changing any of the memory or logic circuit cards), 1963 to 1965/6 (San Jose, CA). Manager of the Advanced Manufacturing Engineering, Technology Development group, 1966 to 1970. Developed advanced manufacturing techniques utilizing video cameras, laser interferometry, computer controlled automatic grinders to make the SYSTEM 360 disk systems possible. (San Jose, CA)

I retired from IBM in 1970 and, leaving the computer industry, joined Electroglas in 1970 as their Chief Electrical Engineer. During this period I designed and put into production a High Speed /Non Contact silicon wafer scribe using a high-powered Nd/Yag laser. This computer-controlled capability could scribe silicon wafers at a velocity 12 times the then-current surface contact diamond scribes. (Menlo Park, CA) Chief Engineer at Data Pathing . Managed the computer development and communication activities for the corporation and was responsible for the field support activities as required by all of our customers in 1972. (Mountain View, CA) Business Development Program Manager for computer customers at Fairchild Semiconductors from 1973 to 1984. (Mountain View, CA) My initial customer was IBM, for which I had worldwide technology requirements. I retired from Fairchild in 1984. Program Manager for Business Development at NEC Semiconductor, for major computer and communication customers worldwide from 1984 to 1997. I retired (permanently) in 1997. Have lived in Roseville, CA since 1997.

C3 Nine issued US patents in IBM's and my name. IBM Invention Award (1959). Outstanding Development Award for Development of the Electroglas Laser Scribe (1971)

C4 Gloria and I are enjoying our family and grandchildren. We have a chocolate Labrador Retriever that helps keep our five-acre ranch under control. We have a great time working on family genealogy and meet with a very active group each week. I have studied recently with the Steven Ministry "caregivers" program and am now an appointed S/M with a care giving assignment to one of the elderly WWII veterans in our Foothills United Methodist Church. It's a great program. We are still in the church choir and enjoy rehearsals and singing in the church on Sunday. I'm still a registered Assistant Scoutmaster (slightly retired) in two troops. As Scouting Coordinator for our church, I still get a chance to help the programs. (This includes Girl and Brownie Scout coordination)

## Richard Clarke Lamy (Cont'd)

Lastly, having spent 16 years refereeing AYSO youth soccer (both boys and girls) here in California, I have a love of the game that forced me to get a satellite dish and makes me watch soccer from around the world every day. (If you can no longer play it, watch it.)

### Chris Larson

Lenore ("Nori")

A2 Shreveport, Louisiana, February 15, 1938

A3 BS Mathematics, Texas A&M, 1960

A4 Four. One boy from first marriage and three stepchildren from second marriage (two girls and one boy)

A5 Seven. Three boys from my son plus four from stepchildren (three girls and one boy).

B1 Attending Texas A&M

B2 Forgot – college recruiting process

B3 IBM Poughkeepsie, Software, 1960-1962

B4 (1) Harvest MCP file management; (2) Stretch optimizing compiler shell

B5 Jack Miller, Jack Parsons, Ann Ewing

B6 June 1960 to August 1962

B7 Getting the compiler shell working, and developing/coordinating its interfaces with other components of the compiler.

C1 Left the Poughkeepsie snow in 1962 and moved to the area that later became known as Silicon Valley, where I lived for 30 years. Married in 1966; divorced in 1982; remarried in 1991.

Worked (in order) at Stanford University (1.5 yrs), Control Data Corp. in Palo Alto (2 yrs), IBM in Los Gatos (ASDD) and Menlo Park (ACS) (4 yrs), Computer Synectics in Santa Clara (2 yrs), Telex in Santa Clara (0.5 yrs), Hewlett Packard in Cupertino (6 yrs), and Tandem Computers in Cupertino (13 yrs). Two of my Tandem years were spent in Austin Texas, helping start up a new development division.

Most of my career was spent in the development of system software, as an individual contributor and as a manager. Primary interests were in software reliability, software engineering technology, and software development processes.

My wife and I had enough of Silicon Valley and moved to Kona, Hawaii in early 1992. We've never looked back. Few high-tech skills are portable to the outer islands of Hawaii, so we knew that our lives would change dramatically. My wife Nori works as a computer technician for a timeshare condominium company, and I've worked in sales for Costco (6 yrs) and for a locally-owned ceramic tile dealership (2 yrs).

C3 Nothing that would make anyone's head spin.

C4 Our primary interests are simply enjoying our life here and watching spectacular sunsets every evening with a glass of wine. We have three small dogs that we dearly love. We also have a steady supply of yard work because everything grows like wildfire here. Nori still works full time, and I am now learning AutoCad so that I might eventually become a draftsman for wood frame houses. We'll see how that goes.

### Key:

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Roger Lazarus**

Peggy Lazarus

A2 New York City

A3 PhD in Theoretical Physics

A4 Five

A5 Eight

B1 Calculations in the physics of nuclear explosions at Los Alamos Scientific Laboratory (LASL)

B3 LASL, Los Alamos, Logical Design, 1951-1985

B4 Procurement and contract, simulation, acceptance tests and extensive user [support].

B6 1956-1968 (?)

**Walter D. Leach**

Marjorie Saxon Leach

A2 San Diego, California, July 2, 1932

A3 Lehigh University, B.A. Biology, 1957; Carnegie Mellon University, MBA, 1964; University of Tennessee, certificate in Total Quality Management, 1987

A4 Two girls, Elizabeth (1965) and Sharon (1968), born in California. Beth has her B.A. from University of Southern California; Sharon has her PhD in Neuropsychology from University of Miami.

A5 Two granddaughters from Beth (Samantha and Jessica) and one granddaughter from Sharon (Lauren).

B1 Two years in the Navy during Korean conflict, leaving as 3<sup>rd</sup> Class Radar petty officer. After graduation from Lehigh, worked for Service Bureau Corporation and then System Development Corporation before joining IBM and STRETCH in 1960.

B2 D.G. Collins, VP of SBC and Stan Reed, in March, 1960

B3 IBM Poughkeepsie; 704 Building, I believe, but not sure. Located on South Road. Programming on the Master Control Program (MCP) under Gul Hira's direction. Gul reported to Paul Herwitz, who reported to Sully Campbell. I was employed on STRETCH from March 1960 to September, 1962, when I left for Carnegie Mellon.

B4 Programming for the MCP; specifically the IF interrupt mechanism that allowed MCP to gain control after other programs or sub-routines (macros) completed their tasks. Designed a way for the powerful logic set instructions to transfer control most efficiently when program was interrupted.

B5 Jack Garrity and Jack O'Connell were immediate managers, while Gul Hira held my card.

B6 March, 1960 to September, 1962

B7 Programming the IF interrupt mechanism. Six months at Los Alamos, testing and installing MCP. Then six weeks at Aldermaston, in summer of 1962.

C1 Graduated from Industrial Administration School at Carnegie-Mellon in June, 1964, with an MSIA, which is equivalent to an MBA. Worked for Stanford Research Institute (SRI) in the Management Information Systems group as a consultant. Then joined P&O Lines (NA) Inc. in San Francisco as Director of Research and Planning. P&O is one of the largest shipping companies in the world, with HQ in London. Great exposure to how a large international company functions. Joined Bechtel Corporation in San Francisco in 1974 as a senior internal consultant, working initially in the area of "Organization Effectiveness". Work was with senior division management and managers of large nuclear power project teams (up to 400 people). Work was in home office and in the field at plant sites, with both engineering teams and construction teams. Moved to Gaithersburg, Maryland office in 1976. This consulting work ultimately led to initiation of a Total Quality Management effort in Bechtel. I was the TQM Director in the Gaithersburg Office for 4 years, while the effort was being implemented.

### Walter D. Leach (Cont'd)

Left Bechtel in 1990 to join a small TQM consulting group in the Business School at the University of Maryland, at College Park. Our primary mission was to assist small and medium sized companies in the Maryland area to become more competitive through implementation of TQM philosophy and methods. We also did some significant work with large companies and Federal agencies and Departments.

C3 Published chapter in book on Total Quality, through the University of Tennessee.

C4 Retired; active grandparent; active traveler; active investor; enjoy fishing and summers at home at Lake Tahoe, California.

### Ed (Edwin A.) Lilienborg Lynda S. Lilienborg

A2 Newark, New Jersey January 19, 1931 (but grew up in Sweden)

A3 BS Cornell '53, Chemistry

A4 Four stepchildren

B1 Trading futures, developing my own computerized FORTRAN-based portfolio management system.

B2 Nominally Jack Garrity (but see below).

B3 Poughkeepsie, operating system software, 1962-1969.

B4-9 Cannot fairly supply formal answers to these questions. I am not even entirely sure which project the management hired me for originally. My first assigned task was to learn how to program the IBM 7030, but I spent most of my early years on the assembler project for OS/360. During those loosely managed, freewheeling, early days of that project, Ken Sanderson and I, on our own initiative, decided to build an assembler (the first!) for the S/360 on the 7030 while the engineers finalized the design of the former. That assembler turned out to be quite a useful temporary tool.

C1 At IBM Poughkeepsie: OS/360 Assembler language, linkage conventions, system testing. The circumstances around my exit from IBM were a little strange, by the way. My decision to resign was not forced, but stemmed from decisions by IBM (reached after three weeks of consultations among the Legal, Patent and Personnel Departments, five levels of management and several of my 14 previous first-line managers) regarding a charge of conflict of interest, and involving, among other things, an exception for my portfolio management system that I listed in the patent agreement that I signed when hiring in, 6½ years earlier. You may wonder, what caused things to stir after all that time? Methinks a small lapse on my part and the treachery on the part of a woman coworker. A further hint: Hell hath no fury ...

Coral Gables, FL (1969-74): Journeyed here against my better judgment at the behest of a wealthy friend interested enough in my project to support it for a time, then dropping out. Hated the place, had a few day jobs, finished my portfolio management system, and organized a small hedge fund as a limited partnership to trade futures. Wooed and wed Dolores ("Dee").

Boise, ID (1974- present): State of Idaho Controller's Office; data base administrator and systems programmer until 1995, when I retired. Liked the environment. Joys, sorrows and trials soon followed: Early on (1976), bought some land up in the low mountains northeast of town ... built a "temporary" cabin there until I could design and construct a permanent, underground dwelling on the site ... moved in and began commuting ... difficulties, even hardships at times – the winters were the worst ... the fund fell by the wayside ... slowly improved our situation ... but after ten years, Dee had enough ... bought her a place in town ... continued to spend my weekends at the cabin ... Dee's health later began slipping ... died in the waning days of 1998 ... I bought a place with better accommodations next to my mountain property ... sold my town property ... running down to the mailboxes (a couple of miles down the road by the highway) one spring day in the year 2000, I stumbled and fell ... as I lay there bleeding in the dust, a lovely young woman came by and picked me up in her SUV ... love blossomed during summer ... married in the fall.

### Key:

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

## **Ed Lilienborg (Cont'd)**

C4 a) Trading futures, equities and equity options. Ironically, I have in recent years abandoned my mechanical system approach as fraught with flaws both obvious and subtle, for a more discretionary (but mentally exacting) approach. For me, the ten simultaneously real-time updating windows (through a 10 mbps satellite data feed) across my two screens serve me well and profitably, without any programmed data massaging. Incidentally, an old but recently relevant Wall Street wisdom says: "When blood runs down the street, buy!" But you should still exercise discretion to time this more precisely.

b) Writing a book, "An Atheist's Bible." Projected completion: Late this decade.

c) Working on my place. A beautifully pine-wooded, but steep 20 acres about 28 miles northeast of Boise, at about 3600 ft. elevation. My "back yard", northeast to southeast, is mountainous semi-wilderness as far as the eye can see and beyond, millions of sparsely populated acres, including portions of two National Forests; the nearest paved road to the east runs near Sun Valley, 80 miles away. I like to work with rocks (usually basalt) of all sizes up to three tons, for retaining walls and such.

**Sydney L Lindauer**                      Gloria

A2 New York City, December 29, 1932

A3 BEE City College of New York, 1955

A4 Two

A5 Two

B1 Testing 705 in Poughkeepsie Mfg.

B2 John Hipp, Fred Brooks

B3 IBM Poughkeepsie, Design Engineer, June 1955 to April 1993

B4 Design Memory access Unit/Test System

B5 Lars Ulfsparre, Bob Blosk

B6 1957-1961

B7 Successful Design, Successful Test

C1 Transferred to planning then design in 360/65.

C4 Treasurer of Tri State IBM Retirees Club, which meets in Shrub Oak, New York.

Local Leader of AARP Free Tax Assistance

**Robert J. Litwiller**                      Julianne

A2 Princeton, Illinois; February 9, 1935

A3 1956 BS in physics and math, Beloit College; 1958 MS, physics and math, University of Illinois; 1961 MS, computer science, Stanford University (on IBM Resident Study program)

A4 Three

A5 One

B1 Finishing studies for MS in physics and math at Univ. of Illinois

B2 My first manager was Erich Bloch (for some unremembered length of time)

B3 IBM Poughkeepsie, South Road Lab; hardware testing and design, 1958-1991

B4 Hardware testing and design

B5 Not certain, but after Erich Bloch, I can remember Bob Paulson and Bud Allen

**Robert J. Litwiller (Cont'd)**

B6 Two years; I left to go to Stanford on the Resident Study program shortly before Harvest was to be delivered to NSA.

B7 Designed tests and tester for SMS double cards, which were new for Harvest, as I recall.

Three-shift test and repair of Harvest, in a raised floor environment, which was like a refrigerator on 3<sup>rd</sup> shift. Designed and patented a cathode-follower trigger function on a double card with a lot of help from Olin MacSorley.

C1 My large system engineering steps were: a) 58-60 Stretch/Harvest b) 60-61 to Stanford on Resident Study for MS in Computer Science c) 61-64 on 604 project with Bob Meade. d) 64-68 360 Model 91 and e) 68-69 ACS in Menlo Park

Later in life, the most fun: System performance analysis re 3330 disk storage (69-72) and IMS (72-76); 73-75 On foreign assignment in Paris as an SE in an IBM France branch office; Application software planning positions, 77-91; 85-88 On foreign assignment in London on Application Systems staff; Retirement in '91; contractor to IBM on Ultimedia Tool Series, 91-95; 95-98, Tech support manager for Semaphore Communications, a Xerox-funded start-up doing network data encryption products; the company was shut down in '98, and our stock options were worth just what we paid for them! 98 to 02, contractor to IBM Global Services in Mountain View, CA; real retirement in February, 2002.

C3 Two patents led to a low level Patent Award.

C4 Travel, tennis, fitness, family, friends. Basketball fan-atic (I played until I was 49.)

**Edward S. Lowry** M. J. Leslie Lowry

A2 Toronto Ontario, 10 December 1933

A3 B.A. Math and Physics, University of Toronto  
S.M. EE, MIT

A4 Two (one surviving)

A5 None

B1 Programming at Avro Aircraft Ltd. in Toronto

B2 Ted Codd

B3 IBM Poughkeepsie, Software, 1959 to 1976

B4 Multiprogramming experiment

B5 Ted Codd, Fred Brooks, Betty McDonough

B6 1959 to 1962

B7 Multiprogramming scheduling strategies

C1 I developed an initial design for including pointer data in PL/1 and then designed the object code optimizer for the OS/360 Fortran H compiler. In 1968 I focused fully on computer language improvements for simplifying the expression of applications and have been pursuing related goals ever since. After 18 years at IBM I spent 15 years at DEC.

C3 Publications in physics, computer science, and educational technology. Two patents. IBM Resident Graduate Study Program. IBM Corporate Contribution Award.

C4 I am pursuing validation of a theory that there is a unique optimum structure for data objects allowing maximum simplicity: hierarchically interconnected pointers. I am trying to correct for decades of neglect in simplification of software. I am exploring more general issues of representation of technical knowledge and information quality.

**Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Leslie Lowry**      Edward Lowry

- A2 Chesley, Ontario, Canada; June 25, 1934
- A3 BA (math), MS (math), MBA (finance, Marist College-'77)
- A4 Two sons, one died in 1995
- A5 None

- B1 Work on Mach 2 Avro Arrow fighter at AVRO Aircraft in Toronto.
  - B2 Tom Apple
  - B3 IBM Poughkeepsie, Software, 1959-1962, 1963-1964
  - B4 Simulation of Stretch on 704, 709, and 7090, part of the first Stretch loader, simulation of other machines on Stretch, benchmarking.
  - B5 Tom Apple, Bill Carter, George Grover, Stan Reed
  - B6 1959-1962
  - B7 The simulators.
- .
- C1 13 years of child rearing, 15 years as a Mitre Systems Engineer on the SACDIN secure communications network and B-2 Bomber Mission Planning.
  - C3 Air Force service and achievement awards.
  - C4 Volunteer work at a local hospital and on the board of a non-profit conference center (Star Island, Isles of Shoals, Portsmouth, New Hampshire).

**Marla (Orr) MacKenzie**

John MacKenzie

- A2 Buffalo, New York
- A3 AB Psychology, MBA
- A4 Two
- A5 None

- B1 Job
- B2 Paul Herwitz
- B3 IBM Poughkeepsie, Software, 1960-1962
- B5 George Grover and Dick May
- B6 1960-1962
- C1 FAA System Design at IBM. Taught 5<sup>th</sup>-8<sup>th</sup> grade Math. Designed and developed a Demand Deposit/ Savings Accounting System. College administrator at Vassar.
- C2 Solid system design work experience
- C4 Retired



**Standing: Marla MacKenzie, son Jesse, daughter Kinter Lennon.  
Seated: John MacKenzie**

**Bob Manente**      Dianne Manente

A2 Niagara Falls, New York; October 16, 1934

A3 BS Engineering University of Buffalo, 1958

A4 Two daughters

A5 Three grandchildren

B1 Before working on Stretch/Harvest, I worked as an engineer for ACF Industries in Albuquerque, NM.

B2 I was hired into the Service Bureau by Stan Reed. Six months later, I was transferred to IBM.

B3 I was hired in Poughkeepsie, NY as a programmer on April 18, 1960. I left Poughkeepsie in 1972 and joined the IBM group in Boca Raton, Florida.

B4 I worked on the Harvest Master Control Program as a grunt programmer.

B5 I worked for Jack Parsons, Carl Gerberich, George Grover and Dick May

B6 I worked on Harvest from 1960 to 1962.

B7 I lived through the NSA red badge experience.

C1 I joined IBM in Boca Raton, FL. and worked on the Series/1 System as well as the IBM PC. I retired from IBM in 1989. I taught Software Engineering courses at Seminole Community College and at Florida Atlantic University. I joined Motorola in 1991 and worked there as a Software Engineer for about 5 years. I retired from Motorola in 1996.

**Peter Markstein**      Vicky Markstein

A2 Vienna, Austria; June 27, 1937

A3 SB, SM from MIT (Math), PhD from NYU (Computer Science)

A4 Two

A5 None

B1 I worked at IBM Research Yorktown.

B2 Not sure – T.C. Chen?

B3 IBM Poughkeepsie, NSA; Software, 1959-1991

B4 Experimental operating system design, work on I/O for Harvest

B5 ??

B6 1961-1964

B7 Experimental support of multiprogramming (big deal at that time!)

C1 Finished PhD, worked on 801 RISC architecture and compiler optimization; IA-64 architecture

C3 Several IBM Outstanding Contribution Awards (none relating to Stretch). About 25 patents, and one book, "IA-64 and Elementary Functions"

C4 Bioinformatics (new reincarnation!)

**Richard E. May**      Dorothy

A2 New York, NY, February 20, 1930

A3 BS Chemistry, MA mathematics

A4 Two children (boys)

A5 Four grandchildren (two boys, two girls)

B1 IBM Kingston Programming Center – Manager, 704 Programming Group, worked on design automation and engineering support.

B2 Dr. Paul Herwitz

B3 IBM Poughkeepsie, manager of language and compiler development, 1955-1990

B4 Harvest language and compiler development and installation at Fort Meade.

**Key:**

Alumnus/a, Spouse    A2 Birth Data    A3 Education    A4 Children    A5 Grandchildren    B1 Before Stretch    B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer    B4 Role on Stretch    B5 Managers    B6 Years on Stretch  
B7 Worthiest Accomplishments    C1 After Stretch    C3 Awards, Honors, Papers, etc.    C4 Current Interests, Activities



**Richard E. May (Cont'd)**

B5 George Grover initially, Paul Herwitz later

B6 1961-1964

B7 Getting Harvest software development organized

C1 Manager of 360 Language Design Control; Manager of Programming, Advanced Technology Department; Manager of OS 360/370 Design Control; Exiled to Kingston – Manager of FS Development; Transferred to Raleigh in 1982

C4 Teaching docent at North Carolina Museum of Natural Science; Carpenter for Habitat for Humanity; Golf

**Jack McBride**      Joan

A2 Jersey City, NJ

A3 BA Math

A4 Three

A5 Five

B1 I was in the service, stationed at National Security Agency writing 704 programs to assist NSA cryptographers break codes.

B2 I attended a wedding shortly before my discharge and got stuck in a snowstorm in Poughkeepsie on my way back to NSA. I spent the night with a buddy who worked at IBM. Since I could not get out of Poughkeepsie he set up some interviews; one of them was with Sully Campbell. When he learned that I was at NSA, he would not let me out of the office. I was an experienced programmer and I had an NSA clearance to boot. A rare combo. I had no intention of joining IBM until I learned that my former employer (Western Electric) was going to assign me to a SAGE site in Moses Lake Washington. Poughkeepsie started to look a whole lot better.

B3 I was in Poughkeepsie Advanced Systems from 4/60 thru 9/62 and left with the Harvest installation team. Retired from IBM in 1991

B4 I was member of the Alpha Compiler development team, the system installation team and subsequently the system maintenance team when the installation team returned to Poughkeepsie after acceptance testing was complete.

B5 My first line manager throughout was Fran Allen.

B6 1960-1963 or 64

B7 My greatest accomplishment was meeting Joan, who would become my wife, in South Road Lab my first day on the job.

C1 I joined the Branch Office as a System Engineer/Marketing Rep and continued to work at NSA until 1968. I then transferred to the Miami and spent 18 years there. Moved to Atlanta in 1986, spent 5 more years in Branch and retired in 1991. Spent 16 years in airline accounts.

C3 Standard marketing stuff.

**Bob McConnell**      Georgia (2<sup>nd</sup> wife)

A2 Toledo, Ohio; October 9, 1936

A3 BA Economics, Michigan State Univ. 1957; MS, Computer Education, Pepperdine Univ., 1987.

A4 One daughter

A5 Two grandsons, seven step-grandchildren

**Bob McConnell (Cont'd)**

- B1 Came directly into IBM from college, after a spell in the Air Force Reserves.
- B2 I think it was Sully Campbell
- B3 Poughkeepsie Lab, Software Development on Stretch – Harvest /Farmboy. 1960-1987 (Went with Harvest into the IBM field organization, where I was for another 25 years until early retirement in 1987.)
- B4 Development of Library sub-system for Stretch / Harvest relocatable modules
- B5 Fran Allen, Dick May
- B6 1960-1965?
- B7 Development and implementation of the Library subsystem. I can still remember all the machine level instructions: LX, LR SS, SI, RR, etc.

- C1 Went with Stretch / Harvest into the field at NSA; then overseas IBM assignments in Okinawa and later in Alaska, then to Southern California, where I've been since 1970, except for 4 years in Alaska during the pipeline boom. Now semi-retired doing web sites for friends and relatives in the LA area (Manhattan Beach) My present wife and I are Life Master Bridge players and teachers. I have written a book on Competitive Bridge, and also have a web site of the same material at [www.worldwidefolks.com](http://www.worldwidefolks.com), in addition to the normal (have kids, raise a family, put them through college, etc.)
- C3 None. Taxpayer extraordinaire.
- C4 Web site building, golf, tennis, travel.

**Marjorie I. Merritt**

- A2 Ossining, New York; December 4, 1929
- A3 B.A. English, Maryland University 1972



**Marjorie I. Merritt in 1962 (AAA driver's License photo before leaving for Germany)**



**Marjorie I. Merritt at present "Guys, that's a hat, not a white Afro."**

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
 B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
 B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Marjorie I. Merritt (Cont'd)**

B1 Stenographer for IBM Engineering, Product Test Coordinator

B2 Dr. Sullivan Campbell

B3 IBM Poughkeepsie; Secretarial, Document Control; 1948-1990

B4 GateKeeper/Document Control in 701 Secure Room. Later, Secretary for George Grover.

B5 Carl Gerberich, George Grover

B6 1959-1962

C1 Transferred to FSD October 1962. Went overseas in January 1963. Worked as secretary on IBM/Air Force contracts. Returned to U.S. January 1969. In January 1970, took two-year Education leave of absence to finish B.A. In 1972, transferred to IBM, Raleigh. 1973-1990, worked as a librarian in the site library. Two months on litigation in L.A. (1985).

C4 Happily retired. Taking Art classes. Member of Pastel Society of N.C. Also, member of Durham Arts Guild. Love to garden, mostly indoors (40 plants inside: it's a jungle in here)

**John F. Miller**

Jean Miller

A2 Troy, New York; June 30, 1926

A3 Bachelor of Science in Forestry, Syracuse University, 1951; Master of Forestry, Yale University, 1953

A4 One

A5 None

B1 Worked as a Forester with St. Regis Paper Company

B2 Don't remember

B3 My main location was at Poughkeepsie, but also did some work at Los Alamos and Fort Meade. My work was in software development at IBM. I started working for IBM in 1960 and left there in 1970.

B4 Programming development work for input/output routines for Stretch and other programming functions.

B5 Jack Parsons

B6 1960-1965

C1 After Stretch I worked in Field Engineering until 1970, when I left IBM and moved to Vermont where I worked as a programming consultant and programmed for various organizations there.

**George Mine**

Mary

A2 Chicago; May 25, 1935

A3 BS Mathematics

A4 Three

A5 Six

B1 Working on AN/FSQ-7 in Kingston

B2 Don't recall

B3 IBM Poughkeepsie South Road Lab, Development, 1956-1991

B4 Worked with Wes Stetler on the LookAhead Unit

B5 ?

B6 1959-1962

B7 Keeping it running

C1 7040-709 direct couple; System 360 mod 65; Display Development; IBM PC development; Ergonomics Project Office; Litigation support/expert witness

C3 Several in Display development

C4 Retired. Teaching computer skills at community college and SeniorNet

**George R. Monroe** Elaine F. Monroe

A2 Oaklyn, New Jersey; February 3, 1927

A3 BSEE, RPI 1954

A4 Two

A5 None

B1 Manager of the IBM 7090 BMEWS Program, Poughkeepsie Lab.

B2 T. V. Learson

B3 IBM Poughkeepsie, Engineering Management, 1954-1982 (Retired on Disability)

B4 Initially, the 7090 was first to attach and wring out the 2us. Stretch Memory. Later, I was given the task of delivering Stretch/Harvest to extremely reluctant customers who had contracted for the Systems and were disappointed at the performance even though T. J. Watson Jr. had cut the price in half. Several wanted another cut. All wanted severe Acceptance Test Revisions.

B5 Initially, Howard Musell, then Red Dunwell, Bob Evans, then I forget!

B6 1959-1962

B7 1. Absorbing the 2us Memory delay (on the 7090) 2. Getting all Stretch and Harvest/Tractor Systems delivered and functioning, (and paid for at T.J.W.'s prices).

C1 Killed the Plated Tape Program at the Pickle Factory in Poughkeepsie. Started up the FAA Air Traffic Control Systems Bid featuring 360 Systems.

C3 IBM Outstanding Invention Award for the IBM Channel Invention with my two co-inventors, Carl Christensen and Larry Kanter.

C4 Amateur Radio (licensed since 1940), PC Systems Consulting

**Barbara Call Myers** Thomas S. Myers

A2 Springfield, Vermont; May 10, 1938

A3 Bachelor of Arts, Middlebury College, 1960

A4 None

B1 Going to college

B2 I think maybe Ken Tooker, but am not sure

B3 Poughkeepsie, Education Building, IBM July 1960-August 1963?

B4 Worked in mathematical group first, the only thing I remember is working on a program to find the next highest prime number using Stretch memory bits to represent odd numbers. Taught some classes (that is where I met Tom). Then, worked on Stretch simulator of System 360.

Transferred to the Weather Bureau Stretch account in DP in Washington and worked as a Systems Engineer on that until June 1964.

B5 First manager – T. C. Chen, then Joe St Germaine on the simulator project.

B6 1960-1964

B7 360 Simulator

**Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Barbara Call Myers (Cont'd)**

C1 I worked for IBM until 1979 through S/360, TSO, MVS, and FS. When I left I was Director of Information Systems for the Systems Communications Division. We left to live the “good life” a la Helen and Scott Nearing. The labor involved in that life style has gradually become more difficult, so some activities are being phased out.

C3 None significant.

C4 I’m involved in many community activities in our small town. Currently, I’m president of a community organization, Clinton Watch, which publishes a quarterly newsletter, sponsors community workshops and parties and tries to involve citizens in the governmental process. I started a book club that is in its 11th year. I play tennis a couple times a week in the summer and keep busy on our 200-year-old house and land. We go South a couple of times a year to a condo we have on the North Carolina shore.

**Thomas (Tom) S. Myers**

Barbara Call Myers

A2 Martinsville, Virginia – May 22, 1940

A3 B.S. Math (Randolph-Macon College);

M.B.A. Finance (Dartmouth College)

A4 None

B1 School

B2 Jack Garrity

B3 Poughkeepsie, Software (Loader), IBM, 1962-1979

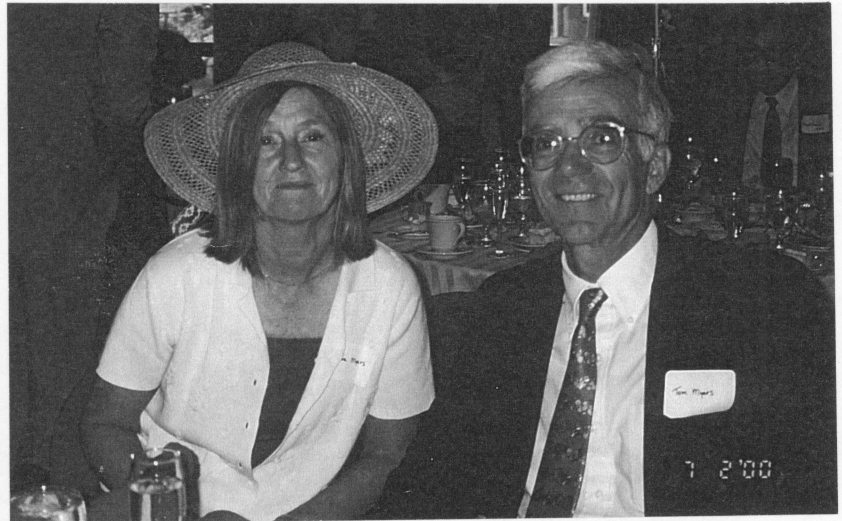
B4 Debugging Eric’s bugs (Loader)

[Editor’s note: sez you!]

B5 Jack Garrity

B6 1962-1963

B7 Married the instructor



**Barbara Call Myers and Tom Myers**

C1 OS/360, then educational leave (Dartmouth), then back to IBM (Finance), stayed in the Hudson Valley, commuted to HQ, left early (1979)

C3 I won a tennis tournament once.

C4 Golf, Beekeeping, barn-building, Planning Board (Town of Clinton, Dutchess County)

**Ernest G. Newman** Rose Marie Newman.

A3 Ph.D. Applied Science, Columbia.

A4 Two girls.

A5 Two girls.

B1 Taught at Stevens Institute of Technology,

B2 1956

B3 Poughkeepsie.

B4 Magnetic Tape Drive Development.

B6 1956 to 1959.

B7 Magnetic Recording System.

**Ernest G. Newman (Cont'd)**

C1 Many management assignments, the last one Director of Technical Staff in San Jose. After retirement from IBM taught at Stanford.

C3 Awards for management and 3rd level of Invention disclosure. Many internal publications and articles for the IBM Research Journal..

C4 During retirement, reading history and oil painting.

**Leo R. Notari**

Ruth M. Notari

A2 Old Forge, Pennsylvania; August 13, 1924

A3 BSEE Penn State

A4 Two

A5 None

B1 I was Site Manager at Montgomery Alabama in the SAGE Program

B2 Chet Baccari

B3 IBM Kingston, all Stretch locations except Los Alamos and Harvest; managed the installation of all systems manufactured in Kingston. 1951-1986

B5 C.P. Baccari and Francis Burud

B6 1961-1964

**John F. O'Connell**

Jean (deceased)

A2 New Haven, Connecticut October 16, 1929

A3 MS Mathematics, University of Chicago

A4 One

A5 None

B1 Job in aerospace industry

B3 IBM, Poughkeepsie, Software, 1960-1967

B4 MCP Testing

B5 Gul Hira

B6 1960-1964

C1 Software development

**Andris Padegs**

Mara

A2 Riga, Latvia on March 27, 1929

A3 Dartmouth, AB, 1953; Thayer School of Engineering, MS (Electrical Engineering), 1954; Carnegie Institute of Technology (now Carnegie Mellon University), PhD (Electrical Engineering), 1958

A4 Three children

A5 Five grandchildren

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Andris Padegs (Cont'd)**

B1 I had just finished work for the PhD, and this was my first job. Those were the good times when engineers were really in demand, and I received job offers from some 20 other companies. But, after interviewing with Werner Buchholz and Fred Brooks, the work on Stretch sounded best. I came to IBM Poughkeepsie and joined the Stretch Engineering Planning group managed by Dr. Buchholz in the spring of 1958. Later, after some reorganization, my manager was Dura Sweeney. I stayed on Stretch until the design was complete.

B4 My main job was I/O planning and I/O interface definition.

B7 The basic design of the system was largely done by the time I joined, but I participated in the resolution of various engineering issues and eventually assumed the responsibility for the chapters in the reference manual on Exchange, High-Speed Exchange and I/O devices.

**Andris is at the lower right of this "Announcement" – (Remember these?)**

**IBM**

**DATA SYSTEMS DIVISION**

*Announcement*

POUGHKEEPSIE, NEW YORK

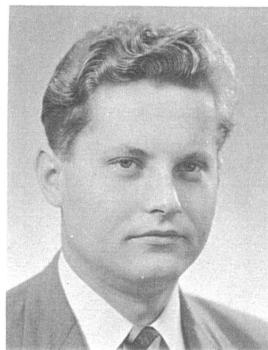
THE FOLLOWING APPOINTMENTS ARE EFFECTIVE IMMEDIATELY:



**ALBERT N. GARTHWAITE**  
Staff Engineer  
Mechanical Analysis  
Laboratory



**VLADIMIR NEJEZCHLEB**  
Staff Engineer  
Mechanical Analysis  
Laboratory



**UNO R. KODRES**  
Staff Mathematician  
Advanced Design  
Automation



**ANDRIS ~~X~~ PADEGS**  
Staff Engineer  
Systems Planning

October 4, 1960  
10 - 11 - 60

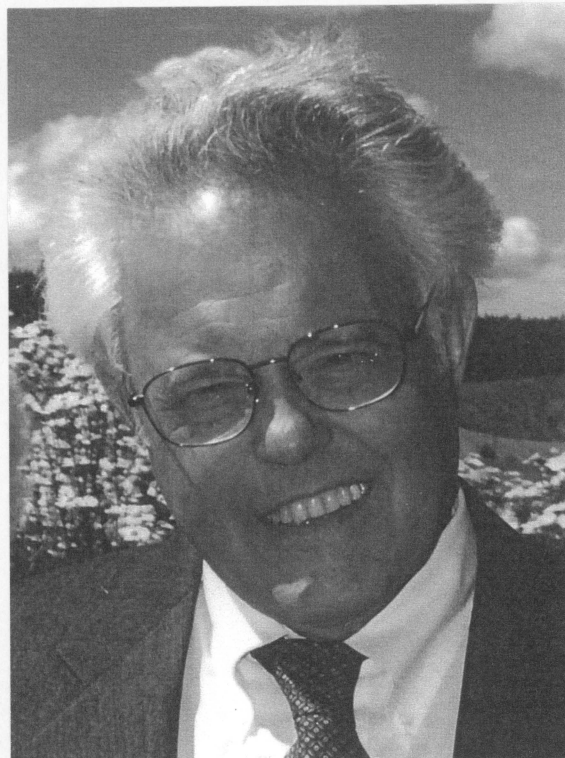
**H. T. MARCY**  
LABORATORY MANAGER

### **Andris Padegs (Cont'd)**

C1 After some intervening projects, such as the attempt to introduce a "standard IBM I/O interface" and others, I became one of the original members of the S/360 architecture group with Gerry Blaauw and Gene Amdahl. My key contribution initially probably was the S/360 I/O interface and channel architecture, later floating-point extensions, virtual storage and multiprocessing. Then I worked on FS architecture and other projects. And, when S/370 was rejuvenated, I eventually became the manager of the organizations responsible for S/370 and S/390 architectures. I retired from IBM in 1992.

C3 I have some patents, have published some 20 papers in various professional journals and have received seven formal contribution, achievement and invention awards from IBM.

C4 After retiring from IBM, I was instrumental in founding the software company Infologistik Inc. ([www.infologistik-inc.com](http://www.infologistik-inc.com)), which originally installed our own workflow and document management systems, but now concentrates on offshore software services. The company's strength is access to software professionals in Latvia. I run the company.



**Andris Padegs, Today**

### **Sam Patton** Stephanie Patton

A2 Lexington, Virginia in 1930

A3 Washington & Lee University, BS Math; Syracuse University, MS Math

A4 Two: a son and daughter

A5 Two granddaughters, 3 and 8.

B1 Hired from Syracuse Math Dept to Harvest

B2 Carl Gerberich was my first manager.

B3 Research at Mohansic Lab in July 1959, transferred that fall to Poughkeepsie, Boardman Road, Programming the Harvest Assembler, at IBM 1959-1990

B4 Group leader for the Harvest Assembler

B5 Carl Gerberich

B6 1959-1963

B7 The assembler was used through the entire life of Harvest.

C1 I joined large systems development in Poughkeepsie, and then worked on a team trying to influence customers by talking about IBM technology, traveling from Korea to Australia and South Africa, and over most of Europe; then getting an assignment in Belgium, and then Thornwood education before retiring in 1990.

C3 Senior Member, IEEE; article in DATAMATION; presentation at ACM National meeting

C4 Still doing computer consulting, (semi) active in ACM. Member of the Poughkeepsie-Dutchess Empire Development Zone Board. Board member, New York State Association of Library Boards. Was involved in local politics, served on the board and as Town Supervisor of East Fishkill, member and Vice President of the Mid-Hudson Library System Board, member and past president of the East Fishkill Community Library Board.

### **Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities



**Gerard Paul** Carol

A2 Jamaica, New York; July 10, 1932

A3 BSEE 1955, CCNY, MBA 1976 Pace University

A4 Six

A5 Eight

B1 I started at IBM in 1955. I worked on the IBM 704; I was there to ship the first one from the factory in Poughkeepsie. After that, I was in the US Army. When I returned to IBM, I started in Stretch.

B2 Dick Merwin

B3 Poughkeepsie

B4 I designed and debugged the floating-point arithmetic unit

B5 Dick Merwin and Erich Bloch

B6 I am not sure. I started in the very beginning and stayed through the end including installation at Los Alamos.

B7 The arithmetic unit, carry look-ahead adder design, carry-save multiplier tree, square root, flexible timing control, taking my turn working fourth shift.

C1 There is life after Stretch. I went on to play a major role in the conception, the design and technical team management of the IBM 360 Model 50 computer. I received an Achievement Award for that effort, and also a Patent Award. Later I joined the Perkin-Elmer Corp., an Analytical Instrument company in Connecticut. I supervised many Instrument Projects during my thirty years at Perkin-Elmer.

C3 I recently completed a chapter on Project Management for publication in the Juran Quality Handbook, for The Juran Quality Institute, Wilton, CT. Moreover, I have given several papers on Design for Assembly Techniques.

C4 I am retired. One activity I have – besides staying in touch with my children and grandchildren – is studying the Italian Language at Fairfield University. I just finished a course on Dante's Divine Comedy. Si', Io parlo Italiano.

**Stanley Pitkowsky**

A2 Yonkers, New York; August 24, 1930

A3 BA, Math; BSEE, MSEE

B1 Working for IBM on another project, in planning

B2 Do not remember

B3 Poughkeepsie, Engineering, IBM, 1956-1990

B4 Engineering Design, Floating Point Unit

B5 Do not remember

B6 1958/59-1962

B7 Design of the Floating Point Unit

C1 Design of 360 (Models 65/67, 85, Vector Processor, 3090); TSS performance analysis, miscellaneous others

C4 Retired, enjoying life

**Kenneth E. Plambeck** Isabel F. Plambeck

A2 Chicago, Illinois, December 21, 1933

A3 BEE Georgia Tech, MS EE University of Illinois

A4 Three

A5 Two

B1 Joined IBM January 28, 1960 and wrote diagnostics for 709 and 7090. On 709, pulled tubes at night (actually, used modules able to be selectively disabled) to see where program stopped.

B2 Probably Clarke Dowling

B3 Poughkeepsie, software, IBM, 1960-2002.

B4 First, under Clarke, diagnostics for Harvest. Then, under Marla Orr, some inconsequential part of an Alpha/Fortran compiler. Then, under John Carter, the indexing and output phases (no subsequent use of an assembler) of a better Fortran compiler.

B6 1960-1964.

B7 The second Fortran compiler, which had good compile time and gave good execution-time performance.

C1 OS/360 (Concepts of Facilities, linkage conventions, standards, checkpoint restart, job-scheduler improvements, control of system control blocks) until 1970, then FS (after which I built a playroom so I could build something that didn't get killed), then DOS/VSE under Jay Martinson and with Werner Buchholz, then two years of no-good staffy work, then, in 1979 or 1980, real S/370 architecture under Justin Butwell and Andris Padegs. System/370 with DAS (dual-address-space facility) was just being released, and 370-XA (31-bit addressing and channel subsystem) was imminent. I was assigned to access registers and the linkage stack, which had already been proposed but for which many development meetings and efforts were necessary, and became owner of the CPU part of the ESA/370 Principles of Operation and its successors (ESA/390 and now the 64-bit z/Architecture) and the related Reference Summaries ("green cards"). Notable activities were data compression (static Ziv-Lempel), subspace groups, perform locked operation, and z/Architecture.

C3 One Outstanding Contribution, one Outstanding Technical Achievement, two Outstanding Innovation, and two Corporate Awards. An article on ESA/370 in IBM Systems Journal, and one on z/Architecture in IBM Journal of Research and Development (to be published).

C4 Will retire September 1. I have enjoyed and will enjoy bridge and pool, but a possible vacancy looms.

**Raymond Polivka** Joanne

A2 Chicago, Illinois 18 July, 1929

A3 PhD University of Illinois 1958, Mathematics

A4 Two children: David and Anne

A5 Three Grandchildren: Robert, James, and Jonathan

B1 I joined IBM/Stretch in 1958 immediately upon receiving my PhD from the University of Illinois.

B2 I was hired by Fred Brooks.

B3 I came to work in Poughkeepsie, at IBM 1958 to 1993.

B4 My principal role was to help develop and program the Stretch console.

B5 My first manager was Werner Buchholz.

B6 I was on The Stretch project from 1958 until 1961.

B7 My main Stretch contribution was to help get the console program running and into the Stretch operating system. (I'm not sure parts were ever used, in particular, those three potentiometers. Why would you ever use them to slow down the execution of programs?)

**Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

### **Raymond Polivka (Cont'd)**

C1 After the Stretch project, I joined Bill Carter to help develop and program CAS, the Control Automation System, which was the software used by engineers and programmers microprogramming many of the System 360/370 machines. This involved a six-month stay at Hursley England. Thereafter, I joined a hardware/software-interfacing group. In 1965-66 I took a year's sabbatical and taught at North Central College in Naperville Illinois. This led me to spend a year at SRA in Chicago developing educational material using APL. I actually commuted there for one week out of the month. Note this was well before teleprocessing. After that effort I returned to Poughkeepsie full time where I joined the Poughkeepsie Education Department. I remained in education until I retired.

C3 I have coauthored three books: APL: The Language and Its Usage (1975), APL2 at a Glance (1985), and APL2 in Depth (1995). I served in various capacities with SIGAPL, the Special Interest Group for APL. These included its chairmanship and finally, for the last nine years, as editor of "Quote Quad", the SIGAPL Journal. In 1990 I received the Kenneth E. Iverson Award for Outstanding Contributions to the Development and Application of APL.

C4 While I retired from IBM in 1993, I still remain active professionally. Established as Polivka Associates, I offer APL education for the three major APL vendors. I continue to write and develop APL material. My wife and I mentor at our church-sponsored after-school academic skills program at the Tubman Terrace Housing project in Poughkeepsie. I also participate in the local Senior Net training program. All of this along with our church activities keep both my wife and me busy and in good health.

### **James H Pomerene** Edythe R Pomerene

A2 Yonkers, New York; June 22, 1920

A3 BSEE Northwestern University 1942, Graduate work at Princeton University

A4 Three children

A5 Six grandchildren

B1 Before Stretch/Harvest, I was chief engineer of the Electronic Computer Project at The Institute for Advanced Study in Princeton, New Jersey, under the direction of Herman H. Goldstine and John von Neumann.

B2 Steve Dunwell

B3 Poughkeepsie, Engineering, IBM, 1956-1993

B4 I was responsible for the planning and overall design of Harvest, but not the Tractor tape system.

B5 Steve Dunwell

B6 I was on Harvest from 1956 to 1962.

B7 Major Accomplishments: a) writing the manual that explained how Harvest worked b) keeping track of Harvest after delivery to NSA.

C1 After Harvest I did some work on parallelism in Research and back in Poughkeepsie was in charge of the PNDC (Parallel Network Digital Computer -, a single-instruction multiple-data system) being proposed to Livermore. We did not build this but the work led to Project HASTY (High Availability Study) which led to the cache memory.

C3 IEEE Fellow, IBM Fellow, Member National Academy of Engineering, Computer Pioneer, IEEE Edison Medal 1993, many patents.

**Sherman L. Prosser** Belle

A2 Vancouver, British Columbia, Canada; March 14, 1927

A3 AB Stanford University, Biology; MA Stanford University, Secondary Education; MA University of Alabama, Mathematics

A4 Three sons: Lee Prosser, David Prosser and Noel Prosser

A5 Seven grandchildren and counting: Holly Christina Prosser (18), Isabelle Frances Prosser (12), Zachary Masco Prosser (11), William (Wooly) Florey Prosser (9), Henry William Prosser (9), Michelle Marie Prosser (7), and Simon Prosser (2).

B1 Hired as an Applied Science Representative, Spent some years in the field as an IBM instructor in Branch Education Centers, Programming Systems (705 Autocoder and first variable output macros.)

B2 Paul Herwitz

B3 IBM Poughkeepsie, Software Manager, 1955-1985

B4 Manager of the Strap II compiler.

B5 Paul Herwitz

B7 Delivery of a working system on time.

C1 I returned to IBM Education Development, where I developed customer training courses. (Actually became a senior programmer there). I bounced around between technical jobs (components of the operating system) and Education functions. Later in life, IBM offered me an Academic Window to go teach at the college level. That is what I am still doing.

C4 Teaching computer science and keeping abreast of the advances in programming languages, standards, etc.

**Sam Raker**

I worked for IBM from July 1955 until about October 1956, during which time I worked on Stretch, but only for a very short time.

When I left IBM for Navy OCS (Newport, RI) I had expectations of the possibility of being assigned to Fort Meade, at which location I would likely continue working on the other end of the project. While at OCS, I was interviewed by Admiral Rickover and accepted an assignment on his headquarters staff for the Naval Nuclear Propulsion Program.

Nuclear power reactors at that time were like large-scale computers - very early in their infancy. Rickover required his junior officers to extend their military obligations by one year. At the end of the four-year military career, I was a committed nuclear engineer in federal service and remained with him and the naval nuclear program in a civilian capacity for the rest of my working life, to 1994. I did this without looking back and without reestablishing connections or ties to the persons I worked with during the first year as a graduate engineer.

**Robert H. Ramey** Janis G. Ramey

A2 New Orleans, Louisiana; April 1, 1925

A3 MS Mathematics, MA Biochemistry

A4 Three

A5 Two

B1 IBM Research Computing Center working on SPADE and numerical procedures

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Robert H. Ramey (Cont'd)**

B2 On loan to SRETCH from Research

B3 Poughkeepsie, Software, IBM, three years at IBM Research

B4 Developing a multiprogramming environment concept

B5 Ted Codd

B6 On loan to STRETCH from IBM Research for about a year

C1 Went to Carnegie Mellon University – Mellon Institute. Designed and constructed large newspaper production control systems. Later, Director of Research Projects at Carnegie Mellon Institute of Research.

C4 Consulting on newspaper production control systems

**Harry J. Reinheimer**      Mary Louise

A2 Poughkeepsie, New York; December 18, 1926

A3 Computer Science candidate at Union College and Syracuse University, 1984–1990. PhD candidate at the University of Maryland, 1980 – 1982. Concentration in Applied Mathematics and Statistical Communications. Completed a ten-week General Class in System Engineering, Computing and Information System Science, System Research Institute, 1977. MS, Electrical Engineering, Syracuse University, 1961. Thesis: *Checking Floating Point Arithmetic*. BS, Electrical Engineering, Syracuse University, 1958.

Equivalent GPA 3.6. Member, Tau Beta Pi and Eta Kappa Nu, honorary engineering and electrical engineering fraternities. Completed T-3 Certificate in Communications, RCA Institute, 1948

A4 Eight

A5 24

B1 Attending Syracuse University to obtain a BS in Electrical Engineering

B2 Ernie Foss

B3 IBM Poughkeepsie, South Road Laboratory; Engineering

B4 With Ralph Bahnsen, I worked on Checking for the Memory, Instruction Unit, Lookahead and the Execution Arithmetic Unit. More specifically the Checker Design took the form: Error Correcting (ECC sec/deed, or Error Correcting Code single error correction/double error detection) for the Memory, Parity for the Instruction Unit and Lookahead and Residue for the Execution Arithmetic Unit.

B5 Reporting to Eric Bloch: My first manager was John Hipp for whom I worked on early plans for the Instruction Unit and Lookahead and Execution units; Bob Fletcher was my manager during the design and implementation of the ECC, Parity and Residue Checkers.

B6 I joined Stretch in 1958 and remained through 1960.

B7 I believe they are the design of the Memory, E Unit Checkers and I Unit.

C1 Directly after Stretch, I did exploratory programming to design computer controls for System/360. I created mathematical models for developing fault location tests and serviceability scenarios for System/360. I also projected new applications for corporate products and forecasted supplies that would be required. Later, I worked in diverse phases of computer development such as architecture and performance measurement, with a pervading reliability, availability, serviceability and maintainability orientation. Also, I did development in fault tolerance.

In 1992, I accepted an appointment as an adjunct faculty with the Department of Electrical and Computer Engineering of the L. C. Smith College of Engineering at Syracuse University.

### Harry J. Reinheimer (Cont'd)

I pursued research Computer-Aided Design. In particular, I did research in Field Programmable Gate Arrays and Binary Decision Diagrams and participated in teaching assignments on an as-needed basis.

C3 Honors and awards: Offered an appointment as Adjunct Associate Professor with the Department of Electrical and Computer Engineering of the L. C. Smith College of Electrical and Computer Engineering at Syracuse University in 1992. Invited to join the CASE Center at Syracuse University from IBM as a Visiting Research Scientist in 1987. Given a Creative Grant from IBM to study fault tolerant techniques at Southern Methodist University in 1977. Received a First Level Invention Achievement Award in recognition for creative contributions to IBM, 1976. US Patents: One in 1972 for a Diagnostic Instruction for a Parallel Processor and two in 1976 for an Error Detecting and Correcting System and Method.

Publications: 16 reports and monographs at IBM, various universities and IEEE, six of them related to patents. Also, numerous presentations on fault tolerance and performance

C4 My appointment as Adjunct faculty with the Department of Electrical and Computer Engineering of the L.C. Smith College of Engineering at Syracuse University is current. In 1999 I moved from Syracuse, New York to Elon College, North Carolina.

### Russell (Russ) J. Robelen Aldona (Ali)

A2 New York City, August 29, 1934

A3 BS Physics, RPI

A4 None

A5 None

B1 I joined IBM in Poughkeepsie right out of college in 1956. I first worked on the 750 machine, which lost out to the 7070 in Endicott and was never built. I was in an advanced packaging group when I was assigned to the Harvest Audit Committee. We were charged with finding out why Harvest was so far behind schedule and when we thought the machine would actually ship to NSA.

B2 I don't recall who assigned me to the Harvest Audit Committee.

B3 I was in Poughkeepsie from 1956 to 1965, from there I went out to the ACS Lab in California and was there until 1969 when I left IBM.

B4 Trying to understand how Harvest worked and why it was taking so long to ready the machine to ship.

B5 I can't recall who headed up the Committee.

B6 I think my five months stint on the committee was in 60 or 61. I know it was in the year just before Harvest shipped which I remember was in January. Exactly which year I don't recall.

C1 Upon my return from the IBM Systems Research Institute and the start of the 360 development, I was assigned as the liaison to the Hursley Lab in England where the Model 40 was being developed. I became such an advocate of Control Stores and microcode that I was given the job of running the CPU design of the Model 50 under Gerry Paul. Following that, I went out to the ACS lab in California where I ran the engineering design of the processor and the memory bus. Bill Mooney had the I/O and I had pretty much everything else.

Just before the demise of ACS, I left IBM and started a company called Multi Access Systems Corp (MASCOR). I recruited a number of people out of IBM, mostly from the ACS lab but a few from the east coast as well. Just as MASCOR, unable to raise a second round of capital, was coming to its premature end, Gene Amdahl left IBM and started the Amdahl Corp. Many of the people I recruited out of IBM joined Gene when MASCOR closed its doors.

### Key:

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

### **Russ Robelen (Cont'd)**

At that point I left the computer business and got into the venture capital business as a founding partner of Idanta Partners in San Diego. One of our early seed financing was Prime Computer. I served on the Board of Prime for a number of years and thus kept my hand in the computer business to some degree. I left the venture business in the mid 70s and was an independent consultant for 13 years before getting back into the venture business once again in 1988 with my old firm Idanta Partners. I am now a retired partner in InnoCal, a new venture firm I joined in 1993. Through all of this my wife will tell you that computers are still my first love.

C3 Nothing of note here. I have served on the Boards of two public companies and several private companies over the years.

C4 I still write code for my PC. I gave a short talk recently on a historical perspective on computing. I spoke about the new Pentium 4 running at 2 GHz and how the model 50 ran at 2 MHz, a factor of a thousand. I talked about the amount of memory on a typical PC today, 256Megs, and how the Model 50 had 256K, again a factor of a thousand. I also spoke about disk storage where the factor was even greater. A 2GHz PC is not yet at a \$1,000 but will be in short order. The Model 50 sold for \$1,000,000. It's really hard to comprehend these numbers even for those of us who were there from almost the beginning.

### **Robert (Bob) Rockefeller**                      Mildred

A2 Philadelphia, Pennsylvania; March 5, 1926

A3 BSME Clarkson University, 1948. Added studies: University of Rochester, University of North Carolina in US Navy V-5 program, WWII. University of Virginia Business Decision Making Course, 1974.

A4 Three children: Bill 1948, David 1951, and Jane 1954

A5 Six grandchildren

B1 System Design Manager SAGE II and SAC machines MPD Kingston, and then staff work on High Speed Computational Techniques (Air Force Contract), also Kingston.

B2 Ed Hofler, manager of the Stretch Project as it moved to Kingston.

B3 IBM Kingston. System Design Manager, emphasis on the Look Ahead Unit "improvement" program. With IBM until 1988

B4 Look Ahead Unit improvement program, application work, interface with Sully Campbell's system programming group, requirements.

B5 Ed Hofler

B6 1961-1962

B7 Improvement Program with Don Gibson as technical leader.

C1 Went on to work on the original FAA project (1964-1966), which turned out to be a technical, and business success for IBM. Worked on TSS and then VTAM Planning Manager and then assignment in the UK as Communication Product Support Manager for early shipments of IBM gear in E/ME/A. Then staff jobs HQ on VSE and then VM prior to retirement in 1988.

C3. Outstanding Contribution Award on the FAA project. Article in System Research Journal on error handling program in a multi processor environment (FAA). Rewards: working with a lot of nice people.

C4 Retired Community Affairs (headed town master plan committee) Gardening, golf, painting

**Ed Rodgers** Ruth M. Rodgers

- A2 Texas, April 18, 1926
- A3 BS in EE from University of Texas
- A4 Three children
- A5 Four grandchildren

- B1 Customer Engineer on Model 705 in Ft. Worth, Texas
- B2 (?)
- B3 Joined Harvest design group in Poughkeepsie in January 1959 and stayed with the group until the system was delivered to the customer.
- B4 Harvest logic design and system debug
- B5 Tom Wotr, Jim Pomerene, Bud Allen, George Werner, and others.
- B6 1959-1961
- B7 Surviving the rotating shifts during system debug.
- C1 After Harvest I continued working in the product development laboratory in Poughkeepsie through successive generations of large systems until I retired in 1990.

**Joe St. Germaine** Harriet St. Germaine

- A2 New York City; June 9, 1931
- A3 BS (Business) Denver University
- A4 Three
- A5 Two

- B1 1949-51: NYC, NYU, Student (advertising research); 1951-55 Denver, USAF, Instructor (statistics/data processing); 1955: NYU, Student, evening division (advertising research), Compton Ad agency (marketing research); 1955-57: Denver, Denver University, student (business/statistics), United Airlines, programmer/operator, IBM 607 Plug-Board "computer" (midnight shift); 1957-59: St. Paul, Minnesota, Univac Programmer (Satellite/Titan missile ground guidance systems). First satellites put in circular orbit (Transit Artificial Star and Tiros weather satellite)...PLUS... unused A-Bombs
- B2 Interviewing manager, Tom Apple
- B3 IBM South Road Lab, Poughkeepsie; Software, employed by IBM 1959 until March 3, 1990.
- B4 Master Control Program (resident) design, with Jack Garrity; MCP Initial Program Load (IPL), design/development; MCP multi-programmed prototype, design with Ed Bensley, MIT; Stretch System/360 simulator, design/manager (with great people)
- B5 Card holding (virtual) manager was Paul Herwitz. (Paul held more cards than a Vegas poker dealer, as the Stretch group [attracted people] into Poughkeepsie's South Road Lab from all over the world.) First (real) manager was Jack Garrity (second lines...George Grover, Gul Hira)
- B6 On Stretch from November 1959 until c.1963
- B7 Co-design (with Jack Garrity) of resident Master Control Program. Team participant in design and development of System/360 simulator on Stretch
- C1 System/360 Design Control group member; Manager, System/360 Change Teams, releases 1 to 10; Manager System/360 Development Aids groups, releases 10 to 23 (Utilities et al, TSO {Test, Utilities, Editor}); Staff to Director of Programming – Programming Development Quality coordinator; Other IBM: Future Systems test planning, Product Test project review. Retirement
- C3 Honor: the opportunity to be a part of the Stretch software effort
- C4 Family, travel, sailing, beach walking

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
 B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
 B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities



**Cas Scalzi** No spouse

A2 Bridgeport, Connecticut; May 15, 1930

A3 BS Mathematics and Philosophy, Fairfield University, Fairfield, Connecticut

A4 None

A5 None

B1 1954-56: US Army, The Signal School, Fort Monmouth, New Jersey; 1956: IBM, Processor design group in Building 703

B2 Werner Buchholz

B3 IBM Poughkeepsie, South Road Laboratory. I remained with IBM until the end of May, 1998, with most of that time spent at the Poughkeepsie lab in 705 and 707 buildings. I spent two years on the Corporate Programming staff in Armonk.

B4 Assigned to write chapters of the Principles of Operations (POP) manual on Indexing, Variable Field Length Arithmetic, and Program Interruption operation. When the POP was finished, I transferred to a small group that designed, specified, coded, tested and did performance runs on a generalized multiprogramming control program running on the Stretch computer. (Stretch Experiment in Multiprogramming, or STEM). This program was later taken over by Research and used for a time at Yorktown as its main operating system, after some modification by people there.

B5 Werner Buchholz (POP assignment), Ted Codd (STEM assignment)

B6 1957-1962, approximately

B7 1) Detailed definition of the Stretch program interruption system so as to allow generalized multiprogramming of unrelated applications without their programmed cooperation. This included establishing the architectural classification of the ending of instructions after special circumstances as Complete, Suppress, or Terminate, allowing programmed recovery after such special circumstances. This [scheme], further extended, is still used in 390 architecture today

2) Working with Lew Headrick of engineering to reflect the instruction ending architecture in the machine operation.

3) Working with Betty McDonough on the design, creation and debugging of the STEM control program supervisor.

**Alfred (Lee) Scott** Margaret (Ellen) Scott [Editor's note: Lee Scott passed away July 22, 2002.]

A2 Orbisonia, Pennsylvania; February 9, 1930

A3 Juanita College; June, 1953; BS in Economics and Business Administration

A4 Two

A5 Three

B1 Working for Caterpillar Tractor Co. in York, Pennsylvania. Last year, installed a 305 RAMAC System replacing a tub file system.

B2 Carl Gerberich

B3 IBM Poughkeepsie, software, 1960

B4 Working with Sam Patton and Frank Gagliano to provide Harvest extensions to the assembler.

B5 Carl Gerberich, Jack Parsons, Dick May

B6 1960-1963

B7 Programming the assembler extensions, debugging same, doing final documentation

**Lee Scott (Cont'd)**

C1 O/S 360 COBOL Compiler (Phase 9) Alpha Specs. O/S 360 JOB INTERPRETER - JFCB Housekeeping (Programmer). Scientific and Special Operations Branch Office, Washington, DC. Systems Engineer, Account Representative, Marketing Representative. Wheaton Development Center, Wheaton, MD. Documentation and coordination functions for BASIS program product. Gaithersburg Programming Center, Gaithersburg, MD. Documentation Specialist and Test Coordinator for Networking project. Gaithersburg Programming Center, Project office (JES 2/JES 3) test coordinator. DP Headquarters, Bethesda, MD. Developing specs for rewrite of AAS Sytem. Raleigh, NC, coordinator for VM support activities. VM system representative for all Raleigh test systems. 3294 terminal development, test coordinator. Development of test specs for Bell Atlantic project. CallPath program product, test coordinator.

C3 Published ATR Manual on "Testing Procedures in a Network Environment."

C4 Retired, being a kidney dialysis patient limits my activities.

**Elmer M. Sharp** Grace

A2 Hamburg, New York, August 31, 1923  
A3 MS in Physics (Cornell Univ.)  
A4 Two  
A5 One

B1 IBM Special Systems Rep. (Applied Science, DP) Chicago, IL  
B2 My Immediate Manager was Bob DeSio  
B3 IBM, MidWestern Region DP, Special Sales Rep, 1957-1960  
B4 Representation of Stretch to prospective customers (primarily to Westinghouse Bettis Atomic Power)  
B5 Bob DeSio  
B6 1958-1959

C1 In 1960 I transferred to Poughkeepsie (development lab)  
C3 Yes (Two outstanding Innovation/Achievement awards after coming to Poughkeepsie.)  
C4 Retired: travel, antique cars, home life

**James H. (Jim) Shelly** Jean O. Shelly

A2 Zanesville, Ohio; November 28, 1932  
A3 Oberlin College, BA 1954, University of Illinois MA 1956, PhD. 1959, all in Math  
A4 Three  
A5 Four

B1 Earning a PhD at the University of Illinois  
B2 Jim Pomerene  
B3 Poughkeepsie, Engineering, IBM, 1959-1987  
B4 Design of the Adjustment Unit for Harvest  
B5 Art Fitch  
B6 1959-1962

C1 I remained with IBM until 1987. I was a lead designer of S/360, Models 60 and 65, and was responsible for the machine description, against which the microcode was tested. Following that, I worked in Ad Tech roles, particularly in the development of set-associative cache strategy and vector processing with Stu Tucker. I was later involved with the ES/3090 and ES/9000 projects, working with delay calculation

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**James H. (Jim) Shelly (Cont'd)**

methodology and floating point arithmetic. At my retirement, I held a position as Member of the Senior Technical Staff.. I accepted the 1987 retirement opportunity, and was accepted into the Technical Academic Career Program, I then took a position with North Carolina State University's Electrical and Computer Engineering Department, where I taught for six and one-half years.

C3 IBM Outstanding Contribution Award, 1969, for Buffer Storage Technique

IBM Outstanding Technical Achievement Award, 1983, for Optimization of Technology Design

C4 Since my second retirement, Jean and I have continued our enjoyment in travelling, round and square dancing, and church work. I have been active in a brass ensemble in the church, and last year took up the tuba. We enjoy our children and grandchildren, especially now our two-year-old granddaughter, Laura Anne, whom Kevin is raising as a single parent. My other activities include computers, golf, photography, genealogy, and the myriad of jobs facing the homeowner.



**Jim and Jean Shelly**

**Richard C. Siebold                      Ann**

A2 Rhinebeck, New York

A3 BSEE Union College and graduate work at U. of Maine

A4 Three children: Mark, Carin and Daniel

A5 Six grandchildren

B1 Returned from three-year leave of absence for a tour in the US Air Force as a Pilot.

B2 Don't remember

B3 IBM Poughkeepsie at South Road Lab, Engineering, 1955-1993

B4 The build and debug of the Los Alamos machine and the installation of this machine at the Los Alamos Lab.

B5 Vaughn Winkler and Eric Bloch

B6 1959 to 1961

B7 Successful completion of the design/debug and installation of this machine in Los Alamos

C1 Worked on the 7040/44 with Pete Fagg and Joe Brown and some of the team from Kingston. Designed the decimal arithmetic unit on the 360/65 and was on the development team on the 360/85 with Larry Kanter. Took the M85 program to Kingston for manufacture. Worked on the development of Carnation line switching PBX with Bob Rolfe and the Lagaude Lab for a while, and IBM decided not to get into the PBX business. While in Kingston, I was asked to manage the development of the first 3270 Display System which was a very successful project (made a lot of money for IBM). Managed the development of the IBM gas panel for a couple of years and then went back to manage the follow-on to the 3270 (another winner – multi billion \$ world wide revenue program). Somewhere here I was promoted to Director of Display development. Took a tour as director of Product Assurance for SDD and then back to Displays and set up the IBM Monitor line in Raleigh. Directed Raleigh Lab Operations, 3-year tour in Brazil setting up a

### **Richard C. Siebold (Cont'd)**

development operation to support IBM Brasil, back to Raleigh as Director of Business Ops for the lab and retired in July 1993, 38 yrs with IBM.

C3 Several Outstanding Contribution Award and informal awards.

C4 Living in Fearington Village near Chapel Hill, North Carolina offers many opportunities. Currently involved in golf, racquetball, fishing, trap shooting, and traveling around the US and Canada visiting our children and grandkids. We purchased a motor home in 1998 and have toured most of the US, Alaska, and the east and west coasts of Canada (50k miles), we are selling it now and intend to stay in North Carolina for a while. My youngest son is a pilot for United Airlines, so we have unlimited travel capabilities that we will probably use in the near future.

**Ronald M. Smith**, married Evangelyn (Vangie) Gardner June 20, 1958

A2 Brownsville, Ohio; April 22, 1934. Vangie was born in Swanville, Minnesota, October 1, 1938

A3 BEE, Ohio State University, 1957

A4 Seven: Gwendelyn, 10/7/59; Laura, 1/13/61; Timothy, 9/19/62; Ronald, Jr. 8/31/65; Ryan, 9/22/71; Malinda 4/2/73; Jacquelyn, 12/17/80.

A5 16.

B1 Joined IBM Endicott 6/17/57 to work on the 1410. Moved to Poughkeepsie in August 1961 and worked on the 7040.

C1 Joined the effort for the New Product Line (NPL) in 1963. Just like Ken Plambeck, I am still working for IBM, still in Poughkeepsie, and still working on CPU architecture extensions to the S/360 line (most recently renamed z/Architecture).

**Ronald K. Staheli** Anne F. Staheli

A2 New York City; December, 1936

A3 Queens College, BS in Math; Iona College, MBA in MIS

A4 Three (Scott, Diane, Christopher)

A5 None

B1 Queens College

B2 Hired by IBM Research at the Lamb Estate in Ossining, New York

B3 Locations: IBM employee during Stretch project located at Ossining and later transferred to Poughkeepsie. Tested or provided onsite software support for IBM in Kingston, Los Alamos, Mitre, Weather Bureau, Naval Weapons Lab, AWRE. 1960-1967

B4 Initially, tape I/O and Data Input programming. Later responsible for all of MCP support and enhancements. Technical editor for MCP Analysis Guide

B5 Jim Havender, Jack O'Connell, Ken Tooker and Bob Webster

B6 1960-1964

B7 Worthiest Stretch accomplishments would be both my programming for data input processing and the ongoing support and enhancements for the Stretch user community.

C1 After Stretch, my next (and last) IBM project was program development for the OS/360 operating system: Job Scheduler, SYSGEN, ISAM and JCL. Switched to commercial program development in a variety of languages as computer project manager and programmer for a combined total (including IBM) of 41 years in the computer business.

C3 John G. Hagan award for academic excellence from Iona College. Awarded at my 1975 MBA graduation.

C4 Taking classes in Internet development. Snowshoeing. In the process of learning kayaking.

### **Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Charles M. Strauss**

A2 Providence, Rhode Island: October 18, 1938

A3 A.B. Harvard 1960, Mathematics; Sc.M. 1966, Ph.D. 1969, Brown, both in Applied Mathematics

A4 Three

A5 None

B1 Going to college

B2 I don't really know - IBM recruited me at college

B3 Poughkeepsie, programming (Fortran compiler group), IBM, just one year at IBM

B4 Programmer on the Fortran compiler project

B5 Franklin Branin

B6 Just one year

B7 I lived through it!

C1 Worked as a programmer in/around Boston for three years; went to graduate school in Applied Mathematics for the next four years; stayed on as Assistant Professor for the next seven years; worked in Rhode Island and Boston as a contract programmer and in my own startup for twenty-five years; and have wound up, happy and contented for a huge change, at Draper Laboratory in Cambridge for the last six years.

C3 A few papers; a few computer-generated movies. Mostly book reviews.

C4 Working, sailing, lying on the beach, playing the piano, drinking wine, gossiping with old friends

**Dura Sweeney** (deceased 1999) Liz Moore Sweeney (who submitted this material)

A2 December 16, 1922 in Rochester, New York

A3 BA in Math, University of Rochester 1946; MA in Industrial Management, MIT 1963

A4 Four

A5 Four

B1 First job was as a lowly mathematician in the Los Alamos Lab, T division. Joined IBM Endicott in 1954. Moved in 1956 to Poughkeepsie (Salt Point). Retired from IBM in 1981.

C3 I think Dura received a patent with Fred Brooks during the Stretch project.

C4 Dura had 18 wonderful years of retirement. We lived, and I still do, on a Stamford, Connecticut harbor. Dura was so bright and had so much energy and had so many skills, he was able to direct it towards volunteer work in the neighborhood, the church, and the community. Some of it on boards, but much of it hands on -- he could fix anything. He also was an avid off-shore sailor/navigator and sailed to and from the Islands almost every other year, as well as being in Bermuda races. He also built furniture for us and our children. He remodeled the house and was a demon gardener (transplanting was his obsession -- no plant was safe). He died February 11, 1999 (76 years old) while swimming at the Y. He was trying to do a certain number of laps. His motto had always been "I'll do it if it kills me" and this time it did -- but he had achieved his goal. He was so much fun to live with -- I miss him very much. Liz Sweeney

**George Swift**, my spouse is Adele.

A2 Minot, North Dakota; July 1, 1926

A3 Ph.D. Mathematics, 1954

A4 Three

A5 Seven

B1 IBM Applied Science Representative, Martin-Denver Scientific account. Before that, Duke University Mathematics Department.

B2 Werner Buchholz

B3 IBM Poughkeepsie, Architecture, Engineering Planner; 1956-1989

B4 Instruction set, character recognition, memory, reference manual.

B5 Werner Buchholz, Fred Brooks, Gerry Blaauw

B6 1958-1960

B7 Invented and patented a character recognition device for Stretch. Worked out a method of error correction for disk storage. Co-author of the reference manual. (And, Poughkeepsie Chess Champion.)

C1 IBM Federal Systems Division, Manager of Special Large Scale Computer Plans; Manager of the Intelligence Research Department in the FSD Washington Systems Center, image processing, information retrieval, statistical analysis, operations research. Adviser to IBM's Independent Research and Development program associated with the US Government. IBM Northwest Scientific Representative. Adjunct Associate Professor of Information Sciences, Washington State University. Development team, IBM System 3 Model 6. Professor of Computer Science, Atlanta University (Faculty Loan). Development team, IBM 5100/5110, IBM's first desktop computers (prior to the PC), maintained software products, IBM's first "hotline" open to customers and third party programmers. ACIS Market Support. Minority Engineering Program, University of Washington (Faculty Loan). Professor of Computer and Information Sciences, Towson State University. Clark College Adjunct Faculty, mathematics.

C3 Technical Program Committee of the 1964 SJCC and Chairman of its Education Symposium. Mathematics Board of the Pacific Science Center in Seattle (Dixy Lee Ray, Chairman), established a mathematics showroom, arranged for IBM contributions. Program Chairman for a chapter of SIAM. Invited lecture on the use of Fortran in information retrieval at a national convention of the American Society of Information Sciences. Managed IBM booth at a national meeting of the American Mathematical Society. Did a special assignment for IBM VP Branscomb. Invented a character recognition device for Stretch, a printer-plotter for the 5100/5110, and a cryogenic device. Published several papers on mathematics and computer topics.

C4 Tennis, chess, cartooning, teaching mathematics.

**Richard E. Toepfer**          Betty

A2 Chicago, Illinois; October 9, 1934

A3 BSEE, MSEE, PhD EE Control Systems and Mathematics, University of Illinois

A4 Three. Two daughters and a son

A5 None

**Key:**

**Alumnus/a**, Spouse   A2 Birth Data   A3 Education   A4 Children   A5 Grandchildren   B1 Before Stretch   B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer   B4 Role on Stretch   B5 Managers   B6 Years on Stretch  
B7 Worthiest Accomplishments   C1 After Stretch   C3 Awards, Honors, Papers, etc.   C4 Current Interests, Activities

## **Richard E. Toepfer (Cont'd)**

B1 I was in my second year of Grad School at the University of Illinois, Champaign Urbana

B2 Jim Pomerene

B3 IBM Poughkeepsie, Engineering, summer of 1958

B4 My recollection is that it was in Software Development, about which I knew little. I was enrolled in a machine language programming course. As a result of this exposure I decided I probably shouldn't ever be a programmer! (The following summer at IBM found me in a hardware design group, working for Ernest Newman, with whom I worked again in San Jose during 1965-66)

B5 Jim Pomerene

B6 Three months

B7 I fear I was too busy learning to make a contribution of any significance in a summer.

C1 I had over 40 years of contribution to the Electronics Industry. It encompassed assignments in all three major functional areas, R&D, Operations and Marketing. My experience includes:

- Thirteen years of management experience in High-technology Manufacturing at Hewlett Packard, Spectra Physics, Convergent Technologies, and Magnuson Computer. This included the manufacture of low volume, highly complex systems in the Computer, Analytical Instrument, and Semiconductor Equipment Industries. It also encompassed high volume, rapid growth manufacturing.
- 23 years of Engineering Management, Product Development, and Program Management at the Aerospace Corporation, Autonetics, IBM, Hewlett Packard, Kubota Graphics, Apple Computer and Adaptec. My engineering experience included development of Computer Systems and Software, Measurement and Control Instrumentation, and Aerospace vehicle control. I managed the original HP 3000 Minicomputer Hardware development program in 1972-73. This processor family lasted 30 years and was removed from the price book in 2002. I also managed Apple's Speech Recognition and Synthesis R&D effort in 1995. This technology is available as an integral part of the Apple OS system, including the new System X. (I do use IBM's Via Voice on my Macs as well.)

My later IBM experience was obtained in the San Jose facilities, 1965 to 1969. I worked in Ernest Newman's Measurement and Control Organization in 1965-66. This was followed by two years as a control engineer on the Cypress Trillion-bit Photo Store System. My last IBM assignment was a year in the Los Gatos ASDD Lab working in Hal Martin's group on a disk-based Video refresh System.

- Five years of combined teaching and research in Electronics and Control Systems at the University of Illinois and UCLA.

C3 I hold a patent for an Infrared Moisture Gauge for the paper industry and have been on the Board of Directors for a company developing CAD software. I was nominated by Bill Hewlett to represent HP as a member of the Technical Advisory Committee on Computer Systems to the Bureau of East-West Trade, U.S. Department of Commerce, 1973-1975.

C4 I retired from Adaptec Inc. in 2001 and am currently finishing our home Los Gatos. I have been a member of the Santa Clara Valley Watercolor Society for 35 years, and hope to follow a second career in painting, in particular aviation art. I have a lifelong interest in aviation, and have an extensive library of books, magazines and videos. With some luck I may even reactivate a long-dormant pilot's license. My wife and I are determined to become experts in multimedia, she on the photography side and I with graphics, video and sound.

Introducing **Ken Tooker**, along with my wife Claire.

I was born in Brooklyn New York, and moved at age 5 to Pleasant Valley New York, where I have lived ever since. Claire was born on Long Island and moved to the Poughkeepsie area in July 1965. We were married in December 1968. I have four children, three boys and one daughter along with a total of nine grandchildren, my daughter having five and my oldest son Ken having three. Ken owns and operates the Bicycle Shop in Pleasant Valley.

I joined IBM on December 22, 1954. Claire joined the Vassar College workforce in March 1966. She was the Manager of the College Store until her retirement in June 2001. I retired in June 1993, and continued to work till February 1994. IBM then called me back to work in 1995, and I continued onto 2001, for a total of 46 years.

I joined IBM in Kingston in 1954 and worked on the SAGE project as a programmer. Then in 1960, things were wrapping up for my part of the SAGE project. At that time I heard that IBM might be staffing for the 7030 (STRETCH) project. I inquired more about it and found it to be quite interesting. I was then asked to join the project, which was located in Poughkeepsie. This was great, joining a project in the embryonic stage as well as being in Poughkeepsie. The latter alone was great as it saved me a lot of daily miles of commuting to Kingston.

I believe that I was hired into the Stretch project by Dr. Paul Herwitz, and then worked for Gul Hira in Poughkeepsie. Later on, I worked for Jack O'Connell and worked mainly in the Master Control Program area. Worked almost the full length of the project, that is from 1960 until 1964.

After Stretch came the early days of OS/360 (the worst part of my IBM career). I then joined the Systems Performance group headed up by Tom Apple, with Nick Neville and Jim Kessler my managers. This job involved systems performance, utilizing hardware devices such as the SMI and PEC. This was another interesting and an enjoyable project. From there I joined the DP division as a systems troubleshooter supporting SEs for VSE systems. Then, in 1981 or 1982, I joined the World Trade Division in systems support, staying there until my retirement in 1993. In August 1995 I was called back to continue with systems support and other related duties until I left in August 2001.

There were no honors, awards, boards or publications, just good hard work. Will say that I enjoyed my stint with IBM for the most part. The most important part, besides being on the leading edge of new technology, was meeting and being with the people that I worked with and for, as well as those I met at IBM during my career.

**Stuart Tucker**      Roberta Holden

A2 New York City; June 21, 1933

A3 Yale BE in Electrical Engineering 1955

A4 Three

A5 None

B1 College; 738 Memory circuit design (we gave up on transistors, not fast enough!); an "Agency" project in Endicott; six months in the Army

B2 Erich Bloch

B3 IBM, Poughkeepsie, Engineering, 1955-1992

B4 Design VFL Unit Controls; Floor debugging; Install at LASL

B5 John Hipp

B6 1957-1961

B7 VFL Controls

**Key:**

**Alumnus/a**, Spouse   A2 Birth Data   A3 Education   A4 Children   A5 Grandchildren   B1 Before Stretch   B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer   B4 Role on Stretch   B5 Managers   B6 Years on Stretch  
B7 Worthiest Accomplishments   C1 After Stretch   C3 Awards, Honors, Papers, etc.   C4 Current Interests, Activities



**Stuart Tucker (Cont'd)**

C1 SLT and SLT Design Automation; 360 M65 and the 70XX emulators; 3090 I-Box and Vector Processor.  
C3 IBM Outstanding Contribution award for the 360/M65 Emulators  
IBM Systems Journal publications on Emulation and the 3090.  
C4 Skiing; Ham Radio; Bicycling (FL to NY in 1997)

**Sherman Uchill**      Audrey Uchill

A2 Denver Colorado, May 15 1933  
A3 BS Aeronautical Engineering, MIT, MBA Harvard Business School  
A4 Three children  
A5 Two grandchildren

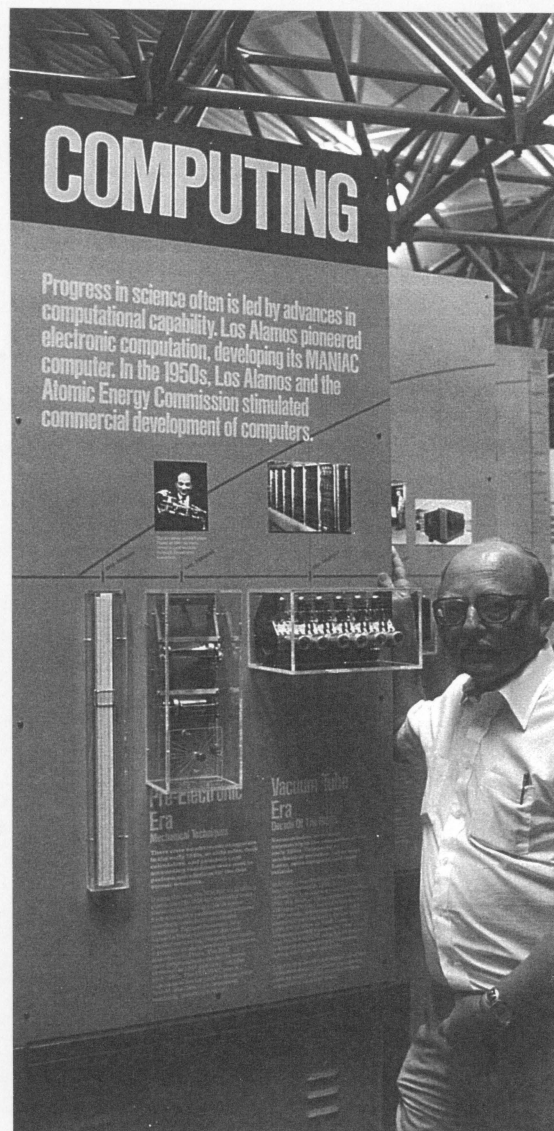
B1 I was working for SBC (Service Bureau Corp) in Boston as an application programmer.  
B2 I don't remember. I think a request was made to SBC for programmers and I responded.  
B3 I worked in Poughkeepsie at the Countess Mara Tie factory.  
B4 I was involved with the FORTRAN compiler. My focus was on loop analysis and indexing. Of course the multiple pass approach to compiling was the source of much amusement by our team, but we followed orders.  
B5 I worked for Marla Orr and Dr. Frank Branin.  
B6 I came in June of 1960 and left in September 1961 to go to Harvard Business School  
B7 I was on the first national standards committee for FORTRAN. Because of my narrow focus on loop analysis and indexing, I probably knew more about that subject than anyone else in the world. Of course that knowledge had no real practical value, as the whole methodology of translating a high level language to machine operation never embraced the concepts of multiple pass translation. The irony is, of course, that we thought we were working on this super fast large-scale computer and it turned out that compared to today's personal computers, it was dinky, slow, and very limited. I don't think any of even the most visionary of us could have pictured where computing has evolved.

C1 After I left Stretch and graduated from HBS with an MBA, I worked at Control Data and then Peat Marwick, before starting my life's work as a serial entrepreneur in the computer field. I started and sold 4 companies over a 20-year career, selling the last one, a chain of computer retail stores in 1988. The last 14 years I was a management consultant, focused on the strategic use of computer technology for competitive advantage. I had large clients like CITGO, DEC, Apple and Lotus along with a number of large privately held companies in a number of different fields. We moved to Las Vegas last fall embarking on our last great adventure. We are doing a lot of biking, hiking and kayaking in Western National Parks. Vegas is centrally located for outdoor activities. There are 15 National Parks within a few hours. I have also started a new business producing large-scale photographs on canvas using an EPSON 10000 digital printer. The pictures look like paintings in this medium.

**Edward A. Voorhees, Jr.** (deceased 1997) Jeanette  
(who provided this information)  
A2 September 4, 1926  
A3 BA, MA in Mathematics

B1 Programmer at LASL for IBM 701 computer;  
Supervisor of Programming Section at LASL  
B3 Los Alamos, Design, LASL, 1952-  
B4 Member of LASL-IBM Stretch design team  
B6 1956-1961

C1 Manager of Computer Operations and Systems  
Programming at LASL; Coordinator, "ADP" for LASL  
C3 Board of Directors, National Association for  
Retarded Children; President, New Mexico Association  
for Retarded Children; Chairman, Los Alamos  
Community Action Program; Vice Chairman, New  
Mexico Department of Hospitals and Institutions;  
numerous other positions in church and state/local levels



**Edward A. Voorhees, Los Alamos 1988**

**Allen L. Walker** Marlene K. Walker  
A2 Sheridan, Indiana; July 25, 1929  
A3 A.B. in Government (Now called Political Science) M.S. in Education  
A4 Two  
A5 Five

B1 Teaching High School and Junior High Math and History  
B2 Tom Apple (I think)  
B3 Poughkeepsie, Software, IBM, 1962-1990  
B4 Fortran Compiler, Math library for Fortran Compiler  
B5 Jack Garrity, John Carter, Bob Webster, Ken Tooker (Not necessarily in order)  
B6 1962-1964, I think. (I went to S/360)  
B7 Fortran mathematics library revision, documentation, Stretch coverage for Fortran in Paris.

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

### **Allen L. Walker Cont'd)**

C1 After Stretch, I worked on S/360 Main Storage Management, then moved, with Bob Webster, to Rochester, Minnesota and worked on S/3, S/36, and S/38, then in Performance Analysis for S/38 and AS/400. While in Rochester, I also gave seminars on Creative Problem Solving, Memory Improvement Techniques, for the Employee and Management Development Department and gave annual presentations to visiting students from the University of Minnesota on "Perception." These presentations were organized at the request of the Education Department and made use of magic to illustrate points and to make entertaining as well as informative presentations. Immediately after retirement from IBM, I worked on the 1990 census, then did some substituting at Mayo High School. We then moved to Indiana to care for aging parents. I taught Computer Science (Primarily Cobol), Finite Math, and other Math courses at Ivy Tech State College at Bloomington, Indiana for several years until care for parents became a full time job.

C3 Significant monetary awards on S/3 and S/38. ITL symposium paper, "A System Simulation Performance Model for System/38." ITL symposium paper, "Dynamic Tuning of System/38." Article "The Importance of Creativity," which was published at a number of IBM sites in site publications.

C4 We have just finished caring for elderly parents. We are now in the process of moving to Florida to be near our daughter, son-in-law, and grandchildren there. We plan to travel. I am pursuing my hobby of magic and hope to do some woodworking after we move.

### **Robert G. (Bob) Webster**

Elaine (Deceased June 6, 2002)

A2 Huron, South Dakota, August 30, 1928

A3 B.S. Mathematics and Physics

A4 Five

A5 Seven, plus two great grandchildren

B1 Test Engineer, Poughkeepsie Product Test

B2 Dr. Paul Herwitz

B3 IBM Poughkeepsie; Software initially, Management later; 1957-1988

B4 STRAP II. Later on, management of MCP, other software maintenance. Managed passing the baton to a subcontractor.

B5 Sherman Prosser, Jack O'Connell

B6 1959 until software maintenance was subcontracted (?)

B7 Three weeks a month in Los Alamos shortly after getting married.

C1 Management of S/360 Sort Merge ... S/360 Language Manager for Assemblers ... Manager System/3 Software Development, Rochester MN ... Systems Programming Manager, GSDHQ Atlanta ... Director Advanced Technology, CPD, resident in Yorktown with a lab there, Dr. Art Ferdinand, Mgr. (Topview and other PC activities), one in Gaithersburg, Dr. Walter Rosebaum, Mgr. (Spelling Technology) and one in San Jose, Dr. Joseph Ma, Mgr. (Drop on Demand ink jet technology). Retired in Atlanta as a college recruiter for the lab, Raynor Moore Director.

C3 Outstanding Contribution Award for Management of S/3 Software Development.

C4 Was doing quite well and enjoying retired life in Jasper Georgia near the Blue Ridge Mountains until joining the ranks of the widowers. Right now I am making that very difficult adjustment. But fortunately three of our five children live in Georgia. Two are nearby, the other one is a bit farther, but has a Cessna 172.

**Ronald Weiss and Gina Weiss**

- A2 Ron born in Newmanstown, Pennsylvania. Gina born in Naples, Italy
  - A3 Ron graduated from Devry Technical Institute, Chicago, Illinois
  - A4 Have one son Steven who is the Executive Pastry Chef at Showboat casino in Atlantic City, NJ.
  - A5 Have one grandson Charles who is three years old and one granddaughter Emilia who is nine months old.
  - B1 Working in computer operations in 705 building.
  - B2 Al Loring
  - B3 Poughkeepsie, However worked in Kingston, NY while 7030 Stretch machine was in final test. Worked in IBM computer operations from 1961 to 1963.
  - B4 Worked in computer operations.
  - B5 Al Loring
  - B6 I worked on Stretch the whole time the Stretch machine was in Poughkeepsie, NY.
  - B7 Supporting the programmers in getting their jobs through the 7030 Stretch machine. Trying to identify when the Stretch machine was having a problem, let the Field Engineers know so they could fix the problems quickly.
- C1. Worked in 360 computer operations, IS South road lab, IS software review for Richard Case, IS Manufacturing, IS Finance, 1985 transferred to IS Info Center Mechanicsburg, PA. Retired in June of 1987 at age 52.
- C4 My Wife Gina opened an Italian Restaurant in 1986. Investments in Real Estate and Stock Market keep me busy. I am a rotating officer in an all IBM retiree Stock Investment club. Travel to my Condo in New Jersey to visit my son and his family. Restaurant closed after seven years, too much work.

**Jack Wenner**

Nancy Neilson-Wenner

- A2 Madison, Wisconsin; October 22, 1931
  - A3 BSEE
  - A4 Seven
  - A5 Ten
  - B1 Two years in the US Air Force
  - B2 Lou Blenderman
  - B3 IBM Poughkeepsie, Engineering, 1956-1984
  - B4 Tractor Tape Drive
  - B5 Len Thompson
  - B6 1956-1958
  - B7 Test and development of magnetic tape drive
- C1 System/360, manager 2400 magnetic tape system
- C3 Third level patent award
- C4 Travel, construction

**Donald C. Whitmore**

- A2 Born Poughkeepsie, New York, on December 9, 1928.
- A3 Bachelor of Electrical Engineering from Clarkson University, 1951 (minor in Atomic Physics)
- B1 Before Stretch I worked in Diagnostic Engineering on IBM 705, 7080
- B2 Paul Herwitz (I think)
- B3 IBM Poughkeepsie from 1954 to 1984. Worked in both hardware and software development.

**Key:**

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Donald C. Whitmore (Cont'd)**

B4 Development of the Stretch Assembly Program (STRAP), TESTRAN, and Stretch simulator for System/360.

B5 STRAP manager – Sherman Prosser; 360 Simulator and TESTRAN manager – Joe St. Germaine

B6 1959 to 1964 (?)

B7 Input/Output for Stretch assembly program, and writing I/O simulation routines for the Stretch simulator of System 360.

C1 After Stretch, I worked in TESTRAN development (no great success), and then in System 360 Systems Assurance in the areas of publications, performance, and overall assurance of several releases of PCT, MVT, and OS/MVS.

C4 After retirement in 1984, I became involved in several volunteer activities: Vassar Brothers Hospital in Poughkeepsie (Chairman of the Board of the Cupboard for 2 years); Dutchess County Outreach in data processing activities. Presently, volunteering for Dutchess County Tourism at the Franklin D Roosevelt Home, and maintaining tourism statistics for the Dutchess County Tourism Promotion Agency.

**Herbert K. Wild**

Evelyn C. Wild

(During my Stretch experience my wife was Alma Cleveland Wild, deceased in 1973.)

A2 Rochester, New York; April 10, 1925

A3 BSEE, Syracuse University, 1949; MSEE, Syracuse University, 1951

A4 Three children, five stepchildren

A5 Five grandchildren, six step grandchildren

B1 When I was 17 in 1943, I joined the Navy and saw action at Iwo Jima and Okinawa. After my discharge in 1946 I attended Syracuse University. After receiving my MSEE, I joined IBM in February 1952. Prior to working on Stretch I was responsible for the design and development of the off-line tape to printer and card to tape systems, adjuncts to the IBM 702 and 705 commercial computers. 702 and 705 designs did not provide for data input from cards, or data output to tape or the printer and simultaneous data processing. Data processing was halted during data transfers from and to memory from the I/O devices, which affected the processing speed of the systems.

B2 Steve (Red) Dunwell asked me to join the initial Stretch design and development group shortly after the contract with AEC was let in 1956. Those that I recall from the beginning of the project were Steve, of course, and Werner Buchholz, Len Snyder, John Backus, and Nate Edwards. We set up shop in the 701 building and started to work on the planning.

Steve would exhort us to entertain any far out idea of architecture (a word that did not come into use until later) or technology. Meeting the requirements of the AEC meant stretching the concepts of system configuration and performance far beyond those extant, and employing cutting edge technology. His enthusiasm was unbounded and affected us all. We were free to propose and discuss ideas in our meetings that were out of consideration for the product line. Our project was the subject of ridicule by our contemporaries, not associated with Stretch, until months after we shipped.

## Herbert K. Wild (Cont'd)

As our group expanded Fred and Nancy Brooks were hired in. I remember when John Cocke joined us. When we got the Harvest contract we had to go to Washington for lie detector tests with the FBI to get top secret clearance. John Backus moved on after a few months and Len Snyder left IBM to run a family business.

B3 IBM Poughkeepsie; Planning, Engineering, Management; 1952-1988

B4 As the concepts of Stretch gradually coalesced into specifications and the size of the organization grew, Steve organized us into planning, hardware development and software groups. I was put in charge of developing the input/output system for Stretch. The result was a completely new and original complex consisting of a multiplexer called the Link Exchange, which controlled the flow of data between the main memory and a variety of I/O units employing identical interfaces to the multiplexer. The I/O units consisted of card readers and punches, high-speed printers, 727 and 729 magnetic tape drives. The Selectric typewriter, then in development in Lexington, was chosen for the console typewriter since it had no moving carriage. The innovative parallel disk file from San Jose with a capacity of 500 KB (the contract called for 1 MB so we had to give them two) communicated with the main memory through a unit called the High Speed Exchange. For Harvest, a high-speed large capacity tape drive called Tractor was developed. The project required cutting edge development programs, not only in Poughkeepsie but in Endicott, San Jose, and Lexington as well.

B5 Steve Dunwell, Dick Merwin.

B6 1956-1960

B7 The concept and development of the input/output system for Stretch. Each of the peripheral units, magnetic tape, card reader and punch, printer, etc., were designed with a control unit that interfaced to a multiplexer called the Exchange. On the I/O side all devices appeared the same to the Exchange, allowing a variable complement of I/O devices. The Exchange communicated directly with memory, storing and transmitting instructions and data for the various I/O devices, and controlling the transmission of data between each device and memory.

C1 After Stretch, I managed a data communications group until 1962, then a WTC assignment, based in Germany until 1964. On my return I became engineering manager of the FAA 9020 project developing an en route air traffic control system. I was the Poughkeepsie Custom Systems manager for several years, developing airline reservation systems, special customer required features to the standard product line, continued support of the FAA 9020 system, and a variety of other projects.

I then went to Fishkill where I was involved in preparing the E-beam lithography system for manufacture. I then managed the optical lithography development group in Fishkill. In 1976 I returned to Poughkeepsie to manage a project developing a system utilizing modulated laser beams to store information on discs. I later joined the staff of the lab director in Essex Junction, VT, in a strategy planning function. In 1982 I transferred to Boca Raton where I was involved in robotics development, then managed a group designing a parallel processor in conjunction with Research in Armonk. When I retired in 1988 I was managing a data communications program. After retirement I taught some computer courses for Seniornet in Boynton Beach, FL and after moving to Punta Gorda I taught computer courses at the Cultural Center in Port Charlotte.

C3 Award: IBM Invention Achievement Award. Paper: "Organization of the Input-Output System of the Stretch Computer" presented at the International Conference on Information Processing in Paris, June 1959

C4 Cruising on our sailboat through the Bahamas, West Florida and the Keys; solving problems that people have with their PC's; kayaking, camping with our travel trailer, playing bridge, photography.

### Key:

Alumnus/a, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities

**Russell Wilmot**      Augusta

A2 Rushford, New York; October 24, 1933

A3 Bachelor of Electrical Engineering from Rensselaer Polytechnic Institute

A4 One

A5 None

B1 I was doing computer programming in the US Air Force prior to joining IBM.

B2 Howard Montgomery

B3 IBM Poughkeepsie, computer programming, 1959 until 1990.

B4 My job was to write diagnostic programs for the High Speed Disk Drive and the Tractor Tape System. Later I worked on the Stretch FORTRAN project.

B5 My manager was William Wolensky.

B6 I worked on Stretch from 1959 to 1961(?).

C1 After Stretch I went to work in the Diagnostic Engineering group for the then-unannounced System 360. Most of my IBM career was spent programming Reliability, Availability and Serviceability (RAS) functions for the subsequent Large Systems products. I retired from IBM in 1990.

C4 After IBM, I went into business for myself repairing photographic equipment under the business name of Hyde Park Camera Repair. My wife and I are active in the Hyde Park United Methodist Church, and I have served in a number of positions in the financial operation of the Church. I also play with a number of amateur musical organizations in the area, playing the French horn and recently switching to clarinet.

**Bill Wright**      Anne

A2 North Carolina; September 15, 1931

A3 PhD, Computer Science

A4 Three

A5 Four

B1 Harvard University – graduate student and research associate

B2 Steve Dunwell and Fred Brooks

B3 IBM Poughkeepsie, Architecture, 1958-1991

B4 Planning for maintenance, fault diagnosis

B5 Werner Buchholz

B6 1958-1961

B7 Reviewed I-Box logic

C1 System/360 architecture, molecular graphics

**Leon Wun**

A2 August 21, 1928

A3 BSEE

A4 Four

A5 Four

B1 Was at IBM, working in the Memory Group

B3 IBM Poughkeepsie, Engineering, 1954-1966

B4 Main Memory, Exchange Memory

B5 Dale Elder, Fred Ordeman, George Bruce

B6 Last year was 1959

C1 To IBM San Jose in 1959. Left IBM 1966

C4 Retired

**Lim C. Yee** Lorna H. Yee  
A2 China, December 2, 1936  
A3 MS Engineering Science  
A4 Four  
A5 One

B1 School  
B3 IBM Poughkeepsie, Software, 1962-1992  
B4 MCP, NPL (360) Simulation on 7030  
B5 Jack Garrity  
B6 1962-1963  
B7 Possibly one of the last new hires (July 9, 1962)  
C1 MVS-Data Management, TSO, DFP

**Hannon S. Yourke** Estelle T. Yourke  
A2 New York City, October 17, 1926  
A3 MSEE from MIT  
A4 Four children  
A5 Eight grandchildren

B1 Microwave transmission systems at Norden Labs in White Plains  
B2 Bob Henle  
B3 IBM, Poughkeepsie Research, engineering, 1955-1986  
B4 Transistor circuit design and development  
B5 Bob Henle, Jim Walsh  
B6 1956-1960  
B7 See pages 395-398 in "IBM's Early Computers" by Bashe, Johnson, Palmer and Pugh.  
My invention of current steering logic circuits – later called emitter-coupled logic (ECL) – was a major advance in high-speed transistor logic. I personally designed the majority of the logic circuits in the Stretch circuits manual. Received top corporate award in 1966.

C1 Many high tech management assignments, including memory circuit development and electron beam lithography and systems development. Headed the task force that discovered and solved a problem in Intel memory modules caused by entrapped krypton gas. Enabled 3081 to ship on schedule. First to identify cosmic ray soft fails in 3090 cache.  
C3 Numerous invention awards, publications on transistor logic circuits, tunnel diodes and electron lithography  
C4 Retired – play lots of tennis and bridge

**Key:**

**Alumnus/a**, Spouse A2 Birth Data A3 Education A4 Children A5 Grandchildren B1 Before Stretch B2 Hiring Manager  
B3 Employer, Location, Function, Years with Employer B4 Role on Stretch B5 Managers B6 Years on Stretch  
B7 Worthiest Accomplishments C1 After Stretch C3 Awards, Honors, Papers, etc. C4 Current Interests, Activities



## Closing Remarks

**W**e concluded our brief alumni/ae questionnaire with an open-ended query:

**Is there anything else you'd like to tell us?**

**Charlie Allen** wrote, "Best wishes to you all. Stay healthy as long as you can."

Kudos from **Stanley Anderson**: "Three cheers to you guys for putting together this reunion itself and the reunion book."

Poignancy was the leitmotif of **Chester Baccari's** closing comments: "In retrospect, it seems that IBM senior management was never apprised of the Kingston group's tremendous efforts. While the wonder of the reunion appeals to me, it has reawakened my sadness and regret over the lack of corporate recognition for my and Kingston's contributions to the Stretch program."

In an appreciative note that would be echoed by others, **Lucy Ann Berry** offered, "Thanks for the gathering. Wonderful to renew latent good memories, and to chat with friends from the past."

Anticipation was evident from **Bob Blosk**: "Looking forward to seeing old Stretch friends again and doing a little fond reminiscing"

**George Bruce** was terse: "Yes, good luck."

Looking forward was **Bruce Chalmers**: "Patti and I are very much looking forward to the Stretch Reunion. We are especially grateful to the organizers."

Ever the scholar, **Tien Chi Chen** reflected, "The Stretch Project tried to create breakthroughs in CPU hardware technology, auxiliary storage technology, operating system software, and data definition. In retrospect, it could have been done better, under tighter overall control, more extensive simulation effort, and/or earlier performance study. Our group actually had a project to make it run like a hundred times the 7090, by taking advantage of its superior word length and fast arithmetic. The aim was to produce a new Mersenne Prime number using multiple-precision arithmetic. [Editor's note: A

Mersenne Prime is a prime number that is a power of two, minus one.] We investigated over a large range of integers, yet failed to find one. Scientists later found two new Mersenne Primes more or less just beyond the range."

Adding futurism to scholarship, **Bill Collier** weighed in with, "I think we lived and worked during the golden age of programming. No matter how inefficient the software we wrote, the hardware in just one more year would run so much faster that it would make our efforts look good (at least OK).

Can you imagine what programming will be like when hardware no longer obeys Moore's Law? For so long as it can be tolerated, software will grow in size and in needless function, but will run more and more slowly. When the situation is no longer tolerable, it will be possible to accommodate additional function only by removing some current function. So people will have to think hard about what functions are really worthwhile. Also, people will value programming solutions that are efficient. Hmm. Maybe the outlook is not so bleak after all."

This from **Ed Council**: "I'm sorry that Steve Dunwell did not live to see the recognition of the Stretch program that you have provided with your work on this reunion. He would have been very proud of you."

Spiritual sentiments came from **Barlane Eichbaum**: "My wife Bea and I are Christians who have celebrated 52 wonderful years together. We have been blessed with a great family in this great country, the United States of America! We have been blessed with good health, a beautiful family and a Christian Church, Reno Christian Fellowship where they teach from the Bible and honor God and Jesus Christ, our Savior. The Holy Bible is the roadmap to having a successful life, and God's Love is the key to having successful relationships! "Love God and Thy Neighbor"! May God Bless You All!"

A broadcast from **Philip Fox** reads, "Moved to Pennsylvania in 1996 to live in a continuing care retirement community. I am still on the air (HF only) as W2FLI."

**George Grover**: "Looking forward to seeing each of you."

Working CEO **Ann Hardy** has plans: "I try to spend a few weeks a year in Mexico studying Spanish and art history. Hope to do much more of this when I retire."

Also still professionally active, **Norm Hardy** writes "My URL: <http://cap-lore.com> There are some links to Stretch history. I wrote some stuff at <http://cap-lore.com/Hardware/Stretch.html> and Mark Smotherman has collected some information at <http://www.cs.clemson.edu/~mark/stretch.html>. There is a photo of me at <http://cap-lore.com/me4.gif>.

Put on your best face for **Dick Hatch**: "Looking forward to attending the reunion and seeing how old everyone looks."

An observation from **Jim Havender**: "You seem to have tapped into a latent market here: project reunions. There certainly seems to be interest."

**Mike Haynes** with a historical view: "I feel I was fortunate to get in on the ground floor of computer development, and was able mostly to work on what I was most interested in. I had a very interesting and rewarding career, and have no regrets. See Emerson Pugh's books."

For **Bill Heising**, who is in a nursing home with radiation-induced dementia: "He would have enjoyed this [event]. Thank you for including him in the notice. Barbara Heising"

A 'we'll see' note from **John Hipp**: "My thanks to you both for the tremendous effort that you have put in to make this reunion go. We would sincerely love to attend, but Claire will be undergoing back surgery in July and recovery will be a factor, so if all goes well we will try to come but don't put us on the will come list until we are sure. Thanks again."

Speaking for many is **Dick Holleran**: "Stretch was the best project ever."

**Thomas Jordan** offers a pithy reflection: "Computing with the IBM 701 was a challenge."

New York City radio personality and advocate **Larry Josephson**: "A persistent urban legend has it that the engineers who designed Stretch were punished by IBM for not making its goal: running 100 times faster than the 704 (a goal I heard was defined by marketers, not by engineers). I never knew their names, but they should be found, and honored at the reunion for architecture that still informs today's machines."

Editor **Eric Knutsen**: "The Stretch years were exhilarating, a great start. I treasure them to this day."

**Harwood Kolsky** speaks for many: "It has been a great ride! Working on the Stretch project when the computer industry was new was an unequaled opportunity that I have always cherished."

Speaking for himself and wife Gloria, **Richard Lamy**: "We look forward to driving back to Poughkeepsie and meeting with you all on September 28 and 29, 2002"

Well-traveled **Walter Leach**: "Having experienced life in a variety of companies, large, medium and small, I have to say that IBM (a la 1960) was the best-managed and most enjoyable experience I had in my working years. Nothing is perfect, but IBM did a good job with and for its employees."

**Sydney Lindauer**: "Great idea to have 40 year reunion!"

History is compelling for **Robert Litwiller**: "It's awesome to see several Stretch alumni who've been named Fellows of the Computer History Museum (Fran Allen, Gene Amdahl, Fred Brooks) and to feel, by association with that project, a real part of computer history."

A strong point of view from **Ed Lowry**: “From a simplicity perspective, current software technology is “square wheel” – unreasonable and behind what was designed in Poughkeepsie in 1974. Educators massively teach people how to arrange pieces of information but have little idea what is a reasonable structure for pieces of information. One result is a broad failure to express precise information precisely enough, imposing large, needless burdens on students. I regard these as major disasters. There is more description on my web site [www.ultranet.com/~eslowry](http://www.ultranet.com/~eslowry).”

**Leslie Lowry's** closing remarks are closer to home: “These retirement years in a condo are a great pleasure, as is a son who followed us into math and computer science with a third major in psychology (for purposes of artificial intelligence).”

A good wish from **Bob Manente**: “I hope everyone has a great time at the reunion.”

**Dick May** echoes Bob Hope: “Thanks for the memories.”

Regrets from **Bob McConnell**: “Unfortunately, I can't make it to the reunion. Going to Spain and Scotland at that time.”

An ending tale from **George Monroe**: “I enjoyed a wonderful career with IBM. My last assignment was with Don Powers as his Intellectual Security, Adirondack Development Program. While delivering a talk to new hires in Kingston on this subject, I suffered a stroke and left IBM on disability.”

Praise for the 7030 from **Barbara Call Myers**: “I think there never has been another instruction set like that in Stretch. It was so much fun to program. I feel lucky to have had it be my first computer.”

Love of mother country shines through this from **Andris Padegs**: “The overriding drive for me and the family, however, has been and is the preservation of our Latvian heritage and our concern for Latvia and its culture. I was born in Latvia, and the children and grandchildren speak Latvian fluently. During the years of Soviet occupation we were active in defending the interests of Latvia in the USA, and since it regained its

independence in 1991, we have been helping the country to recover. As a tangible recognition of these efforts, in November 2001 the President of Latvia presented to me the highest civilian medal – the Three Star Medal. In 1991 I was elected Foreign Member of the Latvian Academy of Science.”

**Gerard Paul** expresses appreciation: “Good for you guys for organizing this get-together. THANKS!”

Another thankful note, from **Ray Polivka**: “I believe it would be difficult today to find a group of finer people with whom to work. At the risk of omitting names, Fred Brooks, Gerrit Blaauw, Werner Buchholz, Steve Dunwell, Bill Stevens, Bill Wright, Andris Padegs, Jim Shelly, Pauline Bellamy, Tom Apple, and Jack Garrity are some of the fine folk with whom I worked and associated. Most, today, are still very good personal friends.

I came into the Stretch project as a very naïve, inexperienced young man, fresh out of the academic world with some computer experience on the Illiac. The Stretch project was the beginning of a 35-year career with IBM and a romance with the world of computing. I was fortunate to have found my niche in the teaching aspect of computing. I have been fortunate to have traveled in much of the world where, through my teaching, I hope I have contributed something to the growth of computing. The wonder and adventure still continue for me in this truly explosive and pervasive world of computing. Looking back on the past, I believe that today it would be difficult for me to repeat such adventures as I have had or to have a more satisfying career.”

This from **Sam Raker**, who was with IBM for only four months in 1955, and later served on Admiral Rickover's headquarters staff for the Naval Nuclear Propulsion Program: “I recall excellent training, superb working conditions, and fine associates, supervisors, and managers, during my short career at IBM. I regret that I did not have time or energy to sustain associations with those with whom I started my career. I wish you and those who attend the reunion a great time and feeling of accomplishment.”

**Russ Robelen** with gratitude: “I would like to thank you all for arranging this wonderful reunion. We all are in indebted to you for bringing us together one last time.”

Churchillian felicitations from **Joe St. Germaine**: “Congratulations to those few who have done so much for so many in pulling together the Stretch reunion”

Like the Poo-Bah character in *The Mikado*, **Lee Scott** ‘allowed my family pride to be my guide’ with the following: “I am a lucky man with a marvelous Irish wife, Ellen, two sons, and three grandchildren. Older son, Doug, was a Watson scholar, graduated from Bucknell University and Harvard Business School. Currently Doug is Eastern Region Director for his company, which manufactures materials and fire equipment for those companies dealing with molten metal.

Younger son Steve graduated from Rochester Institute of Technology in Rochester, New York with an electrical engineering degree. After graduation, he joined Diamond Power (subsidiary of Babcock-Wilcox). He worked in the field as combination salesman, systems engineer, installer, and troubleshooter. He worked at the company headquarters in Ohio and presently is the Director of a joint venture company (Diamond Power and a local company) in China.”

From **Jim Shelly**, a family hat trick of sorts: “Kevin, Beth, and her husband, Jim O’Donnell, are all IBMers, pending the announced workforce reductions.”

Two good stories from **George Swift**: “When I joined Stretch in 1958, I was clearly the most junior person on the planning team. I shared an office with Andris Padegs, Fred Brooks was through the wall, Harwood Kolsky was down the hall. I could go on but need I say more? While with Stretch, I got in on trend-setting meetings. For example, I was included in the meeting where it was decided that the company should be encouraged to switch from a six-bit character standard to an eight-bit byte. There were representatives from all the IBM laboratories. Being the most junior attendee, I spoke first. Everyone present had a turn. Fred

Brooks spoke last. After two years with Stretch, I left for another IBM assignment at FSD headquarters in Rockville, Maryland. A wonderful goodbye party was given for me and my wife by the members of my Stretch planning group. Gerry Blaauw, with my talents in mind, made up party games so that I would tend be the winner. How very, very thoughtful to do that for the departing member. We had such a good time with such a wonderful team. Oh, and who won most of the games? Sully Campbell – who else?”

Enlightenment came years later to summer intern **Richard Toepfer**: As I recall, Harvest and Stretch were classified and people were very reluctant to say for what the system was being designed. It wasn’t till last year when I read “Body of Secrets”, a history of the NSA by Bamford that I finally found out!

Reflections from **Ken Tooker**: “My feeling today is that this [Stretch] project was one of the best that I worked on during my 46 years with IBM, if not the very best. It was always interesting and challenging, not only because it was new and using the latest technology, but also because of the management team.”

Thailand is featured in **Allen Walker’s** closing remarks: “Upon retirement in 1990, we enjoyed an extended trip to Southeast Asia in which we were guests of some of the high officials of the government of Thailand who were students at Indiana on an exchange program when we were in school there. We have corresponded with them over the years. We were treated like royalty while we were there. We had constant military escort and drivers while traveling all over Southeast Asia. It was a dream trip, which we will never forget and never be able to match.”

Caring for Mom is **Bob Webster**: “I would like to be at the reunion, but cannot say for certain right now because of the situation of my 97-year-old mother living alone in Sioux City, Iowa.”

From **Jack Wenner**, another kudo: “You’re doing a good job.” [We’ll see.]

Praise of Dunwell from **Herb Wild**: “The 360 series systems were virtually scaled refinements of Stretch system architecture. The debt owed to Stretch and Steve Dunwell by the present and future

generations of computer systems, large and small, has never been adequately acknowledged.”

Lastly, and fittingly so, are the closing words from **Hannon Yourke**: “I miss the good old days!”

### Not Saying Anything (NSA) about this Reel of Magnetic Tape



# Appendix

- Harvest Farewell – 1976 (Below)
- Datamation Article – September, 1982 (7½ pages)
- Stretch – R. I. P. September 5, 1980
- Index of Names



NATIONAL SECURITY AGENCY  
FORT GEORGE G. MEADE, MARYLAND 20755

22 January 1976

Mr. R. C. Hatch  
1040 Fernwood Road  
Bethesda, Maryland 20034

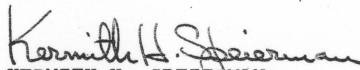
Dear Mr. Hatch:

On Friday, 27 February 1976, the HARVEST Computer System will be retired by NSA. After nearly fourteen years of continuous performance, we now face the fact that HARVEST is no longer practical to operate or maintain.

Starting at 3:30 PM on the 27th of February, there will be a brief ceremony signifying the end of HARVEST operations. I would be very pleased if you could join us in this ceremony. Afterwards, there will be an informal cocktail party in the Old Executive Dining Room where a large number of people who have been associated with HARVEST over the past many years will be joining us. The party will end around 6:00 PM.

We hope you can join us for this sad but significant occasion.

Sincerely,

  
KERMITH H. SPEIERMAN  
Chief,  
OPERATIONS ORGANIZATION

LT. GEN. ALLEN  
MR. BUFFHAM  
MR. SPEIERMAN  
DR. TORDELLA  
OTHER GUESTS AND LONG TIME FRIENDS

FRIDAY  
27 FEBRUARY 1976  
3:50 PM EST

**Right: Befitting a Retiring Guest of Honor, the Harvest computer utters the final words**

(See also the photo on page 10)

MANY OF YOU WERE PRESENT FOURTEEN YEARS AGO WHEN I FIRST BEGAN OPERATIONS AT NSA. ALTHOUGH NOT WIDELY KNOWN, I WAS PROBABLY THE LARGEST, FASTEST, AND MOST TECHNICALLY ADVANCED COMPUTER SYSTEM IN THE WORLD. OVER THE PAST FOURTEEN YEARS I HAVE MANAGED TO HOLD MY OWN IN AN INDUSTRY THAT HAS GROWN MORE RAPIDLY THAN ANY OTHER IN HISTORY. THAT IS CLEARLY A CREDIT TO THOSE OF YOU RESPONSIBLE FOR MY CREATION.

AND NOW, FOURTEEN YEARS LATER, THE TIME TO RETIRE HAS COME. THE COST OF MY UPKEEP AND OPERATION HAS BEEN OVERTAKEN BY MORE MODERN EQUIPMENTS AND THE NEWER TECHNOLOGIES. BUT I MAKE NO EXCUSES, FOR I FEEL MY PERFORMANCE, AND THE PERFORMANCE OF THOSE WHO HAVE WORKED WITH ME OVER THE YEARS, WILL STAND UNSURPASSED AS A MILESTONE ACHIEVEMENT IN THE USE OF COMPUTERS AT NSA.

THEREFORE, WITH A FOND FAREWELL AND FEELING OF "MISSION ACCOMPLISHED", ON THIS 27TH DAY OF FEBRUARY 1976, I STAND "DECOMMISSIONED".

HARVEST

# INFOCUS

## FASTEST IN ITS TIME

by Edward K. Yasaki

**The 1961 Stretch computer had a phenomenal list of "firsts." But the benefits to IBM extended far beyond that Ferrari of a machine.**

Things just aren't the same anymore. It used to be that at this time of year there was a certain excitement as one anticipated seeing what the new cars from Detroit looked like. They would undoubtedly be longer and lower and certainly much sleeker. But the curiosity that once drew people to showrooms has passed.

And so it is with computers. For some reason, the computers of old stirred one's emotions more than the new ones do today. Maybe it's because they didn't make as many of any one model as they do today, and one could conceivably read about an exciting new mainframe and have it become obsolete before ever laying eyes on the real machine. How many people ever saw an Atlas computer, or a Univac Larc? Have you ever seen an Illiac?

One such classic is the IBM Stretch computer, in its time the world's fastest, the Ferrari of the computing scene. Some five years in gestation, Stretch's first customer shipment was in May 1961. That same month, IBM took no more orders for this sleek new computer. But more than sleekness, Stretch had a list of firsts that extended beyond one's reach. They pulled out all the stops on this one, entertaining any and every idea that young Turks just out of college could dream up. It was a sort of test bed for new features, the best of which were to appear in succeeding machines like the System/360s.

But perhaps most significantly it attracted bright young people to IBM, many of whom went on to design the 360s and 370s and their software; several were to attain management positions in the company. Some, like Frederick P. Brooks Jr. and Gerrit A. Blaauw, went into teaching, Brooks heading the computer science department at the University of North Carolina and Blaauw doing the same at Twente University in the Netherlands. An impressive number of them became IBM Fellows, among them Stephen W. Dunwell, Harwood G. Kolsky, John Cocke, James H. Pomerene, Robert A. Henle, and Edgar F. Codd.

One little-known first on the Stretch was its use of a Selectric typewriter as a

console printer. The golf ball typewriter was not officially announced as an IBM product until 1961. As a result, whenever a visitor came to the machine room at Poughkeepsie, N. Y., where a Stretch had been set up, measures had to be taken to conceal or disguise this unannounced typewriter with its odd-looking typing element. IBMers did this by devising a piece of cardboard that fit over the slot on top of the typewriter. Harwood G. Kolsky recounts an amusing incident.

"I remember one time hosting some visitors at the Poughkeepsie lab and standing around giving the standard talk. One of the visitors walked over and picked up this piece of cardboard and looked inside. I thought everybody would die!" Fortunately the visitor didn't appear to have noticed anything new or different under the make-shift lid. "I looked around at the other IBMers and they were all turning pale."

People associated with the machine, either as designers, implementers, or users, had their own list of favorite firsts in the Stretch. When recalling some of those, they start with such features as the instruction look-ahead (four levels deep) or interleaved memories, the 8-bit byte and variable byte size. But Fred Brooks retrieves a list he has filed away and begins to read from it. There

**Perhaps most significantly, Stretch attracted bright young people to IBM, many of whom went on to design 360s and 370s and their software.**

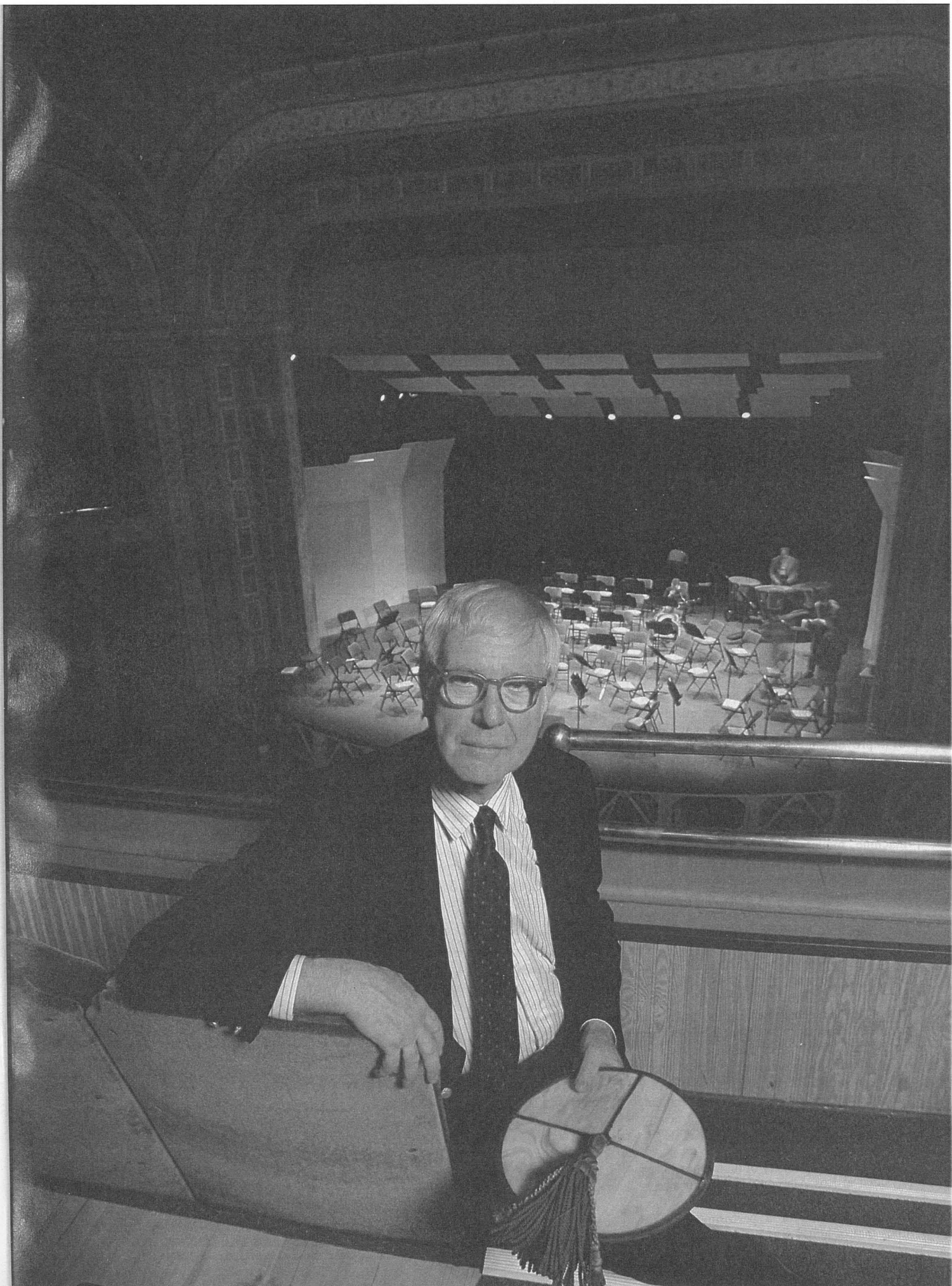
are the supervisory facilities, memory protection, the maskable interruption system, the concept of having the console program interpreted, rather than hardware defined. There was a separate input/output computer, the Exchange. The Stretch had bit addressing, boundary-free alignment, in the fashion of the 370s, and relative branching.

A significant feature, of course, was the use of error correction codes. The machine used 64-bit words plus eight bits of Hamming code to form a 72-bit word in memory. It had single-bit error correction, double-bit error detection. It had provisions for upper and lower case character sets, and could perform decimal, binary, and floating point arithmetic. The concept of a standard interface for I/O equipment was a first for IBM; before 1956 its computers had a different interface for each kind of I/O gear.

Of course, Stretch came originally with an oil-cooled core memory system.

**Stephen W. (Red) Dunwell (at right) became IBM's scapegoat for Stretch, but was later apologized to and named an IBM Fellow. After 41 years with the company, he left to save from demolition Poughkeepsie's 110-year-old Bardavon Opera House.**

PHOTOGRAPH BY JAMES JOERN





## IN FOCUS

Jack Worlton of the Los Alamos Scientific Laboratory (LASL) recalls a problem experienced during the acceptance test phase, when there was a transient memory error in the cores. The engineers worked for days to remedy the error but were unable to figure out what was going wrong. They finally hit upon the problem. As Worlton explains it, there was a piece of solder loose in the oil bath, and because the oil was constantly in circulation the solder would move and attach itself onto a core and cause an error. Then it would move and lodge onto a different core and cause an error there.

"It was the only error I know of that was corrected in a machine by giving it an oil change," Worlton quips.

In a paper presented at the 1959 Eastern Joint Computer Conference in Boston, Erich Bloch said the objective with Stretch was to achieve an improvement in performance over the 704 by a factor of 100. Bloch, up who heads the corporate technical personnel development staff, said they could see a possible sixfold improvement in memory performance over the 704 and a tenfold improvement in basic circuit speed. In his paper, he even notes that "Simulation of Stretch programs on the 704 proved a performance of 100 times 704 speed in mesh-type calculations. Higher performance figures are achieved where double- or triple-precision calculations are required."

In the question-and-answer period at that '59 confab, Bloch was asked how much of the speed improvement could be credited to the use of faster components and how much to changes in the system organization. He replied: "I think one order of magnitude of improvement is due to faster devices and faster circuits. The other order of magnitude of improvement is due to system organization, multiplexing, and so forth. . . ."

From this paper, too, we learn that 169,100 transistors were to be used in the machine, mounted on two types of circuit boards or cards. There were 18,747 so-called single cards and 4,025 double cards, the latter being twice as large and packing four times the capacity of the former. There were 24 different single card types and 18 different double cards.

But Jack Worlton, who joined the Stretch design team about a year after its formation, recalls that the machine's performance never reached the heights anticipated. "The expectation was that it would run faster than it did," he says now. Even up to a few months before delivery, people who had been modeling the Stretch were forecasting that it would run 75 times faster than a 704. "In fact, to my knowledge it never ran more than 25 times faster than a 704," he says.

Harwood Kolsky of IBM, who was a physicist at Los Alamos when discussions on the Stretch began with IBM, says the initial projections of a performance 100 times that of a 704 was merely a ball park

figure. But as time went on, it became an unrealistic target in the minds of the people involved. "This was one of the reasons the machine was later considered not to be successful."

He continues: "I should quickly add that it would be very easy to pick a problem" that ran on Stretch and transfer it to the 704, where it could take a thousand times longer—because the problem would overflow the memory. The Stretch had more than 100K words of memory, versus something like 32K for the 704.

Worlton explains that Stretch was one of the first machines with a broad performance spectrum. Anyone who took advantage of some of the machine's features

### One little-known first on the Stretch was its use of a Selectric typewriter as a console printer.

could get it to run fast, but if the job were programmed ineptly, the performance improvement might be only five or six times greater than the 704. He says the 704, 7090, and 7094, for example, didn't fluctuate in performance that much. But the Stretch made it possible for programmers to take advantage of its features to gain the speed that was inherent in the machine.

Ed Voorhees, who was assistant to group leader Bengt Carlson of the Los Alamos team, recalls that a performance up time of at least 90% was demanded by the Atomic Energy Commission (AEC), which was to be the first customer for the Stretch. He guesses that in actual fact the up time percentage averaged in the low 90s. "Not as good as today's machines, certainly," he

says. But there's no doubting where Voorhees' heart is. Like so many of the LASL user community who ran jobs on the Stretch, he thought highly of the machine.

Worlton recalls the sum paid by the AEC as \$4.2 million, considerably below the price tag later set on the Stretch. But he said no one paid the list price. Ed Lafferty of the Mitre Corp. in Bedford, Mass., recalls that his organization acquired a new Stretch on a lease-purchase plan. He doesn't remember how long they had it on a lease, but says when the decision was made to buy the machine the final payment was for \$6 million, the first and only time he held such a sum in his hands.

The need to lower the price of a Stretch and the financial drubbing being taken by the vendor with each order received were disclosed by IBM's chairman, Thomas J. Watson Jr., at the Western Joint Computer Conference in 1961. The chairman, using the occasion to convene a press conference at the Ambassador Hotel in Los Angeles, set a cutoff date of May 15, 1961, after which no more orders were going to be taken. At that time, DATAMATION reported the price reduction was to some \$8 million from an original \$13.5 million, saying this was proportional to the shortfall in performance of the machine. As reported by DATAMATION, Watson said:

"We undertook the Stretch contract for the Atomic Energy Commission some years ago. They asked us for certain specifications that they wanted met. We said we could meet them within a certain time and then we went about doing it. The cost of building a computer was completely underestimated so that the government funds we have in Stretch are minor compared to IBM

### STRETCH'S INHERITANCE FROM THE 709

In the midst of the Stretch development project, after many of the component subassemblies had been built but before they could be assembled into a workable whole, the federal government issued an RFP for a solid-state computer system to be used in the ballistic missile early warning system (BMEWS), part of the nation's defense setup. IBM proposed a transistorized version of the 709 computer, offering to supply a 709 for program development until the solid-state version could be built.

The new computer, which came to be called the 7090, inherited its system design from the 709 and its hardware from the Stretch, including the emitter-coupled logic circuits, the packaging, frames, covers, power supplies, and memories. Those pieces came directly out of the supply of parts collected to produce the first Stretch. Recalls Frederick P. Brooks Jr., "Even though Philco announced a transistorized computer first, IBM delivered one first—the 7090. And George Monroe's team did that thing in six months from start to first customer delivery." Later IBM was to similarly

develop the 7080 from the vacuum tube 705 III, using Stretch componentry.

Harwood G. Kolsky, now at the IBM Palo Alto Scientific Center, recalls sitting in meetings with Monroe and suggesting that some of the weaknesses of the 709 be corrected in the new version. But Monroe, a stern engineer from the old school, was adamant in retaining the same features. Kolsky says now that Monroe was probably wise in not budging because if he had started making changes, everyone would have descended on him with their pet design features for incorporation in the new machine.

Kolsky observes, too, that the 7090 had "one tremendous advantage, which we now understand very well but didn't at that time. The new computer already had its software written." It came from the 704 and 709 and would run on the new machine unchanged. By contrast, developers of the Stretch were still struggling with a compiler, for example. So the new 7090 was able to leapfrog the software issues, says Kolsky, "which turned out to be much larger on Stretch than anyone had anticipated."

## IN FOCUS

funds. At the end of the period [of the original contract], we were late on delivery date. And when we finally began to assemble the computer we found that though we had the world's fastest and most capable computer, the specifications were not met. . . .

"We will make delivery of the machines because we do not want to break our promise to our customers. We are going to take a good, fat loss on Stretch, but we hope that it will be the fastest and most capable computer on the market. . . . If we get enough orders at this price, we could go out of business. . . ."

Not to worry. According to one report, IBM's total loss on Stretch was a mere \$20 million. While that may have seemed like a significant amount of money for IBM in the early 1960s, in retrospect the benefits that accrued to the company far outweighed any damage that may have been inflicted.

Indeed, the one damaged most may have been the man responsible for the Stretch development task, Stephen W. (Red) Dunwell, who became the scapegoat and, after the first customer shipment in May '61, was banished to a research position at Yorktown Heights. It wasn't until five years later that his contributions to the company came to be recognized. Thomas Watson Jr. made a public apology to Dunwell and awarded him the prestigious IBM Fellowship. But at the age of 62, after 41 years with IBM, Dunwell took early retirement.

Along with his wife, he took over Poughkeepsie's 110-year-old Bardavon Opera House, which was about to be demolished to make room for a parking lot. They breathed new life into the theater, made it a nonprofit, year-round operation, and turned it over to a full-time manager and staff. Now, Dunwell says, he and his wife have

### **The machine's performance never reached the heights anticipated.**

begun something they know a little more about—a timesharing business.

Dunwell recalls that IBM made eight Stretch computers, all in Poughkeepsie, but he could account for the whereabouts of only three or four. Most sources confirm that in addition to shipments to Los Alamos and its sister lab in Livermore, one went to the National Security Agency, one to the Atomic Energy Authority in the U.K., one to the Weather Bureau, and one to Mitre. Other sources believe the Dahlgren Naval Base got one and that the eighth went to the Argonne National Laboratory in Illinois.

When told that Fred Brooks credits him for the Stretch and calls him "the hero of the piece," Dunwell replies, "There were lots of heroes." Then he adds, "It was a heroic effort, I might say."

For the record, it must also be noted that some people at Control Data Corp. had

different ideas about Stretch. In years past, they have said that the mainframe was really designed to keep CDC out of the super-scale, scientific computer market. Perhaps one could call it a "knockout" machine, not so much Stretch as Smash.

# GENESIS OF STRETCH

## **IBM alone could not afford to develop Stretch, so it asked the NSA to share the costs.**

The genesis of the Stretch project, as can best be determined, seems to trace back to the National Security Agency and its need for more computing power than was available. It was easily determinable that such power could not be developed at an affordable price by using vacuum tubes, and yet it was equally obvious that an enormous investment would be required to develop the infant transistor technology. Unfortunately, IBM's policy was that the cost of such technology development had to be borne by the product for which it was incurred.

"In 1954 I believed that the only solution to that dilemma was to obtain support for early development work from an organization which could afford the new technology," recalls Stephen W. Dunwell. "Two of those organizations were the National Security Agency and the Atomic Energy Commission." In testimony presented at the IBM-Justice Dept. antitrust trial in New York City, Dunwell related how a group of engineers brainstormed the problem of overcoming the inadequacies of transistors and of manufacturing the types of solid-state devices required to build new and better computers. IBM management, including Dunwell, was then able to inform the NSA of what the company could do.

"That delegation," he recalls, "made it clear to NSA that IBM alone could not afford to do what was required and asked NSA to share in the cost of developing the necessary components. Dr. Solomon Kullback, on behalf of NSA, agreed to do so."

It was late in 1954 or early in '55, he continues, that the folks at the Lawrence Livermore Laboratory in California asked for a proposal for the fastest computer IBM could build. A similar request also went to the makers of Univac computers, with Remington Rand winning that development contract. Disheartened but not deterred, IBM turned to Livermore's sister lab in Los Alamos, New Mexico, which expressed an interest in sharing the cost of developing the

necessary technology.

"In January 1956 that computer became known as Stretch," Dunwell said in his testimony at the trial "and sometime thereafter was called the IBM 7030." The computer was designed jointly by engineers at IBM and senior scientists at Los Alamos.

The timing on this development project was very fortuitous. Had it been considered two or three years later, circumstances would have ruled against it, for it was a time when government procurement procedures were getting stricter. Harwood G. Kolsky, now at the IBM Palo Alto Scientific Center, says, "At the time the Stretch project was getting started, it was still possible for a major laboratory like Los Alamos to just enter into a contract," saying this is what we want and if you'll build it we'll buy it. "Two or three years later, they would never have been able to do something like that."

Ed Voorhees of Los Alamos, who was on the Stretch design team, would agree with that. "I always felt [the Stretch] was one of the best bargains the government ever got," says Voorhees. "But for some reason, efforts at Livermore and Los Alamos to undertake later development-type activities like this just got the cold shoulder from the AEC."

Kolsky, who was also on the Los Alamos design team before joining IBM,

### **"A lot of the things that were discussed would best be classified as harebrained schemes."**

recalls that day when a group from IBM went to Los Alamos to make a presentation on the state of the computer art and the type of computer they thought they could build. It was Sept. 20, 1955, and the delegation was headed by Cuthbert Hurd. "They talked in terms of a 10-megapulse machine," he says, referring to the speed of the underlying transistors. Lloyd Hunter gave a presentation on magnetic cores. Dunwell spoke on machine organization, of the idea of having interlaced memories to compensate for the fact that the logic was much faster than the memory. They were talking about a two-microsecond memory and the final product ran at something like 2.25 usec, so the IBMers were very accurate on that technology forecast.

"Their estimate on the transistors turned out to be optimistic," Kolsky recalls, "not because the transistors didn't switch in the times they thought," but because the long lines that ran from one frame to the next tended to slow the clock time. But he says one must understand that they were talking about something (the transistors) just out of the research stage and destined for a giant machine. "It takes a real act of faith to do something like that," he chuckles.

In January 1956 Dunwell was appointed manager of the Stretch development program, and the following November the contract was signed by IBM and the AEC/Los Alamos. It called for delivery in 42 months, which made it May 1960. Kolsky recalls the planning meetings. "A lot of the things that were discussed would best be classified as harebrained schemes," he says. "Somebody would come in and say, 'Why can't we do the following,' and they would spell out something or other, but it would have completely undermined the whole structure of the machine if you did something like that."

He adds: "The Stretch project attracted large numbers of fresh young graduates coming out of schools who had heard about the project and wanted to work on the biggest computer in the world. This is the sort of benefit to IBM that is hard to measure. I keep running into those people over the years. They slowly drift up into high positions in the company. They probably would not have joined IBM if it hadn't been for the Stretch project."

Among them, of course, was Frederick P. Brooks Jr., who says, "I went straight from Aiken's lab to work as an architect on Stretch." That was his first job at IBM; he went on to become principal architect of the System/360 and now heads the computer science department at the University of North Carolina. Of his experiences on the Stretch project, he says, "It was an exciting project. You had a chance to try everything you could dream up." He pauses momentarily and then adds, "And we did."

This apparently was true, for Kolsky says if he had to criticize the project at all it would be for the ease with which people were able to put features into the machine. Some of the features were later removed for the 360s, which Kolsky calls "a cleaned-up version of the Stretch." He says a look at the instruction sets on the Stretch and the 360 will show the strong family resemblance.

Recalls Jack Worlton of Los Alamos, who joined the design team about a year after its formation, "One of the beautiful instructions we put in there that we finally had to give up because it was so slow was branch-on-bit. You could pick out any bit in memory, examine it, and branch if it was a one or if it was a zero. But the trouble was that it took about five multiply times to accomplish this.

"Conceptually it was just a beautiful instruction," he continues, "but absolutely worthless. There are still computer designers who haven't learned that: you don't put too much complexity into the order set because it's difficult to build and maintain. If it's too complex, it'll never be used."

But Kolsky, like Brooks, is quick to heap praise on Dunwell for his management of the project. "His real genius was the fact that he saw where [IBM] should be five

**THE STRETCH CLUB: IT NEVER CAME TO PASS**

A nonprofit, cooperative venture by which a number of aerospace companies in Southern California could own and share in the use of an IBM Stretch system was given serious consideration, but never came to pass. The job of studying the economic feasibility of such a plan was assigned to DATAMATION editorial advisor Robert L. Patrick, who was just starting out as an independent consultant. It was given to him by Paul Armer, who was head of computer sciences at Rand Corp., the prestigious Santa Monica, Calif., think tank. Armer, of course, was until recently the executive secretary of the Charles Babbage Institute.

"Southern California was the hotbed of cooperative ventures in the early days of computing," explains Patrick. Many space companies could not justify getting their own Stretch, but it was thought that they could all use a piece of one. These were companies such as Lockheed, Northrup, Douglas, and North American, as well as Rand. About that same time, Herb Grosch was working for a large consulting company called CEIR Inc., which also announced its intention to install a Stretch in a

Los Angeles service center. Both would have accomplished the same thing, allowing those same users to subscribe for some time on the machine, except that one was a commercial venture, the other a nonprofit arrangement. Neither plan was fulfilled.

In his study, with pages dated from January 1960 to June 1960, Patrick reported that the Stretch did not look attractive as a straight out-and-out computing engine, that it might cost the users more to run their workloads on the Stretch than on the machines they were then using.

"That wasn't necessarily negative as far as the Stretch was concerned," Patrick now explains. "It was just a phenomenon of the workload"—mostly short jobs. If the jobs had been weather analyses or forecasts involving massive partial differential equations, then the evaluation would likely have swung the opposite way, in favor of the Stretch. That, says Patrick, was the problem with sales of Stretch, as well as the superscale Control Data 6600 and its ilk. Everyone had shorts jobs. Only the atomic energy community had jobs massive enough to require a big number cruncher.

years hence and put together a project over the endless objections of everybody," Kolsky says. And when people came to him with technical problems, which they did daily, Dunwell would "turn them around and send them back out with the idea that 'yes, it can be solved.'" Until this project, IBM had moved cautiously, making evolutionary advances. But it was Dunwell who sought to make a factor-of-100 improvement in mainframe performance in one giant step.

Dunwell, of course, wasn't concerned only with the design features of the

**For Frederick P. Brooks Jr., the Stretch project was what enticed him to join IBM.**

new computer, for engineers at IBM were also tackling the basic hardware technology on which the entire design would rest. The substitution of transistors for vacuum tubes was to reshape the system design of computers. It was like a new ball game.

It was necessary to design transistors suitable for use in computers. The solid-state devices of that time, Dunwell said in his testimony, "were neither fast enough nor had they the current-carrying capabilities necessary to control the ferrite core memories which would be needed." As in any pioneering role, it was also necessary for them to figure out how to manufacture such devices.

It was found, too, that some engineers just could not think in terms of the new solid-state technology, having been brought up on vacuum-tube devices. In an attempt to get them to redirect their thinking, Dunwell

recalls, "for a time the laboratory expressly forbade anyone to have a piece of vacuum-tube equipment visible within his work area."

The design team under Dunwell tackled other problems. They had to come up with a new design for a power supply system, abandoning a 60-cycle system with transformers to go instead to a 400-cycle system with a motor generator. The back panel wiring, it was determined, was too complex to expect anyone to do the job correctly, so they got the Gardner-Denver Co. to make an automated wire-wrap machine. This device was driven by a punched card reader. And they went to Texas Instruments for the initial lot of transistors, IBM in 1956 having no such manufacturing capabilities. Burndy Corp. was the supplier for the tens of thousands of specially designed connectors needed for each computer.

"Up to that time," Dunwell said in his testimony, "all logical design had been recorded by draftsmen, but it was clearly out of the question to record the design of a machine of such complexity by manual means. A computer-generated design was necessary and a process for that purpose was developed."

When reached at his home in Poughkeepsie, where he retired in 1965, Dunwell said, "One of the fundamental things we were up against, having to do with manufacture and design, was that this machine was big enough and complex enough so we knew we would never get it together if we didn't automate the design and the manufacture." He explained that there would be so much wiring in the machine and it would involve so many drawings that they knew

## IN FOCUS

they would be forever changing drawings, correcting mistakes, and would get into a mad loop from which there would be no escape—unless things were automated.

When reminded of the book on Project Stretch, *Planning a Computer System*, Dunwell said, "One of the rules we had on that project was that nothing was done without first documenting carefully why it was done . . . so there was a great deal of documentation done, justifying the particular choices made, as we went along. And then abstracts were made from that for the Stretch book."

Fred Brooks remembers the book and especially a review of it by Lytton Strachey in the *Computer Journal*. In that review, Strachey said in part, "I get the impression that Stretch is in some way the end of one line of development. Like some early computer programs, it is immensely ingenious, immensely complicated, and extremely effective. But somehow at the same time crude, wasteful, and inelegant. And one feels there must be a better way of doing things."

Brooks, who used that quote in his own book, *The Mythical Man-Month*, says of Strachey's words, "I think that's an accurate assessment."

# STRETCH MARKS AT BYU

**"A lot of people were betting money that we would never get [Stretch] operational."**

"The prophets of doom were legion," says Gary Carlson, former director of computer services at Brigham Young University. Here was a small university nestled in the western foothills of the American Rockies, and it's about to take title to a 10-year-old Stretch computer installed near Boston. The intention is to dismantle it, move it to Provo, Utah, put it back together again, which would be no small feat, and get usable work out of it. No way.

"A lot of people were betting money that we would never get it operational," Carlson recalls. There was so much negative comment from his friends in the industry that he began to question his own decision. He figured it would cost the university about \$50,000 to get into the game, just to see if it could be done. "So there was at least that much of a clear gamble on my part." But there appeared to be no alternative. It was 1970 and there clearly was a growing need for scientific computing capabilities on campus. "And we, like all uni-



**STRETCH OUT:** Bill Ivie tried to get others to pull the switch on Stretch for the final time at BYU's September 1980 shutdown of the system. To the left with coat and tie is computer services manager Willard Gardner, and the bearded gentleman in the center is Joe Wise, who first found the Stretch listed in a government surplus inventory and campaigned for its acquisition.

versities, were always broke."

BYU had installed an IBM 7040 in 1963, and in 1968 installed a 360/50 that opened up computing on campus. It not only made it possible to provide computing services all over the campus but also got people interested in its applications. So, by 1970, two years after acquiring the mod 50, there was a growing demand for computing capabilities, and the Stretch would satisfy that need "at a price we could afford."

Carlson, of course, looked around to see what was commercially available, but found "the numbers were just mind-boggling." They looked into a 360/65, a Univac 1108, and a Burroughs 5700. He recalls all the prices were in the \$3 million to \$4 million range, and they couldn't afford that.

So how much did he figure it would cost to acquire the Stretch? "Well, Joe kept telling me that for a \$5 registration fee we could get it," Carlson says. Joseph L. Wise, manager of the scientific computing facility on campus at that time, was the primary instigator. Carlson had the final say and was supported by his assistant, Willard Gardner.

Wise says that in those days he regularly scanned government publications that listed surplus equipment. In one such listing, he saw an IBM 7094-II system, so he called a man in Washington with whom he frequently chatted about surplus gear. The man said, "Why do you want a 7094 when there's a Stretch system available?" Wise took the idea to Carlson, explaining that the system was available at no cost except for those related to shipping and reassembling. Whereupon Carlson is supposed to have said, "So what if the Navy wants to give me a battleship?" Wise says he still uses that rejoinder whenever anyone talks about getting something for nothing.

But Wise, sympathetic to the needs of researchers for computational power,

was insistent. He talks of users who periodically needed four or five hours of 360/65 time and could get it only on Thanksgiving Day or New Year's Day. And there were some very large simulation runs on campus; one in particular he remembers ran on the campus Librascope L-3055 computer for some 150 hours. When asked if there were that many large jobs to be run, Wise explains that if the capacity is there, people come up with the jobs.

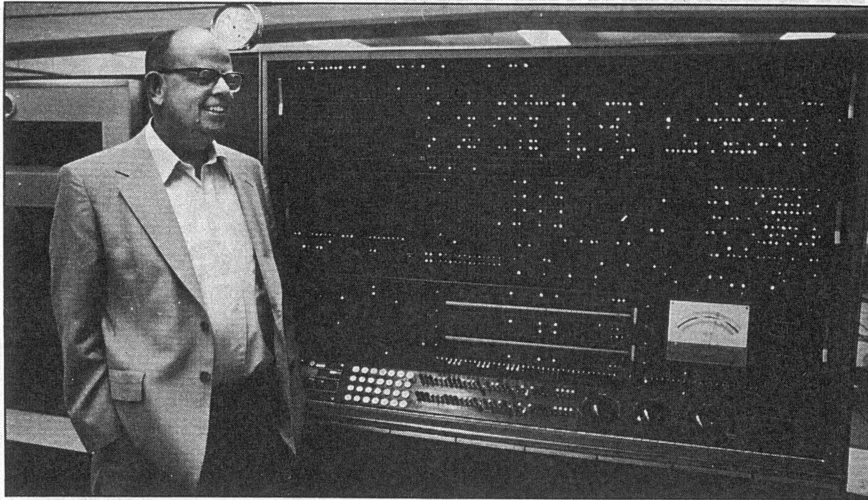
Gary Carlson recalls that in his presentation to the university's board of trustees he estimated the cost of getting and installing the computer at \$100,000. It apparently sounded better to them than the several millions required for a new machine. He also inquired to see if IBM would maintain the Stretch and seems to think their quoted fee was almost \$10,000 a month.

"You get a bargain now, but it'll eat you alive in operating costs," his detractors said. So one can imagine the reaction when Carlson told them he'd maintain it with his

## The longest job BYU ran on the Stretch was a chemistry problem that lasted for 523 hours.

own people, plus a couple of students. As it turned out, BYU was able to get by with two full-time staff plus a few students.

"Bill Ivie is the superstar of this whole show," says Carlson of his manager of operations at the Stretch center. Ivie assembled the machine and, for the final seven or eight years, kept it running. Willard Gardner, who succeeded Carlson as director of computer services, says the entire operating costs, including the salaries of Ivie and students and supplies, has been less than \$100,000 a year. "So we've operated it for something less than people thought it would



DR. GARY CARLSON, who approved BYU's Stretch acquisition in 1971, stands in front of the maintenance panel, which had more than 3,000 lights. About three or four of the bulbs burned out each day.

cost to maintain it," Carlson says proudly.

Approval to acquire the Stretch came in mid-March 1971. The dismantled hardware from Mitre Corp. in Lexington, Mass., had arrived by May, new false flooring at the site had been installed by July 1, and the main units had been reassembled and recabled by the end of July. It required some 14 months, however, before the first user job could be run as a test. (In

mid-November 1971, BYU also acquired the Los Alamos Stretch, and it was soon cannibalized for spare parts.) A report by Wise in January 1973, about the time the installed system appeared "capable of running programs in a general mode," shows the university's expenditures at some \$165,000, including acquisition of the Los Alamos Stretch, site preparation, installation labor costs, and software development.

Bill Ivie recalls that there were some 8,000 pounds of cabling that came with the Stretch. The cables were so long that he just ran them up and down the length of the machine room before connecting them up to their destinations. According to Willard Gardner, Ivie and his crew got the hardware running long before BYU chalked up any operational time. What held back the initiation of service was the poor software and software documentation that came with the machine.

But Ivie says the longest job they ran on the Stretch was a chemistry problem that lasted for 523 hours. This was made possible by a facility developed at BYU that allowed everything in main memory to be read out onto tape, leaving the processor free to run just one job. When that job stopped, other jobs could be rolled in off tape to be run. Ivie says they ran a number of jobs that lasted for 30, even 40 hours, and some for more than 100.

This Stretch, believed to be the last one to be operational, was shut down by Ivie in September 1980. Replacing it for scientific computing on campus are a Digital Equipment Corp. PDP-10 and a VAX-11/780. Joe Wise says that although the VAX will run some jobs faster than the Stretch, "for the large compute job I don't feel that a VAX is an appropriate replacement for the Stretch, even now." \*

## Stretch – R. I. P. September 5, 1980

Late in the preparation of this book, we received two emails from Brigham Young University.

**Joseph J. Ekstrom, Ph.D.** – Associate Professor, School of Technology, replied thusly:

"I managed a software team at BYU that wrote an OS and FORTRAN IV system on that surplus Stretch between 1972 and 1976. (We couldn't keep the hardware up well enough to run MCP consistently and the FORTRAN didn't look like what the physicists were used to). It was used for simulations by the physics department until it became too unreliable to maintain. Finally, the old transistors just gave out. We had a wake. Drew Major (who later would become Architect of Netware and Chief Scientist at Novell for many years) wrote a program that displayed something like "goodbye world" in the accumulator lights, I think something shorted out and we didn't actually see the display at the party, but at least that was the intended last instruction. I contacted Drew, he is going to look for the pictures we took, and see what the actual date was. We got the LASL, Mitre, and one other Stretch and used the parts to keep the Mitre CPU running for about 8 years. It was mix and match for the Memory and the Disk subsystems. It took us about 18 months to put the monster back together and get it running. One interesting side note, Bill Ivie, the manager of maintenance for the entire life of the machine at BYU, had the cards assayed and mined them for gold by breaking off the edge connectors. At the time the parts were mined for a rumored \$75k worth of gold. You might say that we rode the old horse right into the ground. I probably spent as much time in front of the switches looking at that huge panel of lights as anyone. There was an aura about that machine that captivated anyone who ever worked on it."

**Drew Major** – the "Last Stretch System Engineer" wrote:

"I learned much of what I know about computers and programming in the four years I worked on the Stretch while I was going to school. My duties included writing and maintaining the system software and helping Bill Ivie and others track down and fix the almost daily failures. I had the privilege of running the last program on the last Stretch at BYU. I also did a program that wrote "goodbye world" or something like that (was always a little tricky writing with the lights, having to factor in the parity lights in the middle of the accumulators) which I planned to have running when it was shut off. We didn't get to run it because the video crew brushed up against some of the wires ... and broke something, which made it so that the Stretch wouldn't boot. In the end, I set the switches to do a single instruction loop doing the square root of the time register and that's what it was doing [on September 5, 1980] when the power was turned off for the last time ..."

# Index of Names

## A

Adams, Laura ... (See Bensley)  
Akers, John ... 83  
Alexander, Al ... 12, 58  
Allen, Bud ... 112, 131  
Allen, Charles ... 5, 11, 20, 21, 51, 58  
Allen, Fran ... 21, 24, 32, 35, 89, 90, 116, 117, 148, 149  
Amdahl, Gene ... 4, 11, 24, 25, 58-60, 85, 123, 129, 149  
Anderson, Dave ... 20, 23, 38,  
Anderson, Stan ... 11, 20, 22, 51, 61, 148  
Andrada, Jim ... 61  
Apple, Tom ... 12, 20, 21, 22, 51, 62-63, 89, 94, 101,  
114, 131, 139, 141, 150  
Avery, Clarence ... 27

## B

Baccari, Chester ... 11, 18, 20, 34, 51, 63-65, 121, 148  
Backus, John ... 44, 59, 144, 145  
Bahnsen, Ralph ... 25, 128  
Balke, Karl ... 51, 66  
Bardeen, John ... 37, 38  
Beattie, H.S. ... 4, 60  
Bedrij, Orest ... 5, 11, 20, 51, 66  
Bell, Gordon ... 81  
Bellamy, Pauline ... 150  
Bennett, Leo ... 51, 67, 100  
Bensley, Ed ... 131  
Bensley, Laura Adams ... 22, 78, 104  
Berry, Lucy Ann ... 20, 51, 67, 148  
Bertram, Jack ... 96  
Binning, Gerd ... 81  
Bishop, Jack ... 25, 26, 73  
Blaauw, Gerrit ... 5, 20, 25, 26, 51, 54, 67, 123, 137, 150,  
151  
Blackburn, Jack ... 63  
Blenderman, Lew ... 11, 143  
Bloch, Erich ... 5, 6, 11, 20, 21, 22, 24, 26, 51, 66, 67, 68,  
82, 87, 96, 112, 124, 128, 134, 139  
Blosk, Robert ... 11, 20, 22, 32, 61, 69, 97, 112, 148  
Boehm, Elaine ... 22, 59, 60  
Booth, Dick ... 85  
Branson, C.A. ... 65  
Branin, Frank ... 136, 140  
Brattain, Walter ... 37, 38  
Braude, E.J. ... 21  
Brooks, Fred ... 5, 11, 12, 20, 22, 24, 25, 26, 40, 51, 54,  
70, 77, 112, 113, 122, 125, 136, 137, 145, 146,  
149, 150  
Brooks, Nancy ... 145  
Brown, Joe ... 134  
Bruce, George ... 21, 51, 70, 76, 146, 148  
Buchholz, Werner ... 3, 5, 9, 11, 12, 20, 26, 32, 34, 39,  
41, 42, 51, 54, 66, 68, 70, 71, 82, 122, 125, 132,  
137, 144, 146, 150  
Buelow, Fred ... 59

Burud, Francis ... 121  
Butwell, Justin ... 125

## C

Call, Barbara ... (See Myers)  
Callinan, Tom ... 36  
Calvert, Doug ... 55  
Campbell, Betty Lou (nee Hillock) ... 29  
Campbell, Sully ... 12, 21, 22, 23, 24, 25, 26, 29-31, 38,  
53, 58, 67, 71, 72, 82, 91, 93, 94, 96, 97, 100,  
104, 106, 110, 116, 117, 118, 151  
Carlson, Bengt ... 100, 102  
Carlson, Harry ... 24  
Carter, Glenn ... 66  
Carter, John ... 21, 25, 35, 125, 141  
Carter, William ... 114, 126  
Case, Dick ... 77  
Chalmers, Bruce ... 12, 20, 24, 30, 51, 71-72, 148  
Charap, Marilyn ... 12, 22, 72  
Chen, T.C. ... 12, 20, 25, 26, 29, 51, 72-73, 78, 79, 82,  
97, 115, 119, 148  
Cocke, John ... 5, 22, 23, 25, 26, 29, 31-33, 38, 82, 106,  
145  
Cocke, Norman ... 32  
Codd, Ted ... 12, 26, 78, 113, 128, 132  
Collier, Bill ... 12, 20, 22, 34, 35, 51, 54, 73-75, 104, 148  
Collins, D.G. ... 110  
Columbo, Vic ... 85  
Conroy, Gene ... 21, 24  
Constantine, Greg ... 85, 88  
Conti, Carl ... 11, 52, 75  
Cooley, H. E. ... 65  
Cornelli, Bob ... 76  
Council, Ed ... 5, 11, 21, 35, 52, 76, 85, 148  
Cowlshaw, Mike ... 80  
Crauer, Slip ... 43  
Crawford, David ... 11, 76, 77  
Christiansen, Carl ... 119

## D

Dater, Hank ... 25  
Davis, Claud ... 55, 77  
DeSio, Bob ... 133  
de Veer, John ... 77  
Dijkstra, Edsger ... 74  
Dirac, Jules ... 20, 25  
Doherty, Walter ... 22, 35, 52, 77-81  
Dowling, Clarke ... 58, 82, 125  
Drake, David ... 20  
Dunwell, Frances ... 35  
Dunwell, Julia (nee McClure) ... 27, 82, 83  
Dunwell, Stephen W. ... 3, 4, 8-12, 14-17, 21, 22, 24, 26,  
27-29, 32, 35, 39, 42, 60, 64, 65, 66, 68, 69, 70,  
71, 82-83, 96, 97, 119, 126, 144, 145, 146, 150,  
152

## E

Eckert, Wallace ... 27  
Edwards, Nate ... 144  
Eibsen, Robert ... 84  
Eichbaum, Barlane ... 36, 52, 84-87, 148  
Elder, D. ... 58, 146  
Engelbart, Doug ... 79, 81  
Engler, Paul ... 34  
Evans, B.O. ... 15, 20, 119  
Every, Maurice ... 58, 70, 76, 87  
Ewing, Ann ... 38, 109

## F

Fagg, Peter ... 134  
Fairbairn, W.T. ... 10  
Fairclough, John ... 11, 21, 36, 52, 87-88  
Femmer, M.E. ... 88  
Ferdinand, Art ... 142  
Fitch, Art ... 38, 133  
Fitzpatrick, Anne ... 39  
Flanagan, Herb ... 21, 24  
Fletcher, Robert ... 66, 97, 128  
Folkner, Charlie ... 21  
Ford, Harrison ... 105  
Foss, Ernie ... 61, 69, 87, 128  
Fox, Philip ... 11, 21, 58, 70, 77, 88, 108, 149  
Fuchs, Ira ... 80  
Furnback, Sid ... 34

## G

Gagliano, Frank ... 12, 21, 88, 132  
Garrity, Carol ... 12, 21, 89  
Garrity, Jack ... 12, 20, 21, 23, 37, 55, 72, 73, 78, 79, 89, 94, 100, 110, 111, 120, 131, 141, 147, 150  
Gartner, Gideon ... 105  
Gates, Bill ... 101  
Gensheimer, Joe ... 83  
Gerberich, Carl ... 12, 24, 115, 118, 123, 132  
Gibbons, John ... 85  
Gibson, Don ... 130  
Goldstein, Max ... 79  
Goldstine, Herman ... 78, 126  
Gowetski, Dick ... 21, 24, 52, 89-90  
Greenberger, Martin ... 63  
Griffith, John ... 60  
Grodman, Larry ... 12, 52, 90  
Grover, George ... 12, 21, 30, 36, 38, 52, 53, 62, 73, 78, 91-92, 93, 95, 104, 114, 115, 116, 118, 131, 149  
Grubb, Ralph ... 79

## H

Haanstra, John ... 39, 101  
Hallock, Don ... 58  
Hardy, Ann ... 12, 52, 93, 149  
Hardy, Norman ... 22, 26, 33, 39, 52, 93, 149

Harry, Joe ... 78  
Harth, Joe ... 22, 25  
Hatch, Richard ... 10, 21, 22, 23, 24, 52, 63, 94, 149  
Havender, Jim ... 12, 22, 23, 36, 37, 52, 73, 78, 94-95, 135, 149  
Haynes, Mike ... 21, 95, 149  
Headrick, Lew ... 132  
Hebb, "Professor" ... 58  
Heising, Bill ... 12, 52, 91, 95, 149  
Heller, Andrew ... 32  
Henle, Robert ... 11, 70, 88, 147  
Hertel, Harlo ... 24, 41  
Herwitz, Paul ... 5, 12, 21, 22, 23, 52, 62, 73, 89, 90, 91, 93, 94, 96, 97, 102, 110, 114, 115, 116, 127, 131, 139, 142, 143  
Hewlett, Bill ... 138  
Hipp, John ... 22, 52, 96, 112, 128, 139, 149  
Hira, Gul ... 23, 29, 53, 67, 72, 73, 78, 89, 90, 104, 110, 121, 131, 139  
Hofler, Ed ... 18, 64, 97, 130  
Holleran, Richard ... 11, 20, 22, 36, 52, 97, 149  
Horn, Paul ... 32  
Hunter, Lloyd ... 5, 11, 22, 36, 98-99  
Hurd, Cuthbert ... 3, 4, 24, 59, 82  
Hymes, Bill ... 85

## I

Iverson, Ken ... 53

## J

Javits, Jacob ... 35  
Johnson, Clarence ... 73  
Jordan, Thomas ... 22, 99-100, 149  
Josephson, Larry ... 22, 30, 33, 37, 52, 100-101, 149  
Joslin, Phil ... 12, 22, 24, 52, 101

## K

Kahng, Roger ... 23, 34, 78  
Kanter, Larry ... 53, 101-102, 119, 134  
Kasek, Chester ... 102  
Kay, Alan ... 81  
Kehl, Bill ... 79  
Kelisky, Dick ... 80  
Kempton, Larry ... 29  
Kennedy, Bobby ... 35  
Kerr, Gordon ... 12, 22, 53, 102-103  
Kessler, Jim ... 139  
King, Lew ... 21, 24, 40  
Knutsen, Eric ... 12, 23, 29, 30, 34, 37, 53, 104-105, 149  
Kolsky, Harwood ... 5, 8, 11, 14, 15, 19, 23, 26, 28, 30, 33, 37, 53, 82, 105-106, 149, 151  
Kruschev, Nikita ... 39  
Kuenstner, Robert ... 11, 37, 38, 53, 106-107  
Kusmiss, Joe ... 24

**L**

Lamy, Dick ... 5, 11, 24, 36, 53, 85, 107-109, 149  
 Larson, Chris ... 12, 33, 38, 41, 53, 109  
 Lash, Dick ... 41  
 Lawless, Bill ... 96  
 Lawrence, Bill ... 58, 76, 85, 108  
 Lazarus, Roger ... 24, 110  
 Leach, Walter ... 12, 38, 53, 110-111, 149  
 Lear, Bill ... 86  
 Learson, T. Vincent ... 3, 11, 27, 119  
 Lillienborg, Ed ... 111-112  
 Lincoln, Phil ... 58  
 Lind, John ... 26, 42  
 Lind, Warren ... 65  
 Lindauer, Sydney ... 11, 24, 53, 112, 149  
 Litwiller, Robert ... 24, 38, 53, 112-113, 149  
 Logue, Joe ... 70, 88  
 Lohr, Steve ... 31  
 Loring, Al ... 143  
 Lowry, Ed ... 12, 24, 26, 38, 53, 78, 113, 150  
 Lowry, Leslie ... 12, 22, 24, 38, 53, 114, 150

**M**

Ma, Joseph ... 142  
 MacKenzie, Marla Orr ... 12, 20, 73, 125, 114, 140  
 MacMillan, Vern ... 79  
 MacSorley, Olin ... 20, 66, 113  
 Mallon, Julie ... 26  
 Manente, Robert ... 12, 20, 24, 115  
 Manilow, Barry ... 81  
 Marcy, Ted ("Ty") ... 21, 41  
 Marks, Sema ... 80  
 Markstein, Peter ... 78, 79, 115  
 Martinson, Jay ... 125  
 May, Dick ... 21, 24, 30, 38, 55, 92, 93, 114, 115-116, 117, 132, 150  
 McBride, Jack ... 12, 21, 24, 30, 39, 41, 53, 116  
 McConnell, Bob ... 21, 24, 53, 116, 150  
 McDonough, Betty ... 26, 78, 113, 132  
 McDowell, Wallace ... 4  
 McPherson, John ... 36  
 Meade, Bob ... 75  
 Mealy, George ... 22  
 Merriam, Charles ... 29  
 Merritt, Marge ... 24, 53, 117-118  
 Merwin, Dick ... 11, 25, 26, 61, 68, 69, 70, 124, 145  
 Miller, Bob ... 33, 38  
 Miller, Jack ... 12, 24, 109, 118  
 Mine, George ... 12, 24, 53, 118  
 Minsky, Marvin ... 32  
 Montgomery, Howard ... 146

Monroe, George ... 11, 24, 25, 29, 33, 39, 54, 97, 119, 150  
 Moore, Raynor ... 142  
 Morezzi, Paggi ... 99  
 Moss, Larry ... 39  
 Murphy, Jack ... 66  
 Mussell, Howard ... 119  
 Myers, Barbara Call ... 12, 22, 24, 54, 100, 119-120, 150  
 Myers, Tom ... 24, 54, 119, 120

**N**

Nash, John ... 104  
 Nearing, Helen & Scott ... 120  
 Neves, Fred ... 21  
 Neville, Nick ... 139  
 Newman, Ernest ... 54, 120-121  
 Nolan, Richard L. ... 105  
 Notari, Leo ... 18, 65, 121  
 Noyce, Bob ... 85

**O**

O'Connell, Jack ... 12, 23, 29, 49, 53, 67, 104, 105, 110, 121, 135, 139, 142  
 Ordeman, Fred ... 146  
 Orr, Marla ... (See MacKenzie)

**P**

Padegs, Andris ... 11, 26, 39, 40, 54, 55, 121-123, 125, 150, 151  
 Paley, Max ... 11, 65, 87, 97, 107, 108  
 Palmer, Ralph ... 3, 4, 8, 27, 39, 70, 82, 101  
 Parsons, Jack ... 12, 109, 115, 118, 132  
 Partridge, Ralph ... 76  
 Patton, Sam ... 12, 24, 54, 123, 132  
 Paul, Gerard ... 11, 20, 24, 25, 40, 54, 124, 129, 150  
 Paulson, Bob ... 112  
 Penders, Denny ... 10  
 Pendery, Donald ... 106  
 Perry, Bob ... 55  
 Peskin, Mike ... 76  
 Piore, E.R. ... 15, 36  
 Pitkowsky, Stan ... 12, 25, 54, 124  
 Plambeck, Ken ... 12, 25, 33, 35, 54, 125, 135  
 Podvin, Al ... 22  
 Polivka, Ray ... 12, 25, 40, 54, 78, 125-126, 150  
 Pomerene, James ... 5, 10, 11, 38, 54, 75, 82, 84, 97, 101, 107, 126, 131, 133, 138  
 Powers, Don ... 150  
 Prosser, Sherman ... 12, 20, 25, 42, 67, 89, 102, 127, 142, 144  
 Pugh, Emerson ... 3, 10, 82, 149



## R

Raker, Sam ... 127, 150  
Ramey, Bob ... 40, 54, 78, 127-128  
Rave, Bill ... 76  
Reed, Stan ... 110, 114, 115  
Reilly, Mike ... 10  
Reinheimer, Harry ... 25, 54, 128-129  
Reynolds, Carl ... 22  
Rickover, Hyman ... 127, 150  
Robelen, Russ ... 40, 41, 54, 129-130, 151  
Rochester, Nat ... 58, 59, 60  
Rockefeller, Bob ... 18, 25, 54, 130  
Rodgers, Ed ... 11, 25, 131  
Rohrer, Heinrich ... 81  
Rolfe, Bob ... 134  
Rosebaum, Walter ... 142  
Ross, Harold ... 64  
Rossini, John ... 63  
Russell, Bertrand ... 23

## S

St. Germaine, Joe ... 12, 24, 25, 54, 78, 79, 119, 131, 144, 151  
Sammet, Jean ... 25  
Sampson, Ralph ... 64  
Samuel, Arthur ... 11, 36, 41, 68, 98  
Sanderson, Ken ... 111  
Sarahan, Larry ... 64  
Scalzi, Cas ... 12, 26, 26, 78, 132  
Schorsch, Ismar ... 101  
Sciandra, Charlie ... 85  
Scott, Lee ... 12, 21, 26, 41, 54, 132-133, 151  
Selfridge, Oliver ... 79, 81  
Senk, Jean ... 25  
Sharp, Elmer ... 54, 133  
Shelly, Jim ... 26, 54, 133-134, 150, 151  
Shockley, William ... 36, 37, 38  
Siebold, Richard ... 11, 26, 54, 134-135  
Singleton, Phyllis ... 23, 26  
Smith, Ronald ... 54-55, 74, 135  
Snyder, Len ... 144, 145  
Sparacio, Frank ... 26  
Staheli, Ron ... 12, 22, 34, 55, 135  
Stetler, Wes ... 20, 118  
Stevens, Bill ... 150  
Strauss, Charles ... 12, 26, 55, 136  
Sweeney, Dura ... 5, 11, 70, 106, 122, 136  
Swift, George ... 11, 26, 33, 41, 42, 55, 137, 151

## T

Thatcher, Margaret ... 88

Thompson, Len ... 143  
Thue, Bud ... 65  
Toepfer, Richard ... 26, 42, 55, 137-138, 151  
Tomas, W.M. ... 65  
Tooker, Ken ... 12, 23, 34, 119, 135, 139, 141, 151  
Tucker, Gardner ... 96  
Tucker, Stuart ... 26, 55, 133, 139-140

## U

Uchill, Sherman ... 12, 26, 140  
Ulfsparre, Lars ... 112

## V

von Neumann, John ... 3, 37, 126  
Voorhees, Ed ... 66, 141

## W

Walker, Allen ... 26, 42, 141-142, 151  
Walsh, Jim ... 147  
Watson, Thomas Jr. ... 3, 14-17, 24, 27, 28, 35, 36, 43, 82, 119  
Way, Jim ... 23  
Webster, Bob ... 12, 26, 42, 55, 135, 141, 142, 151  
Weis, Al ... 80  
Weiss, Ronald ... 26, 143  
Wengert, Wayne ... 79  
Wenner, Jack ... 5, 11, 26, 143, 151  
Werner, George ... 25, 131  
Whelan, Dick ... 64  
Wheylan, Bob ... 76  
Whitmore, Donald ... 12, 23, 26, 42, 143-144  
Wierzbicki, John ... 24  
Wild, Herbert ... 5, 11, 29, 33, 42, 43, 55, 144-145, 152  
Williams, Peyton ... 97  
Wilmot, Russell ... 43, 55, 146  
Winger, W.D. ... 64  
Winkler, Vaughan ... 134  
Winter, Les ... 20  
Wohr, Tom ... 131  
Wolensky, Bill ... 82, 146  
Worlton, Jack ... 21  
Wright, Bill ... 26, 146, 150  
Wun, Leon ... 5, 11, 20

## Y

Yee, Lim ... 147  
Yourke, Hannon ... 5, 11, 26, 43, 55, 147, 152

## Z

Zasio, John ... 59  
Ziff, Howard ... 22

LookBack Publishing  
7 Pell Place/Riverside, CT 06878  
Tel 203.637.9956•Email [eknutsen@aol.com](mailto:eknutsen@aol.com)