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“Well Paid for a Woman”: Gloria Hardman’s 50-Year Career in Computing

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In 1964, Gloria Nel (née Webb) arrived in England and began her 50-year career in computing at IBM in London (1964–1966). She continued as a programmer at the London Press Exchange (1966–1968), and then in the U.S. at MIT (1968–1969), followed by time as a self-employed educator (1979–1982), at Shore Country Day School (1982–1984), Choate Rosemary Hall (1984–1989), IBM in Milford Connecticut (1989–1993), and Yale University (1994–2014). Her life in computing started in the era of punch cards and ended in the era of smart phones.

“Who would want to read this?” When encouraged to write her memoirs, Gloria Hardman often asked that question. I told her that lots of people would: she was a pioneer in the fields of computing and computing education. When she brushed off that reason, I said that her two children—I and my sister Linda—would. So would her granddaughter Emily. In the 2000s and the early 2010s, Gloria wrote about her life. This account derives from those memoirs, and is augmented by her letters and emails, interviews with and emails from people who knew her, other items in our family’s archive, and my own memories.

Gloria’s career in computing began with an interview at IBM’s London office in September of 1964. Newly arrived to the country and to the field of computers, she was unsure what to expect. A 22-year-old graduate of Natal University in Durban, the former Gloria Webb had taught high school math for two years in South Africa.

Born in Pretoria in 1941, Gloria’s attraction to numbers began in childhood. “When I was a small child I remember my brothers and my father teaching me card games—solitaire, simplified Bridge (auction), and rummy. The cards and their symbols attracted me.” When her cousins observed that four-year-old Gloria wanted to attend school (as her two older brothers

did), they persuaded her mother to enroll her in Peter Pan, a tiny private school in the Durban neighborhood where they lived. She was so adept that, after a little over two years of school, Gloria was already two grades ahead of her age [1], [3].

When her arithmetic teacher taught “rules for discovering which numbers were divisible by, for example, 2, 3, 4, 5,” Gloria spent her walk home from school looking at license plate numbers and working out what they were divisible by. “I doubt that any of the other girls in the class found this fascinating. It seems that an interest in numbers may be genetic and I was just lucky that numbers appealed to me” [3].

Though South African society did not value girls’ education as highly as boys’, her brother Terry noticed that his sister was bright and inquisitive. Her parents would have been happy for Gloria to take “domestic science,” but Terry insisted that she enroll in serious academic courses, including Latin and math.

Graduating at the top of her class, Gloria was Dux (the equivalent of valedictorian in the U.S.) of Durban Girls High School. As a student, she so loved mathematics that she tutored classmates. “I loved to explain it to others and would spend time tutoring my friends and others in the class. Teaching was such fun and I knew I wanted to be a math teacher.” Gloria “was sure that if I taught math properly every girl in my class would find it interesting and be successful” [3].

At the age of 16, Gloria enrolled in the University of Natal at Durban, pursuing degrees in math and English. For the first time, she was not in a girls-only school. “The ratio of girls to boys at was about 1 to 5 which was quite a culture shock to someone who had



FIGURE 1. Gloria Nel in the spring of 1966 poses in London at what was probably the completion of an IBM PL1 class with her students from local IBM offices and IBM's clients. Left to right: Frank Johnston (from one of Great Britain's largest privately owned firms), Graham Manson (later finance director for IBM Norway), Nicholas Blacklock (IBM's Computer Services Centre in London), Mike Allen (Information Services, Beecham Pharmaceuticals), Nick Bark (back; ITT Data Services, whose Data Centre opened in London that September), Gloria Nel (front), Roger Prosser, Bill Clark (data systems at Clark Johnston Whitehead Ltd.), Guy Parker (later managing director, Bellard Investments), George Sutton, George Smith. Courtesy of the author.

attended girls-only schools." Her first-year math class had about a hundred students, but only "perhaps 5 girls in total and the others arrived early and sat together in the front row. I was coming from my English class some distance away and would arrive just minutes before the class began." Each day as she stepped into the large, tiered lecture hall, the boys greeted Gloria with "some foot stomping, whistles and calls to 'sit here – there's room for you.'" The experience was "more than a little intimidating and today it would be classified as harassment but back then (1957) that was just the way it was" [3].

She persisted. By the final year of her degree, the increasing challenge shrunk the math class to 12, with just two girls. When the other girl failed an exam,

19-year-old Gloria became the sole female student remaining. The work was getting harder, and more philosophical, "like proving there were more irrational than rational numbers." Gloria worried that she would be the next to fail [3].

Her professor was not much help. His style of teaching was to write on the board at high speed, say "it is intuitively obvious that..." and then write the next line of a proof without further explanation. On the recommendation of a classmate, Gloria went to tutorials run by a younger professor, Siegfried Grässer [3].

Prof. Grässer taught Gloria how to study. He told her she should "get a large pad of scratch paper and practice writing all the proofs until they were embedded in my brain." She must spend six hours a day studying

math, he said. She followed his advice. Each day for a month, Gloria rose at 5 a.m., worked on math for two hours, took a break by reading English, and then returned to math. At the end of the term, Gloria aced the exam, receiving the highest mark in the class [3].

For the next two years, Gloria taught math—one year at Pietermaritzburg Girls High School, and the next back at Durban Girls High. Gloria at first “enjoyed the challenge of trying to get the nonmath girls at least to feel that they could do it.” However, she soon concluded “that the damage had been done in elementary school and that it is really hard to turn around the perception that ‘I’ll never get it.’” She also missed the coeducational environment and social life of her university days [3].

In September 1963, Gloria needed a date to the Durban Girls High dance—which included some younger teachers. A friend set her up with Pierre Nel. After that night, they began dating. A few months later, when Pierre shared his ambition of going to England for his Ph.D. in chemistry, Gloria said that was fine, but she would not continue dating him exclusively while awaiting his return. In response to Gloria’s nonexclusive clause, Pierre proposed in December—just three months after they had met. They married in July 1964 [4].

In August, she and Pierre arrived in the U.K. so that he could pursue his Ph.D. at Imperial College London. They found a small basement flat with a rent of £8 per week. At 56 Penywern Road, they had a bedroom, small dining room, tiny kitchen, and a bathroom. But no hot water, nor any heat. To get those, they put money into a meter that “swallowed it faster than you can imagine.” As Gloria recalled, “Landlords in London made extra money that way—they paid the electric bill and had the key to your meter so they could set the rates somewhat higher than they paid” [4].

Pierre had a British Council Scholarship, but Gloria would need to be the primary breadwinner. Thinking that computing might pay better than teaching, she scheduled an interview at IBM at 101 Wigmore Street in Marylebone [4].

When she arrived, “they put me in a little office with their aptitude test . . . It was great fun—just up my street.” They graded the test—which had arithmetic, logic, and algebra sections—while she waited. Gloria aced it. They interviewed her, and set up another interview at their Education Department on Lodge Road. There, “they asked whether I was planning to have a baby and then quit. I managed to convince them that was not part of the game plan.” Her starting salary was £1000 per year—far “better than I would have got as a teacher. And as a teacher in a tough East End school I would probably not have survived!” [4].

To prepare her to teach the corporation’s salesmen and customers, IBM enrolled Gloria in a six-month training program. She was the youngest person and sole woman in a class of 24, and one of only two students learning to be instructors. The others would become systems engineers and salesmen. It was a “trial by fire.” They began by learning about machines that used punch cards: key-punch machines, verifiers, sorters, and calculators. That was but a warmup to the very latest in tabulation technology: the 421 accounting machine, a calculator larger than a contemporary washer-dryer. For each new task, one had to rewire its control panel. The 421 would then read instructions from a stack of 80-column punch cards [4].

After two months of course work, IBM sent Gloria out into the field with an experienced salesman. Together, they “had to figure out how to sell these behemoths and would have to create sales plans to solve the accounting or inventory control problems in a factory or business.” She felt “horribly out of my depth—I had no business experience and did not know an invoice from a hole in the wall” [4].

Gloria persevered, learned, and then returned to IBM’s classrooms for two more months, where she began learning programming languages: Assembler, Fortran, Cobol, and RPG. She learned to write code for the punch cards. This meant that, first, she wrote all the code on paper. Next, she keypunched the code into the card. Then, she gave the cards to the operator, who loaded them, ran the program, and gave her a printout with all the error messages. Gloria then corrected her code, and repeated the entire process until the program performed as intended [4].

After Gloria completed the six-month training program, IBM sent her into its classrooms, teaching customers who had come down to London for one or two weeks of training—the cost of which was underwritten by IBM. “Fortunately my ‘students’ were all very polite, kind Brits who did not shoot holes in my teaching or ask really embarrassing questions that I could not answer.” When asked a difficult question, Gloria used her tea break to find the answer. She would dash to the instructors’ lounge and find a knowledgeable man who would tell her what she needed to know. “It was a steep learning curve, but I was young, I needed the job and I survived by studying at night for the next day’s class” [4].

She also began putting what she had learned into practice. As Gloria watched Pierre process complex calculations for his own research, she realized “we could write a program to automate this.” Assisted by her IBM colleagues, she wrote a program that Pierre then put on punch cards and ran on the Imperial College computer. It worked! for Gloria, programming was no longer a theoretical endeavor. She could actually do it [4].

Soon Gloria was teaching customers how to use the brand-new IBM System/360 computers, which the corporation began shipping to customers in the spring of 1965. With a faster programming language, PL1, that ran on earlier machines and peripherals compatible with third-party manufacturers, the 360 series dominated the market by the late 1960s. But in 1965, they were so new that salespeople had not yet had the chance to test them. Gloria found herself telling a class what the 360 would do, only to be interrupted by one student whose company had already installed one: "Well, it didn't work like that on the one we have!" [4].

In May 1966, after about 20 months with IBM, Gloria learned from conversations in the staff room that her male colleagues were being paid a lot more—even men who started when she did and were doing exactly the same job. She thought that "since I am the primary breadwinner in our little family I should be paid at the same rate as the male breadwinners." So, she plucked up her courage, and went to the office of her manager, Mr. Cooper. She explained the situation, and asked politely for a raise. Cooper responded, "You're being well paid for a woman" [4].

As Gloria left his office, she thought to herself: with my IBM training, I could get a raise by getting a better job. Looking through the newspaper ads, she saw a better-paying job programming in assembler language on IBM's System/360 for the London Press Exchange, a market-research firm. The company hired her, and she quit IBM [5].

Though she never forgot the discrimination she faced there, the years at IBM also launched her career as a computer educator. But it would take a decade for her to return to teaching people how to use computers.

Pierre defended his Ph.D. in August of 1967. He got a job at Carter's Ink in the United States. While waiting for their U.S. visas, Pierre and Gloria returned to South Africa. In the spring of 1968, they flew to Boston, Massachusetts.

Gloria got a programming job at MIT's Office of Institutional Studies. In December 1968, when she was nearly six months pregnant, Carter's Ink fired Pierre. He thought the company insufficiently innovative, and voiced frustration that his research project was taking so long to be approved. Though his tendency for blunt criticism likely cost him his job, by early 1969, Pierre had a new job in the research division of Polaroid, and joined the team that designed the battery for Polaroid's SX-70—the iconic camera that instantly ejected pictures which developed as you watched. Meanwhile, Gloria went from a full-time MIT employee to working part-time from home. At the end of March she had her first child—me. Two years later, she had her second—Linda.

Though she was primarily a stay-at-home mom from mid-1969 until 1976, Gloria's interests in mathematics,

computers, and education were never far away. We were the only family in our neighborhood that used computer punch cards as scrap paper. When she learned about Cuisenaire Rods (colored blocks designed to teach mathematical ideas), she bought a set and used them with her children. These blocks are the reason I still think of numbers spatially.

Exercise led her back to the classroom. In 1974, Gloria read Mildred Cooper's *Aerobics for Women*, which advocated regular exercise that raises the heart rate to 130. A year later, with both children in school, she started taking and then teaching Jacki Sorenson's Aerobic Dancing. In 1978, Gloria began working with Math Learning Inc., and developed and taught courses to help people of all ages overcome math anxiety [7].

In 1979, the family acquired a Radio Shack TRS-80 computer. Gloria began giving workshops at home on how to use personal computers. Within a year, she was teaching Lynnfield Massachusetts school teachers and courses on programming in BASIC (Beginners' All-purpose Symbolic Instruction Code) in the town's adult education program. In 1982, Pierre took early retirement from Polaroid and set himself up as a computer salesman and consultant. Since that was not particularly lucrative, the family needed a new breadwinner.

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In meeting this necessity, Gloria transformed her life and the family's. For the next 32 years, Gloria devoted her professional life to teaching people how to use computers. In 1982, she designed the classroom, selected the equipment and planned the computer curriculum at Shore Country Day School in Beverly Massachusetts, where she would teach for two years. Under her direction, the school installed about 15 Apple computers—likely the Apple II Plus—in a classroom on the second floor of the main upper-school building. In 1983, those were joined by some Franklin Ace 1200 computers—the lower-priced, short-lived clone of the Apple II. She taught the students BASIC, including the "IF... THEN..." routine, simple graphics and animation, the random number generator, and how to debug one's program via TRON (Trace On).

Gloria described the experience as "tremendously challenging and enjoyable." It was "a teacher's

dream—the students are lined up outside the computer room in the morning, eager to get in, and they are working productively on programming in BASIC. It is easily the most popular course in the school and I have ideal conditions, with one student to a computer in most of my classes.”¹

In addition to Gloria’s expertise, her students remember her patience, her supportiveness, and her gently irreverent sense of humor. Steve Sloan (Shore ’84) recalled, “because we all started with different levels of exposure to computers,” Gloria “supported us 1:1 from wherever we were starting.”² Alex Rigopulos (also Shore ’84) became a successful game designer, co-founding Harmonix Music Systems, the company that developed both the *Guitar Hero* and *Rock Band* series of video games. He calls Gloria’s classes “the most energizing and inspirational classes in my 3 years at Shore,” crediting them with “changing the trajectory of my life,” and adding “that there’s pretty much a direct line from [her] classes to my career making music games.”³

Though a private school paid a lower salary than a public school, Gloria was in one respect now well paid and not just for a woman. Since faculty children could attend Shore tuition-free, her work gave my sister and me access to a first-rate education.

When I was to graduate from ninth grade, Gloria found a new job that would allow both of us to continue our private secondary education. For five years (1984–1989), she directed Computer Education at Choate Rosemary Hall in Wallingford, Connecticut. Rare among private schools at the time, Choate in 1984 had a superminicomputer—a DEC VAX 11/750, running Unix. Roughly the size of a refrigerator, it sat behind a glass window, in a climate-controlled room, and was connected to a series of terminals in a larger classroom. Though few used it, every Choate student had an account, via which they could send email—via Yale—anywhere in the world, if they specified exactly how they wanted it routed. As Jan Mikovsky (Choate ’86) recalls, to send a message to somebody at Stanford, he would “send it to Yale, and then to this other hub and then to Stanford, and then to their final email address.”⁴

Jan is one of Gloria’s students who realized in retrospect how unusual it was to have a woman teaching computer science. As he recalled, “she was the first woman that I knew who was sort of a leader in the



Gloria Nel, director, computer education

FIGURE 2. Gloria helping a student in Choate Rosemary Hall’s Academic Computer Center, 1987. Photo from *Course Catalog: Choate Rosemary Hall 1987–1989*. Photograph courtesy of the Choate Rosemary Hall School Archives, Wallingford, CT.

field of computing.” His computer science instructors at his high and middle schools had “all been men.”⁵

In taking over computer education at Choate, Gloria inherited an unusual managerial structure: members of the almost entirely male Choate Computer Club were the system administrators. On the one hand, as Jan observed, “it’s not a universal good” to put teenage boys “in charge of anything.”⁶ Gloria maintained order by reminding them of their responsibility and intervening as needed. On the other hand, as Gloria said at the time, managing a computer system “provides an opportunity for students to be unrestricted without a bureaucratic system hanging above them. They have independence” [6].

When they devised independent projects, Gloria supervised and evaluated their work. In one of them,

¹G. Nel and P. Nel, letter to Phil Penney, 29 December 1982.

²S. Sloan, “Re: Research question about Gloria Nel at Shore,” email to author, 12 June 2022.

³A. Rigopulos, “Re: Research question about Gloria Nel at Shore,” email to author, 11 June 2022.

⁴J. Mikovsky, Zoom interview with author, 13 June 2022.

⁵Mikovsky, Zoom interview.

⁶Mikovsky, Zoom interview.

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Gloria Hardman

Gloria Hardman

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card to subscribe.*

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Gloria Hardman

FIGURE 3. Gloria Hardman, "Hello, World!" Editor's Comments, inaugural issue of IBM's *AIXpert*, Winter 1991. Reprint Courtesy of IBM Corporation © 1991.

Jan wrote an interpreter for the programming language Karel, allowing it to run on Unix. He shared it on Usenet and, soon, Jan's compiler was being used by people at AT&T, Digital Equipment Corporation, and in courses at Stanford University. The education at and internships attained via Choate served as "an important foundation for [his] career." Jan spent 15 years at Microsoft before leaving to co-found two companies—Cozi and Component Kitchen.⁷

In July of 1989, Gloria—now Gloria Hardman—returned to IBM, but this time at the company's offices in Milford, Connecticut. She became a project administrator in the AIX Programs Department. In the winter of 1991, she launched and edited the company's *AIXpert Journal*. As she wrote in its inaugural issue, the publication's goal was to provide software developers and others "with timely, relevant information that will optimize your AIX development work." [2]

In 1993, when IBM wanted her to relocate to Texas, Gloria left the company. The next year, Phil Long hired her to work in Yale University's Instructional Technology Department, where she remained until she retired in 2014.

For her first decade at Yale, Gloria supported Classes*v1, helping faculty and graduate students with their technological needs, including (in the mid-1990s) introducing many of them to email. She not only answered emails and phone calls, but went to their offices and classrooms. When conservative icon William F. Buckley returned to Yale to teach writing in the late 1990s, he insisted on using WordStar—a mid-1980s word processing program that had to be adapted to current computing systems. Gloria ensured that he could use WordStar, and he "was extremely considerate and courteous to his 'computer geek assistant' and sent me autographed copies of his books for several years after he taught at Yale."⁸

In March 2005, Yale's Academic Technology Director Chuck Powell decided to bring Sakai to Yale's course management system. Gloria became part of the main team implementing Sakai on Classes*v2, led by project manager David Hirsch and programming team manager Andy Newman, with technical manager Michael Appleby, and programmers Jen Bourey and Drew Mazurek. From then until her retirement, Gloria was its sole full-time support person and "the face of Classes*v2," as her colleague Matt Regan said.⁹

⁷Miksovsky, Zoom interview.

⁸G. Hardman, "Re: Shiny & Busy & Bow-tie'd," email to author, 3 March 2008.

⁹M. Regan, "Re: Query for IEEE article about Gloria Hardman," email to author, 12 July 2022.

Assistant Dean Risa Sodi recalled that "It was a comfort" to know that Gloria "was the real, live person behind the Classes*v2 help button." Gloria wrote much of the documentation and balanced the interests of IT management and the faculty. On the one hand, she supported Sakai and the people using it. On the other, to improve the system, she brought their critiques back to management, and helped people use v2 in ways not anticipated by its designers [8].

The onset of posterior cortical atrophy, a variant of Alzheimer's, began impeding Gloria's ability to read certain typefaces. She devised workarounds, such as changing or enlarging the font. But PCA erodes the brain's capacity to interpret what the eyes see, and Gloria soon realized she would need to retire. As she said then, "I don't want to stay on past my sell-by date." In the fall of 2014, she moved to The Commons in Lincoln, Massachusetts.

Though Alzheimer's has mostly silenced Gloria, when I told her that I was writing about her role in the history of computing, she opened her eyes and managed to utter a single legible word: "Good."

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