

Reflections on the Nature of Gene's Achievements

by
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Someone once asked Gene how he got started in mathematics. He said, "I was at first in chemistry. Math was more fun and I was always good at manipulating formulas. I went to Wright junior college for two years. After Wright junior college, I had to go somewhere, but wanted to stay at home, so I commuted to the University of Chicago. After two years of a junior college and then the University of Chicago I didn't do too well. I did well on the homework but when it came to the exams, I don't know, I just sort of froze up. I rode the train for an hour and a half each way. Some of my friends were in Urbana, so at the end of the year that's where I wanted to go.

Gene was an undergrad at the U of I for one year and didn't know anyone from his class of '53. He roomed at first with three other guys at 507 First but ended up eventually with only one roommate. He worked at the Digital Computer Lab as a senior and then as a graduate student, he worked for Jack Nash whom he had taken a course from. His first assignment which he worked on for six months was to program Milne's method.

After Gene did Milne's method, it was never used because Runge Kutta Gill was so convenient. Nash then had Gene do statistical calculations. At first and then for a long time he just formed the normal equations. But in 1959 '... there was the Householder transformation. A spotlight came on and there was Householder on the stage.'

There is a story that Gene's friends from his days as a grad student like to tell. Dave Muller, Jim Robertson, Ted Poppelbaum and Gary Metze chipped in to buy a \$50.00, 1940 Chrysler. Gene's birthday was usually celebrated during a ten microsecond interval after midnight Feb 28, but for his sixth birthday a special occasion was called for. Poppelbaum made a grand speech about the significance of birthdays, then came up with car keys, and the group led Gene out to the car. The car started smoothly and his friends made the innocent seeming decision to go for a ride with Gene. It was terror-filled. Car ownership came then as now. Though the car was free, it turned out to be expensive due to the insurance.

A little on Gene's thesis. His advisor was Abe Taub. Taub wanted outside opinion. Gene said, "Varga came to Illinois — Taub invited him to check me out. Varga told me 'I have some similar results. Why don't we write a joint paper?'

"The next day Taub came up to me and said 'I understand you have results similar to Varga's. You know a Phd is supposed to be an original piece of research. If Varga's results are published first, then no Phd!'

"I wasn't worried because of course Varga had told me we would write the paper together, but I then thought 'Who is this guy?' I was new at this game then at which everybody is so honorable. So I worked on the paper with Varga, and that's when you know everything very well. Varga did most of the actual writing. Varga is a great mathematician and there I was saying to him 'Well you see you take this and it means that.' We were actually able to improve some of the results of Sheldon. That was a very productive collaboration, even though Varga was four, five thousand miles away. I've written papers with people down the hall and not had nearly as good a relationship."

Besides the results in his thesis, Gene also discovered and developed cyclic odd-even reduction as a grad student. This didn't get into his thesis due to stability problems, but was not exactly dead. He developed the block idea later and with notable contributions from others, an elegant method resulted in the late sixties.

After Illinois, Gene spent a year in England. From there he went to Lawrence Berkeley Lab, but felt that was no place to be because it was run by physicists. He was at TRW for fifteen months, and his boss there was Seymour Parter. Gene had been there previously while in grad school and his boss at that time had been Dave Young.

Friday morning, Oct. 5, 2007, Gene and a friend were enjoying breakfast at Gene's. The pleasant morning was typical of time spent with Gene: Golden and mellow, a moment to treasure. Suddenly, interrupting the mood, Gene paused as though reminded of something, pushed back his chair, turned it ninety degrees in the direction of his living room. He faced his friend who was slightly to the right.

Gene said "You know I don't have much longer to live."

Gene showed no distress but was matter of fact as though mentioning an appointment in the afternoon. The startled listener took this as the preamble, to a

topic of considerable gravity and murmured something neutral in tone, wishing to convey above all else that the near term future was a sunny opening up and not a constricting hole leading into darkness. Control of the moment slipped away while urgent matters—the dishes, someone coming—took over and the drift down the river of time resumed its forward motion.

There is neither a shred of meaning nor understanding in the loss of this beloved friend and never can the event be anything other than a monstrous cruelty. To lead us away from this lightless gloom, we have the greatness that was so much Gene.

He had a full and rich life but not one that was just handed to Gene; he had to earn it through dedicated hard work. But he brought to his life and his work more than sweating labor. Gene brought a creativity that was different and lofty, of the kind that we find in great artists such as Mozart. There is more to say of this comparison. The beauty of Mozart compositions sweep across the emotions, leaving the listener in a hypnotic trance of acoustic pleasure. Reading one of Gene's papers induces a similar feeling of a sensory response to artistic creation. It is not only a scientific document to feed the mind but also a composition with warmth to it and a capability to move the soul. Golub is to algorithms as Mozart is to melody.

An instinct for timing characterized Gene. Timing also connects to music where the sense of beat holds everything together and gives music its feeling of forward motion toward an ending that expresses a deeply satisfying organic unity. Another sense of the word timing lies in the judgment of readiness. Gene pushed for the preconditioned conjugate gradient method when most of us did not even understand the scope of the preconditioning idea. He saw the potential for electronic networking. And he founded two great scientific journals. To borrow from Thucydides's description of an esteemed countryman, "He has been a man who showed an unmistakable natural genius: in this respect he was quite exceptional, and beyond all others deserves our admiration. . . . He was particularly remarkable at looking into the future and seeing there the hidden possibilities . . . this man was supreme at doing precisely the right thing at precisely the right moment."

After Gene's funeral, Gene's brother Alvin (Al) and sister-in-law Shirlee invited the company of grieving friends and family to join them at their home. The warmth of the hospitality and the graciousness Al and

Shirlee showed everyone belied the depth of loss, the numbness, and the out of body feeling.

Among the guests was Mort, one of Al's friends going back to childhood days growing up and working together in high school. Al, the older brother, had helped Gene find a job at the same place Al and Mort worked, which was a shoestore. Gene could hardly have received a greater gift from neutral Fortune than to have Al as a brother: An outgoing man, full of warm humor, more than willing to help a deserving kid brother. Gene was a good employee but did not meet Al's high standards, though, and was not encouraged to make general contact with the ready-to-buy customer. There was much other work in the store and Gene had a job. Gene worked in the stock room where, among other important duties, he put the shoes back that the master salesmen had maybe had Gene earlier pull out for one of the customers.

Only Al had more of an influence on this kid brother than he may have thought.

Gene may not have been a master shoe salesman, but he was a master salesman. The traveling, scheduling, presenting, persuading—the selling—that Gene did was exactly the set of skills of a salesman. Only the product was a set of ideas not a boxed pair of shoes.

The salesman's pitch, approach and contact were uniquely Gene's style, with the friendly hand extended, all set to greet the potential customer with a "Hi! I'm Gene Golub."

The job of salesman is anything but easy. Try it sometime if you haven't already: Walk up to a stranger, and just try projecting confidence while feeling oppressed with a heavy load of doubt. The rejection, the slights and the little failures were costly to Gene. They did cause injury but never enough to make him stop. Death and only death would ever stop Gene Golub: He fed on his Genius and on his knack as a master salesman.

So Gene, this great man of clever discoveries, this man whose very name¹ is at the middle of the word ingenious, this great creative "gene-ius," pushed himself at a job humble in its need for approval, the salesman yearning to show a good product, see the buyer benefit with some profit in it for Gene. People marvel at Gene's strength of invention but don't always see Gene's vulnerability, which was the same as that of the salesman: A dependence on the customer who alone

¹Gene was born Howard Joseph Golub and was "Gene" only later in life.

has the power to say Yes, to approve.

Gene followed the creed of the salesman: Stop if successful, yes, but never out of doubt. Thus was doubt made into Gene's constant unwanted companion, tapping him on the shoulder up to the very end. Only friends and family were ever steady in their support.