

AC 2007-339: LITERARY ENGINEERING ? ENGINEERS AND THEIR CREATIVE WRITINGS

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Literary Engineering – Engineers and Their Creative Writings

Abstract

The creative writing endeavors of a handful of engineers have received critical acclaim and enjoyed commercial success. These engineers have written award winning mysteries and science fiction, best-selling adventure novels and highly praised literary fiction and poetry, some of this work based on their personal experiences in the engineering world, other work seeming to have no connection whatsoever to that part of their lives. This paper provides a broad overview of some of the contemporary and past engineers who have successfully tried their hand in the world of literature and looks at the engineering school experiences of several American writers for insight on how their technical education affected their development and creativity as writer-engineers.

Introduction

In a memoir titled *Sky of Stone*, Homer Hickam describes how his father scanned the report card his son had brought home at the start of the summer after his first year of engineering school, noting that the single “A” grade was in English, and sarcastically suggesting that his son might better pursue “literary engineering” rather than the real thing.¹ Hickam finished his engineering studies and enjoyed a successful engineering career but he is best known for his “literary engineering”, in particular a narrative of the rocket launching campaign he and his friends, all the sons of West Virginia coal miners, embarked upon in the shadow of Sputnik, a story brought to the screen as the popular movie *October Sky*.

Hickam is not alone. Engineering has provided a starting place for a surprising number of quite successful creative writers, including poets, short story writers and novelists. These writer-engineers have won awards, gathered smash reviews and in some cases best-seller status for their literary efforts.

Several quite famous writers tried their hand at engineering school and then moved on to other endeavors and fields of study. The most famous, probably, is the renown novelist Robert Louis Stevenson, author of adventure classics such as *Kidnapped*, *Treasure Island*, and *David Balfour*, who spent a year at engineering school before switching to the study of law.² An English writer, Eric Ambler, studied engineering at Northampton Engineering College (now The City University) but gave it up after three years of rather half-hearted academic effort, and went to work for the Edison Swan Electric Company.³ Ambler is considered to be a progenitor of the modern espionage novel and his work includes *The Mask of Dimitrios*, the Edgar winning *The Light of Day* (filmed as *Topkapi*) and *The Levanter*. Two of America’s most famous living novelists, Norman Mailer and Thomas Pynchon, studied engineering. Pynchon studied engineering physics at Cornell for two years before leaving to join the Navy.⁴ Mailer received

his degree in aeronautical engineering from Harvard although he discovered a knack for writing while in college and never gave any indication of wanting to actually practice engineering after graduation.⁵

One of the most famous early engineer writers was the English novelist Nevil Shute, who graduated from Oxford and worked for de Havilland aircraft before forming his own aerospace company, Airspeed.⁶ An engineer elected as a fellow of the Royal Aeronautical Society, Shute's most famous book was *On the Beach*, a story of apocalyptic nuclear conflict that was a best seller during the Cold War and was made into a highly popular film. Another engineer, L. Sprague deCamp, a graduate of Cal Tech who earned a masters degree in engineering from Stevens Institute of Technology, gained fame as a writer of science fiction.⁷ DeCamp received numerous honors, including the Hugo Award, the Robert Bloch award and the Gandalf. Two other prominent science fiction writers had engineering backgrounds. L.Ron Hubbard, well known as the founder of Scientology, wrote numerous stories for the popular pulp magazines and several science fiction novels. Hubbard studied engineering for two years at George Washington University.⁸ Robert A. Heinlein, the famed writer of such science fiction classics as *Stranger in a Strange Land*, graduated from the U.S. Naval Academy and worked as an engineer during World War II.⁹

A number of other engineers are active contemporary writers. These include memoir writer and novelist Hickam (industrial engineering), science fiction craftsman Gene Wolfe (mechanical engineering), mystery novelist Aileen Schumacher (civil engineering), poet Brad Henderson (mechanical engineering), and acclaimed literary novelists Nick Arvin (mechanical engineering) and Stewart O'Nan (aerospace engineering).^{10,11,12,13,14,15} At some point each of these engineers discovered that they had the creativity and interest in language, as well as the drive and energy, needed to succeed in the tremendously difficult world of creative writing. They evolved into, in effect, "literary engineers."

Several of these engineer writers were interviewed about their experiences as engineering students, engineers, and writers. Some of the interviews were done through e-mail, some on the telephone, and others through face-to-face personal interviews. In each case, the goal was to learn as much as possible about the individual's engineering education, experiences in the work place, and path to writing, as well as his or her thoughts on creativity in engineering and writing. This paper examines some of the early responses relative to the educational experiences of these engineers and their reflections on them.

An examination of the experiences of the contemporary engineer-writers raises several questions about both engineering education and the practice of engineering, especially as it is seen by young, creative entrants into the profession. The paper introduces and discusses these questions, positing some possible future areas of exploration.

Homer Hickam

Homer Hickam, Jr., is best known for his story of growing up in a small West Virginia mining town, designing and test firing rockets, and yearning to join Werner Von Braun in America's

space program. That first memoir, *Rocket Boys*, was made into the immensely popular movie *October Sky*.¹⁶ Hickam has written two other books about his coming of age in Coalwood, West Virginia, but he also has written three novels and a fourth is scheduled for release soon.

Hickam attended Virginia Polytechnic Institute and graduated with a degree in industrial engineering. He received excellent grades on his writing assignments in his Freshman year – better than his engineering grades – and later wrote a column for the Institute’s newspaper that got him to be a “mini-celebrity on campus since everyone read my stuff”, giving him additional confidence in his ability to use language to tell a story.¹⁷ In one of his memoirs, *Sky of Stone*, Hickam makes it clear that he struggled with some of his early engineering studies, but he also enjoyed many of the classes.¹⁸ “I loved learning the language of the computer and how to use logic to instruct the computer how to solve problems,” he recalls. “For instance, I can remember clearly a problem given to my class to take a set of random numbers and list them in sequential order, smallest to largest. We had to use FORTRAN, the principle computer language of the time, to figure out how to do that. Every line had to be absolutely correct, and our logic could not be flawed in any way. If it was, the computer would do exactly what we told it to do and the results would be unpredictable. But if I thought it through, and wrote the instruction language down correctly, and then punched it correctly onto punch cards, I'd see a perfect result. That was fun!”¹⁹

He also enjoyed another course, Operations Research. “This is the study of applying a variety of parameters to the solution of a problem. I recall we were given the dynamics of the Berlin Airlift to solve which meant taking a set number of aircraft, and applying them to the cargo required to be lifted and how often. It was complex,” Hickam remembers. “But it was also fun.”

He was also proud of his performance in a traditional engineering foundation course, Dynamics. “For some reason, I enjoyed the course taught in the Engineering Mechanics Department, notorious for flunking about half of its students in every class. I even got an A!”

Not all of Hickam’s courses were, for him, that enjoyable. “Some math courses were onerous. Fundamentals of Complex Variables just required too much memorization and I saw no need to know it. I dawdled through the class and my grade reflected it but I got past it. I had a little trouble with my courses over in the Electrical Engineering department for the same reason. Too many equations to memorize and I had little interest in the subject. Why? I don't know. I just didn't.”

Long before he sat down to write the magazine article that would be the seed for his popular memoirs, novels and his writing career, he found his ability to use language of great value. “One of my greatest strengths as an engineer when I worked in that profession was my ability to write cogently, simply and with precision,” he says. “I often observed instances when my fellow engineers (often much better engineers than I) were unable to properly describe their ideas and projects, either in writing or in a variety of formal and informal presentations. It is absolutely essential that an engineer be able to communicate. It is why I have strongly urged American engineering schools to stress English, literature and writing skills in their curriculum.”²⁰

Brad Henderson

Brad Henderson came from a family of engineers, his father and grandfather both practiced and taught engineering, and he continued that tradition, studying engineering at the University of California's Davis campus and then transferring to California Polytechnic State University (Cal Poly) where he graduated with a BS degree in Mechanical Engineering. Henderson worked as an engineer for the Parker Hannifin Corporation and later as a technical trainer for Hewlett Packard. He also studied writing at the University of Southern California where he earned a MS in Professional Writing. His first novel, *Drums*, was published by a prominent small California press noted for its quality offerings and his first book of poetry appeared last year, published by a different small press.^{21,22}

At Cal Poly, Henderson enjoyed the engineering courses. "I took statics and dynamics and started to understand how engineers take Newton's Laws and apply them to a physical system. So, getting my head around a three dimensional physical system with a free body diagram about it and force vectors, that really turned me on." he recalls with amusement. He was an avid bicyclist in college and as he began taking mechanical design classes, he turned to his bicycle, looking at it as a machine, isolating every part and analyzing its design and function. For his senior design project, his team worked with the Food Machinery Corporation (FMC) and redesigned an actuator to brake and release a machine gun. "I was proud of myself because I came up with the concept for our design which instead of a squeeze braking system, used a reverse cantilever braking process. We ended up getting the specified braking force using fewer moving pieces," he says. The project was closely monitored by FMC and the students went to the company's San Jose headquarters for a design review. "That was the first time I really got to work on a real engineering design and see how the big boys played. I found out that engineering is not a game. It is for real. At the end of the road there are people who are counting on you to make sure something works, that it is maintainable and that it does not fail."²³

Henderson is now on the faculty at the University of California's Davis campus and among other subjects, teaches technical , engineering, and science writing. "The pedagogy of English is different from the pedagogy of engineering education," he says. "Profoundly. Because in the world today, in the post 60's educational world, it is in vogue to pass over the fundamentals and launch students at a very early age into the holistic writing process. The idea is the fundamentals of how to write a sentence will be absorbed by little insights and little on-demand discussions with teachers about nouns and verbs and at some point in time the light will go on and everything will come together," Henderson explains. "Well, sadly that rarely happens. It is particularly bothersome to the engineering mind, because the engineering mind knows that process just isn't going to work. At the very get go. So the engineering mind is desperately wanting somebody to sit down and share the fundamentals first. The other thing the engineering mind craves is whenever something is evaluated, the engineering mind yearns to know what the evaluation criteria are. There is a lot of evaluation in the letters and in sciences where the evaluation criteria are highly obscure. Vague, if defined at all."

Nick Arvin

Nick Arvin's first novel, *Articles of War*, received smash reviews and earned him an important Rosenthal award from the American Academy of Arts and Letters.²⁴ Arvin started out studying

aeronautical engineering but switched to mechanical engineering at the University of Michigan. He earned a MS in Mechanical Engineering from Stanford University and then went to work as an engineer for the Ford Motor Company. After two years at Ford, Arvin left to study at the famed Writers' Workshop at the University of Iowa where he wrote the short stories that made up his first published book, *Into the Electric Eden*.²⁵ Subsequently he worked as a forensic engineer, analyzing accident scenes and the evaluating the damage to automobiles in an effort to better understand how crashes occurred.

At both Michigan and Stanford, Arvin received excellent grades in his engineering studies. "My favorite set of classes was thermodynamics and there was one teacher in particular who probably inspired that. He was a terrific teacher, very enthusiastic," he recalls.²⁶ "A lot of engineering teaching is pretty stiff and formulaic. He was more vigorous about it. And it was a really hard class but I got a lot of satisfaction out of doing well in it." Arvin detested a course in quality management that he had to take. "A lot of it seemed like common sense, the rest of it seemed like stuff that no one would actually use." He also enjoyed a design project where his team worked out a problem for a company that took scrap metal and slagged it to make metal for use in sand blasting operations. "That was fun but I got more satisfaction out of the more abstract aspects of engineering. That is part of what pulled me into thermodynamics. Fluid dynamics. The Navier Stokes equations. It doesn't get much more abstract than that."

As a writer and engineer, Arvin has given much thought to why some engineers seem to struggle with writing and communication. "One of the things that struck me in college, was the number of engineers who said they got into engineering because it was a way to get out of having to deal with any English classes or history classes, classes where you had to write papers which people then graded but couldn't give you any definitive, any precise reason for why they had given you the grade they had given you," he observes. "In engineering classes you are analyzing the rate at which some object is falling. There is an equation to be solved and you either do it right or do it wrong and they can give you some rational feedback about that. It removes a lot of that ambiguity."

Arvin didn't avoid those classes and recommends that other students look to maximizing their exposure to areas of study outside engineering. "Any good university has such a panorama of interesting stuff that you can learn about and stuff you might be able to apply to your engineering in surprising ways or just stuff for personal growth you can learn a lot from. I would encourage them [students] to not get too binded into the engineering classes – and do as much as they can to get out into liberal arts classes or other science classes, biology or whatever, whatever is interesting to them. That is essentially what I did in college. It was a huge benefit in my life to have taken as many English classes and writing classes as I did. As I said, part of it was taking credits I didn't even need. Universities are such great as places to learn all sorts of things. You should take advantage of it."

Aileen Schumacher

Aileen Schumacher is a registered civil engineer and a principle in a firm that does structural and environmental engineering in Florida. An avid reader of mystery novels, she authored a series of four novels featuring a female structural engineer who teamed with an El Paso detective to solve

crimes. The second of these, *Framework for Death*, was nominated for an Anthony Award as the best mystery novel in 1999.²⁷

Schumacher started out studying biology at New Mexico State University and was doing research at the Woods Hole Oceanographic Institute on an undergraduate fellowship when she nearly electrocuted herself working on a piece of poorly grounded equipment in a wet lab environment. It shocked her into the world of engineering. “I realized for being such a ‘smart’ girl and taking all these ‘technical’ classes in biology and chemistry and things like that, I really had no idea about how things worked in the real world.”²⁸ So when she returned to the university, Schumacher signed up for Electrical Engineering 101 as a free elective. The instructor helped her adjust to the new field—she later dedicated her first two books to him. “He worked with me and I started to see some of the practical applications of engineering in the real world and problem solving and I just fell in love with it,” she recalls. Schumacher took a second electrical engineering course to finish out her senior year and turned down an opportunity to enter a PhD program in immunology to continue at New Mexico and do graduate work in civil engineering. “I shook the whole day. It was one of the first times that I was wondering what have I done by pursuing just this kind of, ‘Oh, let me see what this is like’ and ‘Oh, this is really cool to figure out’. I had just turned down a PhD program at a place that was considered to be very prestigious in immunology and decided to go for the ‘what is behind door number two’.” Behind that door were engineering classes.

“Except for a little bit of problem solving in chemistry, the realms that I had been working on before pretty much had been based on memorization. For most biological classes, if you understood what was going on and memorized the material you could make a good grade,” Schumacher says. “Whereas in engineering you could sit with the same chapter in front of you trying to solve a problem for three hours and still be no further along than you had been when you sat down. That, to me, was a totally different challenge and it was something that I actually started to choke on when I first started to take tests in engineering because it wasn’t just regurgitating what you had learned in some textbook. It was actually being able to apply some concept that you had somehow managed to grasp and be able to apply it in a slightly different way.”

Schumacher survived her switch to engineering classes and embarked on a career in civil engineering, doing environmental and design studies for roads, storm drains and even some of the engineering for the entry structure at the Pro Football Hall of Fame.

Gene Wolfe

Gene Wolfe is a much honored writer of science fiction. He has authored more than 25 science fiction and fantasy novels and some 17 collections of short stories and garnered some of the genre’s most prestigious awards, including the Nebula (twice), the Locus (four times) and the World Fantasy Lifetime Achievement honor.²⁹ Wolfe has a large and devoted fan base and is considered one of the masters of fantasy fiction.

Wolfe earned his BSME in 1956 and went to work as an industrial and production engineer for the Proctor and Gamble Corporation, where he was involved in many innovative designs,

including the production machinery used to create Pringles potato chips. He later became the editor of *Plant Engineering*, a monthly trade magazine providing problem solving information for plant engineers.

Wolfe grew up in Texas and enrolled at Texas A&M College, it being the most affordable alternate for his family. “That meant I would pretty well be limited to engineering or agriculture. For a devoted science fiction reader, the choice was clear,” he recalls.³⁰ The school was filled with veterans of the World War and Wolfe found them to be tough competition. He left A&M and was drafted into the army and served in Korea where he earned the Combat Infantryman Badge. Upon his return to the United States he entered the University of Houston, living with his parents and using the GI bill to cover the school’s tuition costs. He had matured during his stint in the army. “I would have to say that at A&M I saw courses, while at U. of H. I saw a profession,” Wolfe says³¹. That profession was engineering.

“Thermodynamics opened a whole new world to me. Heat transfer bored me to death. I wanted very much to study machine design. Neither of the schools I went to wanted to teach me that,” Wolfe recalls. “I did well in math through elementary calculus – and hit the wall after it. There was something I couldn't grasp, and I never even found out what it was. I liked machine shop, but I wasn't very good at it. Most of the students had previous machine shop experience; I did not, and I never caught up.”

Wolfe wrote stories for the college’s literary magazine when he was at A&M and woke early in the morning so he could get an hour or two of short story writing in before he went to work at Proctor and Gamble. When he retired from the Production Engineering position, he was able to devote himself to writing on a full-time basis.

Karl Iagnemma

Karl Iagnemma is a principal research scientist and lecturer at MIT, working in the mechanical engineering department with graduate students and postdoctoral researchers on robotics projects for space exploration and medical applications. He earned his PhD. in mechanical engineering at MIT but had become interested in writing while doing his undergraduate studies at the University of Michigan. His short stories won a number of awards and a collection, *On the Nature of Human Romantic Interaction*, was published in 2003, and his first novel is due for publication in 2007.³² His accomplishments as both a writer and an engineer were profiled in a segment of the television program Nova.³³

Iagnemma thinks that the mechanical design process is the engineering activity most akin to creative writing but it was not something that interested him in his undergraduate studies. His passion then was control systems. “I became interested as an undergraduate student in control systems. I really don’t have any good reason for it. Other than they are interesting. When you are an undergraduate they seem somehow a little bit magical.”³⁴

Iagnemma also found the time to take several writing classes while at Michigan. “The tough thing about being an engineering student is there is such a broad core curriculum that you have to learn, it doesn’t leave a lot of room for doing other things,” he says. “If you are interested in

studying writing and English as I was, there wasn't that much room for elective courses. There is I think a debate in engineering education I am sure at every school as to how that balance should be struck. There is so much information to teach young engineers before you can responsibly send them out to the world to design things that will effect people's lives. At the same time, for me in particular, that broadening of your view of knowledge, I mean, obviously it changed my life, because it was really through those classes at Michigan that I was inspired to take writing seriously."

Stewart O'Nan

In 1996 Stewart O'Nan was selected as one of the best American novelists under 40 for inclusion in a special edition of the literary magazine *Granta*.³⁵ O'Nan was an aerospace engineer who had graduated from Boston University (BU). "My father and grandfather were engineers, and I was good at math, and had been fascinated with planes and rockets since I was a kid, so aerospace engineering seemed like a natural path. At BU I liked my mechanics and physics courses, but while I did well at the more theoretical math courses, I wasn't really intrigued by them. I hadn't started writing yet, but I was reading a lot on my own, and getting into music and art and all kinds of things that the strict engineering curriculum had no place (or room) for."³⁶

O'Nan worked for the Grumman Corporation, doing fatigue analysis of aircraft parts, before returning to school to earn an MFA at Cornell University and embark on a second career as a writer.

Discussion

Each of the engineers that were interviewed has demonstrated his or her creativity as a poet, short story writer or novelist. Some have had tremendous careers, publishing many very well-received volumes. Others are just starting although their initial successes have been remarkable. All have earned a place in contemporary literature, developing their readership, garnering positive reviews, and finding a place on the shelves of America's brick and mortar bookstores as well as the listings of the online book merchants. To accomplish this they have manifested skill with language, a highly developed sense of literature, especially within the genres where they have chosen to work, and the tenacity and will to apply themselves to being recognized in the literary world. Most of all, they have found within themselves the creative spark and the problem-solving abilities that are prized within both engineering and writing and using these assets were able to design and develop literary efforts that have been recognized at the highest levels.

Most struggled to find the time to practice their creative writing while working at demanding jobs that also looked to use their energies. It may be that these are all individuals with different lives and different stories and little if anything can or should be inferred from their experiences and insights. But there are many similarities in the paths that they have followed and by looking at them it may be possible to get some sense of how engineering education and the engineering curriculum responds to students who have an abundance of creative talent and possess a degree of skill with language.

For example, several of the engineer-writers noted the appearance of subjectivity in grading in writing and liberal arts classes, and expressed concern that it may be a negative factor for some engineering students. Can writing skills be presented in a way that minimizes the appearance of subjectivity, allows engineering students to develop and enhance their communication skills, and does not end up a mechanistic and boring exercise? Some of these writers encouraged engineering students to take courses outside the engineering disciplines while in college to broaden their multidisciplinary knowledge and their perspectives. How many of those courses can be packed into tough technical curricula? How can students be guided so they find and take courses that match their inclinations and really help them grow as opposed to taking courses outside their major for the sole reason that they meet an institutional liberal arts or general education requirement and are offered at a convenient time? Several of the interviewees noted their dislike of classes that relied on memorization, especially when the need for that memorization was not evident. How can student diligence and progress be measured and evaluated without subjectivity if nothing must be committed to memory? How do you demonstrate the importance of memorizing facts, principles and equations that may be readily available in books or electronic form?

These are just some selected points taken from responses to questions about their educational experiences from a preliminary set of interviews with a small number of engineers who have been successful creative writers. But if university engineering programs are going to embrace highly creative students, especially those with strong verbal aptitudes, there appears to be a need to ensure there is room in the curricula so that students can schedule courses outside the engineering realm that satisfy their special interests and help them fully develop as individuals and engineers. Programs might also try to ensure they offer a range of courses that exposes students to both the practical and the theoretical aspects of the respective engineering field and provides outlets such as design exercises to help exercise student creativity. The need to integrate writing into student programs and teach it in such a manner that technical students clearly see its value and understand what constitutes quality work and the steps and actions needed to create it.

Additional future interviews with more engineers who have also demonstrated success as creative writers may offer very different views or they may provide reinforcement for some of the points these first seven have made.

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Biography

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