

As the Twig is Bent: The Early Life of John Mauchly

BY JOHN COSTELLO

Our life experiences influence the way we think and the types of activities in which we engage. This paper examines the early life of John Mauchly, one of the inventors of the ENIAC, and details those experiences which came to influence his contributions to the creation of the ENIAC and subsequent computers.

Introduction

When he died, *Time* gave him a mere 20 lines of black agate type. Between the same covers, George Meany got a full-page obituary complete with illustrations in color. The grand old man of the American labor movement deserved every ounce of ink that *Time* spent on him. Meany the Mick, true son of hard-working, hod-carrying Irish immigrants, had changed the American blue-collar worker's world. By comparison, the passing mention that John W. Mauchly drew from one of the world's great weekly news magazines was both poignant and typical.

Here was Mauchly, once a kid from suburban Chevy Chase, one of the true movers and shakers who changed everyone's world. And the world knew him not, though few who shared with him the same time on this little Earth had left on it an impact so lasting and deep.

So the media farewell was apropos. It was the difference between a warm, beery Irish wake, capped with a censored requiem Mass—and a simple graveside good-bye attended by the nearest of kin.

Here's what *Time* January 21, 1980, had to say:

DIED. John W. Mauchly, 72, co-inventor of the first all-electronic computer, during heart surgery; in Abington, Pa. The Ohio-born physicist was teaching at the University of Pennsylvania in 1943 when he and Graduate Student J. Presper Eckert Jr. began building an electronic machine to replace mechanical devices. The ENIAC (for Electronic Numerical Integrator and Calculator), a 30-ton leviathan completed in 1946, was 1,000 times speedier than any other computer. After selling their company to the Sperry Rand Corp., the two devised smaller and even quicker machines, among them the celebrated UNIVAC, developed in 1950.



But Sperry lost its early lead in computers to IBM, and ENIAC's creators, having signed away their patents early, never achieved great wealth. Said Mauchly: "That is life."

Obituaries, like cremation, have the ability to shrink the immensities of a human being to the dimensions of a Mason jar. So, like this one, it told nothing of the bright young lad, another brilliant physicist's son, whose keen mind, generous spirit, and humor amused his friends and endeared him to them.

John W. Mauchly, "Bill" to the family, grew up at 107 East Bradley Lane in Chevy Chase, Md. Some years ago, the street numbers in that area were changed. So the present address of his old home is 3,519 Bradley Lane. More than addresses have changed. Chevy Chase today may seem merely another

gold-plated, velvet-lined enclave for the rich, the well-born, or the highly successful. Say a lush green picture place, oak shaded, where wealthy cave-dwellers (native born Washingtonians) and some accepted new-comers laugh and play—maybe hack around the well-groomed 18-hole golf courses on weekends, play pitty-pat in white tennis shorts or scanty panties on the black-top tennis courts near the club houses, or party on sunlit patios behind well-kept emerald lawns and coiffed shrubbery.

Not so in Mauchly's time!

His father, a physicist with the Carnegie Institution, raised poultry there. Betty Westphalen, née Mauchly, John's sister, laughs when she recalls those days.

"My father," she explains, "believed in living off the land. And there was World War I, too, you know. We moved to that house in 1916. World War I wasn't over—when was it?—until 1918 or 1919. It was patriotic to raise your own food. So my father kept about 50 chickens. "It was my brother's duty to clean the chicken coop every Saturday morning. And he just hated it. But he knew

he had to do it. So he went out and did it. That was his job.”¹

When Sebastian J. Mauchly, his wife Rachael, son Bill and daughter Elizabeth moved there, Chevy Chase was still in diapers. The subdivision was developed by the Chevy Chase Land Co. Two wealthy US Senators representing Nevada, Senator William M. Stewart and Francis G. Newlands, bankrolled the firm. Newlands was a very wealthy widower. His late wife was a daughter and heir of the principal owner of the fabulously rich silver mine, the Comstock Lode.

Twenty-six years before the Mauchlys arrived, from Cincinnati, Ohio, Newlands' land company bought up more than 1,700 acres, through strawmen, along what was to be one of DC's main streets, Connecticut Avenue. At the time, the short street dead-ended at Rock Creek in the heart of the District of Columbia. The land company bridged Rock Creek's deep ravine at Calvert Street and at Klingle, then laid street-car tracks all the way from Seventh and U street out to distant Chevy Chase Lake in Maryland.

Senator Newlands had the big bucks, but Senator Stewart was a handy partner to have. For one thing, he was no slouch on Capital Hill. He helped get a “Jim Dandy” charter for the car lines. It gave the Rock Creek Railway the right to buy out any other transit lines in the District of Columbia or Maryland. That put the Rock Creek Railway in a class by itself locally. In addition, the Nevada statesman pushed a bill to create Rock Creek Park out of a lovely wilderness area which ran along the east side of Chevy Chase. The park was a distinct aesthetic asset to the new subdivision.

But the Senator's mind was fixed on more than natural beauty. As he candidly admitted, this blow for environmentalism also took “2,000 acres out of the market.” Sen. Newlands' agents tried to buy up all the land fronting on what would be Connecticut Avenue, but they missed some parcels. The land company, which would build the street, simply shifted it to by-pass land-owners holding out for too much. True, this put an awkward jog in the broad avenue-to-be, just where it would leave the District and cross into Maryland. No problem! A traffic circle, Chevy Chase Circle, solved that.

But even in what was meant to be an upper-crust neighborhood, Chevy Chase did have a right and wrong side of the tracks. When they went on sale in 1907, lots east of Connecticut cost 25 cents a square foot, and you could put up your dream home for as little as \$3,000. But west of Connecticut? Heavens, no. Lots fronting it there were more dear—38 cents a square foot. And no \$3,000 houses, though hardly shanties in those days, could go up there. They had to cost at least \$5,000.

The Mauchlys lived east of Connecticut. “We lived east of Brooksille Road in what was called Martin's addition,” George Winfield Stone Jr., a boyhood friend of Mauchly's recalled. “A red-headed Irishman, Harry Martin, bought a good deal of land from the farm of Cy Cummings. Cummings Lane was an outlet from the farm to Brookfield Road. Martin built the houses, so the area grew up with the small houses that are still there. The houses are still the way they were then. It was all country, great fields of corn, great fields of pumpkins, and kitchen gardens. Cy Cummings had a stable full of horses; he was a huntsman. He kept the hounds for the Montgomery Hunt Club. I remember, as a boy, seeing Cy and his friends in their black caps, red coats, white pants on horseback, riding out to the hunt. The hound dogs would trail along for several blocks. It was quite a huge pack.”

1. Quotations in this article are from interviews done, at various times, by the author.

“The only store in the neighborhood was Sonnemann's on the corner of Quincy Street and Brookville Road, just a block and a half from John Mauchly's house. John's house, as I remember it, had an open field next to it.”

“West of Brookfield Road, at Raymond Street, the fields were all open. In the fall, families burned the fields, the men all standing in wide circles. The thought was that the potash, or whatever comes from burning the fields, would improve the grass the next year.”

“In the spring, the boys made them into baseball fields. There was one in a big vacant lot next to my home. I lived at what used to be 410 Cummings Lane, now it's 3500 something. We built a tennis court there. We used to play football in Chevy Chase Circle. There wasn't a tree on it.”

Maybe the \$3,000 side of Connecticut was short on bucks, but not on IQ.

“Chevy Chase seemed to have practically all the scientists in Washington,” John Mauchly told an interviewer. “The director of the Weights and Measures Division of the Bureau of Standards lived near us. So did the director of its Radio Division. In fact, the directors of practically every division of the Bureau of Standards were living somewhere around there. So was a guy named Charles B. Abbott, who was secretary of the Smithsonian Institution for many, many years. The principal of McKinley High School, where I went later, lived in Chevy Chase. So did the scientists, like my father, who worked at the Department of Terrestrial Magnetism. It was kind of a scientific center.”

“The Department of Terrestrial Magnetism—that's part of the Carnegie Institution—was near by, and the Bureau of Standards wasn't too far away. It was located in the middle of nowhere, in what they called Cleveland Park. Actually, it was a little further out than true Cleveland Park.”

“But in spite of the fact that scientists were numerous around there, and in good, prestigious jobs, It didn't seem like they were paid an awful lot. In today's money, of course, it sounds like peanuts. Maybe \$4,000 a year.”

But years later, John wouldn't knock it. Later that \$4,000 per annum would seem like a handsome sum to Mauchly, a PhD from Johns Hopkins, compared to his paychecks as head of the physics department at Ursinus College.

Now, if Chevy Chase seemed like the boondocks, Bethesda, Maryland, another Washington suburb, was really the sticks. “In those days,” Mauchly recalled, “it was a whistle-stop on a freight railroad spur. When I was a kid, I used to bicycle over to Ferry's Feed Store in Bethesda. Coal and feed, you know. In the winter, it was coal; in the summer, you could sell ice. You could sell feed the year around.”

This was horse-and-buggy America, not the USA of the Tin Lizzie. “And another thing,” he added, “just before the Fourth of July, they sold fireworks. You see, you could sell fireworks in Maryland then, but not in the District. So we'd go there and get the fireworks. Then I'd fix up some electrical contraption so that when I pressed a button, the fireworks would go off 50 feet away.” That wouldn't wash in suburban Chevy Chase today, but there were a lot of wide open spaces there in the 1920s.

Mauchly's feat with the fireworks may seem like a ho-hum now, but it wasn't then. It was close to magic. Electricity was a new, mysterious force. Even as a kid in knee-pants, Bill Mauchly was fascinated by it. For electricity was still the Eighth Wonder of the world. Fascination came naturally to a chip off the old block. His father was chief of the Section of Terrestrial Electricity at the Carnegie Institution's Department of Terrestrial Magnetism.

True, Edison's incandescent lamp was 40 years old in 1919. But

that was the anniversary of little more than a laboratory toy. America went from gas-light to electric light much, much later. It tried out in New York, of course, then as now the Big Apple. Long before everything was up-to-date in Kansas City, New York had gone about as far as you could go. Edison's first commercial power station opened there Sept. 4, 1882, with about 85 customers, supplying juice to some 400 electric lamps. That was the first stroke of the lamp-lighter's knell. But it was decades before electricity was a tame, household pet, as universal as toilet paper.

The Potomac Electric Power Co.'s lines, for example, didn't run to suburbs like Chevy Chase until 1914. That was only two years before the Mauchlys moved there.

So Edison's invention was closer in fact to Mauchly than TV is to our high school seniors. Electricity made an even bigger impact on the nation. At the time, Edison's bulb meant only cheap, safe illumination. Unlike kerosene lamps, for example, it wouldn't explode and set the house afire.

But a brilliant teenager could do a lot more with electricity, even then, than set off fireworks. Especially one with a keen sense of humor. "On April Fools Day," his sister Betty recalls, "he wired the front doorbell so that when you rang it, you got a little shock. And he used his knowledge of electricity to stay up late without getting into trouble. John's bedroom, like the others in our house, was on the second floor. Now John was an avid reader, but he was supposed to have his light out by 10:30 or 11:00. And if he wasn't still studying then, I'm sure he was reading a book or *Popular Mechanics*. "Now if my mother and father happened to go upstairs to bed and saw that he still had his light on, John would really catch it. So he found that one of the steps in the stairs had a board that was a little loose. He rigged up some kind of switch that turned on a little light in his room, or turned it off, when someone trod on that loose board. This warned him that his parents were on their way up. Then he'd hurry and turn out the light in his room. And you know, he used to wire houses. That's one of the things he did in the summer time to earn some money. When people were having trouble with their electrical system my father would say: 'Well, I think my son can fix it for you. He would spend a couple of weeks and do the whole thing. And,'" his sister adds with pride and affection, "he was only 13 or 14 years old!"

If you saw Judy Garland in *Meet Me in St. Louis*, you'll have a pretty good idea of what life was like for the Mauchlys and their pals, growing up in Chevy Chase. But the Mauchly home wasn't as grand as Judy's mansion. "It was an eight-room frame house" his sister Betty says, "very plain. You went into the hall and then into this big sitting room, a kitchen, dining room, and upstairs four bedrooms and one bath—in those days, it was unusual to have two. Then there was a porch all the way across the front of the house. The lot was about 100 feet wide. It was a good-sized lot, one of the biggest on East Bradley Lane. We had four big pin-oak trees and a big hedge all around the lot. And it was John's Saturday job—or whenever he could do it—sometimes he was busy on Saturday—to cut the hedge.

Four bedrooms—one for their parents, one for John, and one for Betty. That left a spare bedroom. "Mother rented that room out," Betty recalls, "to a man who worked in the city. She rented the room and gave him breakfast. Mother could always use that extra money."

Chevy Chase Country Club was only a short bike ride from their home. Columbia Country Club wasn't much farther. But neither figured in the family's social life—the Mauchlys didn't belong to country clubs! Columbia, however, was a source of summer income for John. He caddied there and also picked up tips baby-sitting the members' Buicks, Stanley Steamers, and Packards

on the club's parking-lot. Most of the social life for him, and school chums like Gus Winnemore and Win Stone, centered on the nearby Chevy Chase Presbyterian Church. Gus, christened August E. Winnemore, grew up to become a teacher in district high schools. Win, later Dr. George Winfield Stone, was a well known theater historian who became dean of libraries for New York University. Then they were high school kids, friends since their days in the class rooms of the old Elizabeth V. Brown school. It was on the northeast corner of Connecticut and McKinley now the site of the Chevy Chase library and community center.

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At Chevy Chase Presbyterian, they were members of Christian Endeavor, a teenage fellowship group. It met every Sunday evening, about seven, in the regular chapel where church members had attended service that morning. "Usually," Win Stone says, "there was an older person there, a parent or an elder or deacon—the church didn't have an assistant minister for youth in those days. He'd come down and open up the church and sort of run the meeting." How did these Roaring Twenties teenagers spend their Sunday evenings from seven to nine? "We'd talk about topics of the day, social issues or religious projects," says John's younger sister Betty, a member later, "and I think we had refreshments. It was partly religious, partly social," Win Stone recalled. "There wasn't a lot of doctrine or theology, although we did have readings from the New Testament."

John Mauchly's wry sense of humor almost disrupted one session. "At a certain period in this service" Win Stone relates, "we were asked to bow in silent prayer and then come up with a moral saying or Biblical quotation that would be inspirational. One of the group spoke up and said: 'The Lord is my Shepherd.' Someone else offered 'It is better to give than receive.' Still another, 'Lead me not into temptation.' Now all these had a nice, warm New Testament ring to them—a Sermon on the Mount spirit, a Love Thy Neighbor theme that would serve beautifully as background music for a speech on food stamps. But Mauchly's offering cut through the rosy glow like a laser. It was strictly hard nosed Old Testament. After the first three volunteers spoke, there was a long silence. Then John burst forth with: 'Vengeance is mine saith the Lord.' At that point, the whole crowd broke up."

What drew John Mauchly to Christian Endeavor? He was an active member, faithful in attendance. Later in life, someone remarked to his sister, it seemed that he was an agnostic. "I don't know," she said at first, then "Yes, I guess he was. He never went to church, really, but he would go with his family. And I'm sure he believed in a strong force." A deity? Or something? "Yes."

But Christian Endeavor had something more going for it than piety. It was a small group, only 12 to 15 teenagers, but coed and there were long, lingering walks home. "John loved the girls," his sister says with a smile. "He was crazy about Martha Roberts then.

John Mauchly, His Early Life

She lived on the west side of Chevy Chase. He and two other boys occasionally walked her home." One was Gus Winnemore. "There were three girls John, Win Stone and I walked home from church services or Sunday school," he says. "The first girl we dropped off was Winona von Amon. She lived on Belt and McKinley. We walked down Belt Road to McKinley. Part of Belt is now 41st St. The second girl was Ruth Miller. Her home was on Belt Road and Wisconsin. The last was Martha Roberts. She lived on Cumberland in Somerset." From Chevy Chase Circle to Martha's house and back was about a three-mile hike. Then about another mile from the Circle to where John, Gus and Win lived. "We must have been very much attracted to Martha." Win Stone muses.

John, Gus and Martha were students at McKinley High. Their 1925 yearbook makes clear that others weren't immune to Martha's charms. On the street car, it was a fairly long ride to



In this 1960 photograph, John Mauchly, Kay Mauchly, and Arthur Draper inspect part of the Livermore Automatic Research Calculator (LARC) © CBI

McKinley High, where John Mauchly was a freshman in 1921. He could catch the trolley at Chevy Chase Country Club—when it entered the District, it switched from overhead to third rail—a 15-minute hike from his home. Then the Seventh Street Wharves car clanged down Connecticut to Calvert, took a left across the bridge to Eighteenth St., made a right down to U St., then a left on U St. to Seventh St. He'd hop off at Rhode Island, where the school then stood. But why McKinley, then a manual training school, for a bright PhD's son like Mauchly? "In those days," Gus Winnemore says, "students at E.V. Brown school could go to Central, Western, Eastern, or McKinley. Dunbar was for blacks. McKinley was called a manual training school, but it was really a sort of pre-engineering school. It offered drafting and machine shop, but the shop courses at McKinley were far superior to those at the University of Maryland. The instructors were fine, skilled craftsmen, many from the Navy Yard. So the University of Maryland would give credit to the boys who had gone to McKinley for shop courses." And at 14, John Mauchly's goal was an engineering career.

Unlike many fathers in the neighborhood, Gus Winnemore's dad wasn't on the public payroll. He was a businessman, Washington representative for ABC Elevator Co., with a downtown office. He was also one of the few men in this neck of the

woods with wheels. Mr. Winnemore owned a 1918 Buick touring car, with canvas top, isinglass rear window and side curtains that, of course, rolled down in case of a change in the weather. The Buick was neat but not gaudy—long, lean classic lines.

John Mauchly was a crack student, a whiz at math and physics. "We had an excellent physics teacher at McKinley," high school chum Gus Winnemore says, "named John Adams. In those days, they gave numerical grades, like 95, 85, 75, instead of A, B, C. At the end of the year, Mr. Adams said 'John, you made 100 on the quality of your homework and assignments, You made 100 in all your tests. And you made 100 in your class recitations. But nobody's perfect. So I'm going to give you a grade of 99 for the year.'" But John was no greasy grind. He was a member of the national honor society, on the debating team, editor-in-chief of the school's newspaper, *Tech Life*, in his senior year and could have headed the District-wide high school cadet corps. His accomplishments made him eligible for two big plums: *Tech Life* editor or cadet corps commandant. The school ruled he could have either—but not both. "John was very interested in the high school cadets," his sister Betty recalls. "They had to drill twice a week with Army instructors. They looked very snappy in their uniform, and were proud of it. John went right up in the ranks. First he was a corporal, then 2nd Lieutenant, Captain and Major. There were five leading high schools in DC at that time, and they all had the cadet program. John scored highest in the city wide competition for the top officer—chief of all cadets in all five high schools. But he also worked on the school paper and was in line to be editor-in-chief. So the school said he couldn't have both the two top jobs. He could be editor of the paper or commandant of the corps. So he chose to be editor of the paper." He was a graduate of the class of 1925. The entry in the school's year book for John W Mauchly reads like this:

Now John, our editor is fine
Does everything up to his line;
He can edit some paper,
Cuts never a caper,
And above all he does shine.

That fall, he went to Johns Hopkins, on a state scholarship, to study engineering. At 20, in his sophomore year, he was fed up with it. "It looked to me," John said later, "that this engineering is just a bunch of cookbook stuff. While you may want to do big things, you find that you're told to design a girder that will bear so much weight How do you find this out? Not by any law of nature, but by looking it up in a handbook published by the United States Steel Co. And it says, to bear this weight, you have to put in so many rivets of such and such diameter. There's nothing less interesting than learning how to take stuff out of a handbook and put it down on my homework paper."

Other people he knew had chosen careers that seemed far more challenging.

"The problem," he explained, "was that my friends were not just garden variety engineers. My friends, and my father's friends, were scientists. They were over at Johns Hopkins taking PhD courses there."

Even in the mid-20s, Johns Hopkins was not just a great medical school. The Baltimore university was a center of scientific learning whose faculty boasted of scholars with an international reputation. Washington, then, had no institutions to rival it. "Anybody who was trying to get an advanced degree in science," Mauchly recalled, "who was working in Washington, would arrange to commute to Baltimore to study at Johns Hopkins. It turns out that there was a scholarship available that would let you

work in the physics department. It wasn't one of those grandiose things that gave you spending money or anything. It paid only your tuition. But at least it would replace part of what I lost by giving up my scholarship in engineering." John weighed switching from cookbook stuff to something more weighty and fundamental—physics. But he decided to talk it over with his father.

Sebastian J. Mauchly was a physicist, too. Earlier, his daughter recalls, he was principal of Woodward School in Cincinnati, where she and her brother were born. But on moving to Washington, after earning his PhD, he worked for the Carnegie Institution, where he was head physicist in the Department of Terrestrial Magnetism. There Dr. Mauchly was long remembered—perhaps still is—as the man who made a significant discovery: The Universal 24-Hour Term in the Diurnal Variation of the Potential Gradient of the Earth's Magnetic Field.

"My brother came home, when he was in his sophomore year," his sister says, "and talked to my father who had been ill for some time. John said to him: 'I'm not too crazy about engineering. And they've told me at Johns Hopkins that I'd make a very fine physicist, and they're willing to let me transfer my scholarship into that area.' My father thought for a minute and I think he said: 'Well, I had hoped... I liked the idea of engineering because I feel that's the thing of the future and you'll make more money. As a scientist, you probably won't.' My father was talking from experience. He was hoping all those brains would bring in some more money for his son. 'But,' he said, 'It's your life and you'll have to decide what you want to do.'"

So, of course, John did change." And ultimately prove, even after ushering in the revolutionary age of the computer, that his father was right!

Before the frame house at 107 East Bradley Lane wore bunting to celebrate the son's graduation from Johns Hopkins, it wore crepe for the father's death. He died Christmas Eve, 1928. "I remember that Christmas very well," Betty Mauchly adds. After a lingering illness, the 50-year-old physicist probably was done in by some bug he picked up on scientific field trips to the tropics, his family believed. "The doctors called it encephalitis," Betty Mauchly says, "but nobody knew exactly what it was."

Was John Mauchly a chip off the old block? "My father was active in everything," Betty Mauchly adds. "He was president of the PTA, superintendent of our Sunday School, and he belonged to many scientific organizations. He wrote articles for scientific publications and designed instruments to measure the electricity in the air. That was his specialty. John, was almost a carbon copy of his father. He was always busy. I remember the sign he had over his desk in his bedroom: 'What should I be doing now.' Instead of being idle, he was always thinking what should I really be doing at this moment."

Timing, they say is everything. The worst year to say adieu to academe and hello to help wanted ads had to be 1932. All 12 months wallowed in the trough of the Depression. Clever

Americans, illustrating that necessity is indeed the mother of invention, came up with a new industry: selling apples on street corners. That was the year Johns Hopkins conferred a PhD on the 24-year-old physicist.

Now the Chevy Chase kid wasn't a Joe Blfisk, the epitome of bad luck. Unlike Al Capp's cartoon character, a dark cloud that poured down torrents of rain wasn't his constant companion. On the other hand, his nickname was never Lucky. If Mauchly ever looked back on his life—and occasionally he did—he must have wondered. Somewhere, somehow, despite a dazzling IQ, had he been jinxed?

He was not only a Phi Beta Kappa, but also a member of Sigma Xi. That's a double-barreled honor few graduate students garner. But the world wasn't clamoring for his services. In fact, it gave

him the cold shoulder. Being an egg-head didn't help matters in 1932. His specialty was molecular spectroscopy. His doctoral thesis was entitled: *Third Positive Group Carbon Monoxide Bands*. You can't sell that like winesaps on street corners.

How did a smart guy like Mauchly wind up in this blind alley? "When I got into physics," he explained, "I couldn't decide whether I wanted to be a theoretical physicist, or an experimental physicist. Did I want to sit at a desk somewhere in an ivory tower—push a pencil around and think great theories—not knowing anything about the real world at all? I didn't like that dichotomy, so I decided to do both. A professor had just arrived at Hopkins, a Dutch guy, Dr. Gerhard H. Dieke. He was an authority on molecular spectroscopy, a field then believed to be the coming thing. You see we had solved the problem of a little itty-bitty atom. But clustered in molecules, it was much more complicated. Great names in physics were investigating the spectra of molecules. Hopkins had to have one, so we got Dr. Dieke. This sounded good to me. In that kind of spectroscopy, the first thing you have to do is go down into the laboratory and get a photograph of the spectrum. Then you go into a dark room and optically measure the lines on those plates." Not child's play. A single molecule might generate 20,000 spectral lines.

"So I elected to do this. I spent time learning glass-blowing, blowing my own glass tubes; how to work the vacuum equipment and make high voltage sparks; how to put the plates into the spectroscope and how to develop them. All the grimy, messy stuff the experimental guy has to learn. Then I'd go and measure the lines on the plates. Finally, I'd have to compute. Not on the electronic computers you know today. I used a little mechanical computer, a desk machine which Marchant manufactured. It could multiply, if you pushed the right buttons and pulled the little handle that looked like a lima bean. I spent thousands of hours on that lima bean computer." For the first time in his life—but not the last—he ran into the crying need for a real, honest-to-God number cruncher.

Now, along with his degree, the young PhD got same advice: "Don't expect to land a cushy job, or any job at all. Stick around until things look up." He took the Civil Service exam for a senior physicist—salary \$3,200 a year. Don't call us, we'll call you, the



ENIAC ENGINEERS - From left to right: Cummings, Sharpless, Chedaker, Shaw, Davis, Chu, Huskey, Eckert, Goldstine, Burks, Sheppard, Michaels, and Mauchly (1946).

hopeful applicant was told. Meanwhile, he was offered a position as a research assistant to Dr. Dieke at 50¢ an hour. He took it. "And guess what?" he said. "It was all calculations for a Dieke research paper. And there I was on that same old Marchant machine. I sort of got fed up with computing on computing machines. But anyway, I learned about how to guess the mathematics, you might say—the cleverer ways of getting the computation done faster!"

Ten years later, the lives of GI's fighting in North African deserts would depend on the 50 cent-an-hour physicist doing just that. For it was firing tables needed for American artillery—not some business or scientific imperative—that gave us ENIAC. But for John Mauchly, the road to ENIAC led through Ursinus College, a 63-year-old liberal arts school 25 miles from Philadelphia.

Compared to Johns Hopkins, it was minor league. At the Baltimore university, Mauchly rubbed elbows with faculty or fellow students who were luminaries in scientific circles—or would be. Men like J. B. Aston, later director of the Bureau of Standards; Raymond Pearl, one of the world's foremost statisticians; Merle Tuve, later director of Carnegie Institution's Department of Terrestrial Magnetism; Dr. Dieke and R. W. Wood, both distinguished physicists. But Ursinus represented opportunity.

"At the end of a year working for Dr. Dieke," Mauchly said, "why miraculously along came an offer from Ursinus College. They wanted somebody to head their physics department. So I went around and collected references, drove up there and was interviewed by the president of the college. He presented my qualifications to the faculty—they ran things very democratically in those days—and I was voted in. When I arrived, everyone was curious to see me. They had never heard of anyone with such great qualifications. What really impressed them was the names signed to the letters. I was recommended by the minister of the Chevy Chase Presbyterian Church. It had nothing to do with my technical qualifications, but attested to my character, I was also recommended by the president of the Carnegie Institution, John Campbell Merriam. He was a man I hardly knew. But he must have thought that my father, whom he had known, had a good son."

So in 1933, I joined Ursinus College as head of the department of physics. In fact, I was the only person teaching physics there." The salary for this one-man band wasn't princely. "Twenty-four hundred dollars a year," Mauchly recalled, "but this was the Depression. One of the agreements the faculty had was to remit 10 percent of their salaries to the college. I went along with the crowd that year. So on a \$2,400 a year salary, I wound up with just a little over two thousand bucks." That was still a lot better than the average working person was making. In 1933, his paychecks added up to \$1,048 a year.

Mauchly also picked up some money on the side. In the summer—he taught nine months out of the year—he sometimes made extra income working at the Carnegie Institution for \$100 a month.

When it hired Mauchly, the little liberal arts school in Collegeville, Pa., apparently got more than it bargained for. This 27-year-old PhD was not your run-of-the-mill college don. For starters, he wasn't much older than Ursinus' upper-classmen. Partly, as a result, he was on the identical wavelength with many of his students. In addition, he was no nine-to-five. He was a hard-working inquisitive, serious scientist. Often the lights burned late in the physics lab where he was working on his own projects. Finally, he didn't take academic life or his academic status too seriously. He became a campus celebrity—if not a faculty favorite—for the irreverent Professor Ho-Hum lectures he used to

deliver on the last day of class before Christmas.

Ursinus was a friendly little coed college in a small town (population 878) on Route 422 about 25 miles from Philadelphia. It had a handsome, 140-acre tree-shaded campus, about 500 students, and good academic standards. Most of the students were boarders.

John Mauchly's classes were in a new, three-story science building—Pfahler Hall. The students nicknamed it Failure Hall because the science courses, physics, chemistry and biology, were tough. Mauchly was hired to teach first year physics. But he soon began teaching advanced courses as well, often to classes as small as six or eight. "Ursinus had a good reputation with the main medical schools in Philadelphia for supplying first-rate premed students," Mauchly said in an interview a few years before his death. "It still has. But when I was there, students were directed toward only two professions—medicine and teaching high school. I used to spend a considerable part of my time trying to show the students there were other things they could do."

One whose horizons he broadened was John W. De Wire, later associate director of the laboratory of nuclear studies at Cornell University. "My original thought in going to Ursinus," he says, "was to teach in high school. The only college graduates I knew—except doctors, and I didn't think that was for me—were high school teachers. So I went to Ursinus fully expecting to become one. But in my sophomore year, I took physics from John Mauchly. By the end of the year, I decided to go to graduate school. And I'm sure it was Mauchly who was responsible. My family lived in Baltimore then, and he used to take me along with him, like at Easter vacation, when he was going to visit his mother in Chevy Chase. He'd go and visit places like the Bureau of Standards, the Navy research lab, the Department of Terrestrial Magnetism, where they were working on nuclear physics, and Johns Hopkins' physics department. Mauchly was the guy who got me into physics. He made it live. Thanks to him, I found out about all the wonderful things physicists were doing in their laboratories. And, of course, I knew what John Mauchly was doing. He had a lot of things going. He was a brilliant guy."

John Mauchly was not only a dedicated teacher; he was also a good one. He had that gift as a kid. To school chums like Gus Winnemore that was one of the unmistakable signs that their friend was a very sharp cookie. "Why did you think he was so smart? Gus Winnemore was asked. "Because," he said, "we used to study together, and John could make me understand things no teacher ever could."

According to local lore, when Gus made the National Honor Society, his family said: "Hurrah for John." The Twentieth Century, if it were properly appreciative, ought to say, "Amen." □



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