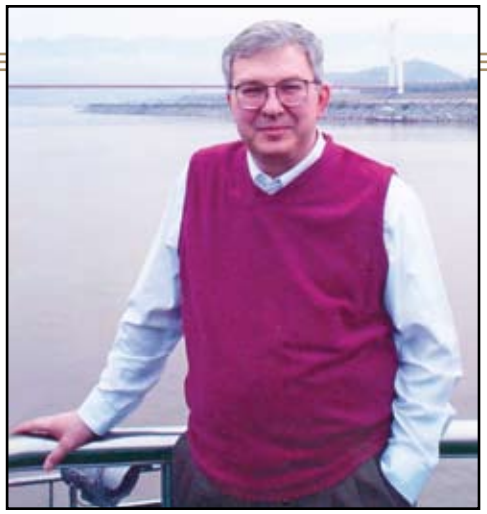
America's Poet Laureate of Technology

Duke University Professor Henry Petroski

By Richard G. Weingardt



Henry Petroski - photo courtesy of Catherine Petroski

As reported in his captivating autobiography *Paperboy: Confessions of a Future Engineer*, Henry Petroski, like many young Americans of the day, resolved to become an engineer after the Soviets surprised the world by launching *Sputnik* in the fall of 1957. In high school at the time, Petroski said, "I was good at math and science and students who excelled in those subjects, and were thinking about going to college, were encouraged to study engineering."

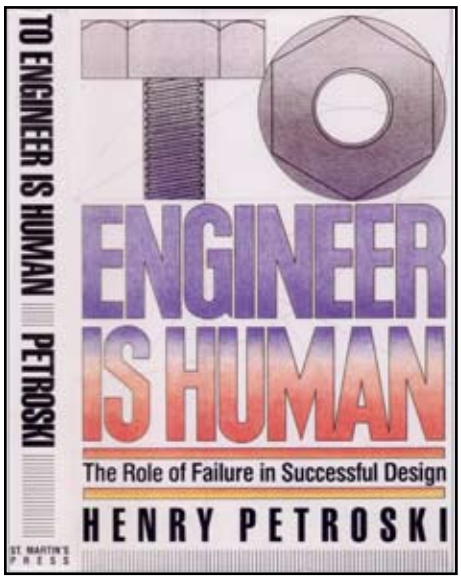
By the time he graduated from high school, it was taken for granted that engineering would be his career path. It came down to a "roll of the dice" as to whether he would get his degree in civil or mechanical engineering. The latter won the roll and so, when he entered college in 1959, the mechanical track was the degree plan he followed. His interest in structural engineering, and his subsequent fascination in expansively writing about it and other things structural, developed later on and came about in a less nonchalant but more roundabout way.

Recalled Petroski, "My involvement with structural engineering started at Argonne National Laboratory [1975-80], where I headed up a group in fracture mechanics to deal with problems relating to cracks in large piping systems and pressure vessels and other structural components of experimental and advanced concept nuclear power plants. The field of fracture mechanics introduced me to historical case studies of failure, which I found fascinating.

"When the nuclear power field in this country became depressed after the accident at Three Mile Island, a lot of the work at Argonne dried up and I looked for other opportunities. But earlier, I had begun writing essays for the op-ed pages of newspapers like the New York Times and the opinion pages of MIT's publication, *Technology Review*. In time, I began to write longer feature articles on engineering topics like fracture and failure for that magazine. I began to think of writing a book, and I thought that being at a university would give me more time to do that, especially during summers."

In 1980, he was offered a job at Duke, in part because he had been writing for newspapers and magazines as well as publishing in technical journals. Petroski said, "Duke and I seemed to be a good match. Not only did I feel encouraged to write for a broader audience, but also I had access to a world-class library that gave me the resources to write more extended and ambitious things."

According to Petroski, "My interest in writing itself began with poetry. As a graduate student and young engineer, I wrote a lot of poetry late at night. Relatively short poems, like sonnets, were not only possible to finish in a night or two, but also their structure and form (their constraints) were challenging and enjoyable to work out. I have written on what appeared to me to be similarities between writing and doing engineering. Writing poetry taught me how to look at every word, while at the same time keeping the whole composition in mind. I am sure that the discipline that I learned by writing poetry prepared me to write better prose."



Cover of Petroski's first book To Engineer Is Human

His first book *To Engineer Is Human: The Role of Failure in Successful Design* in 1985 was his attempt to answer the question "What is engineering?" He believed that "although I was a professional engineer who had been practicing and teaching engineering for years, I did not feel that I could answer that question sufficiently clearly to satisfy my colleagues who were in different fields. At the same time, in the late 1970s and the early 1980s there had occurred a number of embarrassing engineering failures (DC-10 crash in Chicago; Hartford Civic Center roof collapse; Kansas City Hyatt Regency walkways collapse; etc.) that had raised questions in the mind of some laypersons, at least, as to whether engineers had their technology fully under control."

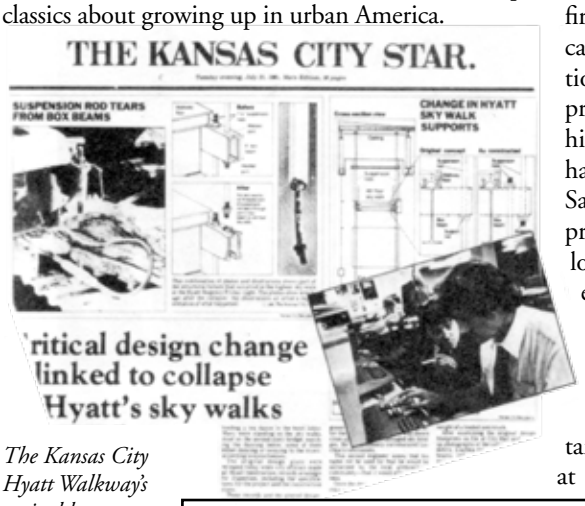
According to Petroski, "I looked for a unifying theme for a book to explain engineering in that climate, and I came to the conclusion that it would be fruitful to explore the topic through the interrelated concepts of design and failure. My background gave me plenty of examples and case studies in mechanical and structural engineering, and I used them to illustrate the book's themes."

To Engineer Is Human was very successful among engineers and non-engineers alike. It continues to be assigned in engineering schools and is recommended to younger engineers by their mentors. The book also served as the basis for a BBC-television show by the same name.

Petroski said, "It was not only the success of this first book but also the pleasure and understanding that I gained in writing it that encouraged me to continue to write about the nature and history of design and engineering – especially structural engineering-related topics. I have written about structures ranging from paper clips to suspension bridges and have striven to use such diverse examples to illustrate what I see as universal principles of design, especially those rooted in the concept and avoidance of failure. With *To Engineer is Human*, I began underscoring how writing and design are similar endeavors."

A native of New York, Henry was born in Brooklyn on February 6, 1942, the oldest of Henry F. and Victoria Petroski's three children, followed by William "Bill", who like his older brother would become an engineer – a civil engineer, and Marianne "Mary" (the youngest). Their father, a rate clerk for a trucking company, was a life-long stickler for detail and keeping lists, something that rubbed off on his sons. "My father showed me by his example how to look closely at things and how to create the lists that helped me remember them," said Petroski.

All three Petroski children attended parochial schools in Brooklyn and Queens, New York. From what Petroski recollects in *Paperboy*, their youthful escapades, though at a different time period, were not dissimilar to those described by Booth Tarkington in his delightful *Penrod* classics about growing up in urban America.

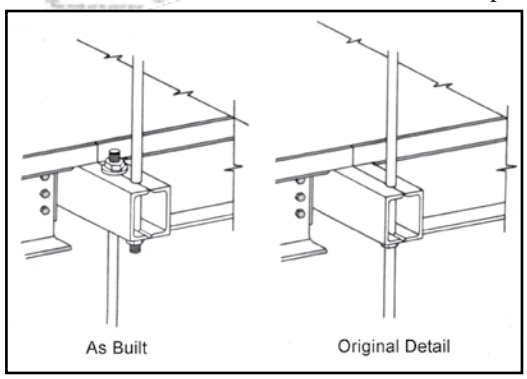

THE KANSAS CITY STAR.

SUSPENSION ROD TEARS FROM BOX BEAMS

CHANGE IN HYATT SKY WALK SUPPORTS

ritical design change linked to collapse Hyatt's sky walks

The Kansas City Hyatt Walkway's revised hanger connection detail, as depicted in To Engineer is Human, clearly illustrates the difference between what was designed and what was constructed. Photo courtesy of the U.S. Bureau of Standards



Being a paperboy for the *Long Island Press* and an almost altar boy, along with many of Henry's other youthful adventures and misadventures such as helping his father and uncle with small building and other around-the-house projects, made a big impression on him. Acquiring and maintaining bicycles was also an impacting part of his youth, highlighted by his purchase of the Cadillac of all bikes in his day – the spring-forked Schwinn "Black Phantom", a piece of equipment so prized he resisted using it to deliver newspapers when the weather was inclement. Petroski believed, "Delivering papers and my experiences as a teenager predisposed me to become an engineer."

After graduating from Holy Cross High School, Henry enrolled in Manhattan College, where he earned his bachelor's degree in mechanical engineering in 1963. He received his masters in theoretical and applied mechanics from the University of Illinois at Urbana-Champaign in 1964. He stayed for four more years and completed his doctorate in 1968. While working on his Ph.D., he was employed as a teaching assistant and instructor in Illinois's Department of Theoretical and Applied Mechnics.

On July 15, 1966, Henry married Catherine Groom in Urbana, Illinois. Catherine, a writer and photographer, has been an indispensable partner in Henry's success. She is the first reader of everything he writes, often catching mistakes and making suggestions for improvement – and assists with proofreading and with the graphics for his illustrations. Henry and Catherine have two children – Karen (a lawyer in San Francisco) and Stephen, a registered professional engineer (PE) with bachelor's and master's degrees in mechanical engineering who is currently studying patent law.

After receiving his doctorate, Petroski and his family moved to Austin, Texas, where he was an assistant professor of engineering mechanics at the Department of Aerospace Engineering and Engineering Mechanics at the University of Texas.While there, he became registered as a professional engineer (PE) in Texas.

In 1975, Petroski took a job as mechanical engineer and group leader with the Argonne National Laboratory in their Fracture Mechanics Group, Reactor Analysis and Safety Division, where he stayed until 1980 when he joined the engineering faculty at Duke University. In addition to serving in a number of increasingly significant positions at Duke, including chair of the Department of Civil and Environmental Engineering for nine years (1991-2000), Petroski was named the Aleksandar S. Vesic Professor of Civil Engineering (beginning in 1993) and Professor of History (beginning in 1995), two positions he continues to hold at the University.

An eloquent and prolific writer, Petroski allows, "My books are my projects." He has written a baker's dozen! Many of them have been bestsellers, and they have been translated into foreign languages including Chinese, Finnish, German, Hebrew, Italian, Japanese, Korean, Spanish and Turkish.

In addition to his books, Petroski has written hundreds of papers and articles for numerous technical and non-technical publications. He writes a regular engineering column in both *American Scientist and ASEE Prism* – and occasionally writes oped essays in widely read publications like the *New York Times*, *Wall Street Journal*, *Newsday* and *Washington Post*.

He has published over 70 refereed journal articles in such places as *International Journal of Fracture*, *Engineering Fracture Mechanics*, *Journal of Applied Mechanics*, *Structural Safety*, and *Research in Engineering Design*.

A much-in-demand speaker, to both technical and general audiences, Petroski has delivered many lectures and keynote addresses at conferences and meetings, in the U.S. and abroad. He averages approximately two-dozen invited lectures per year, including named and endowed lectureships, banquet speeches and commencement addresses. In conjunction with lecturing and frequent engineering site visits, his travels have taken him around the world to places like Australia, New Zealand, China, Singapore, France, Germany, Italy, Spain, Netherlands, U.K., Ireland, Canada and Mexico.

Petroski has been (and is) regularly interviewed in the mainstream media, especially in conjunction with the publication of his books. His national television appearances include the *Today*© show on NBC, as well as programs on CBS, CNN, C-SPAN, PBS, the History Channel® and the Discovery Channel®. He has also been interviewed on a wide array of radio shows such as NPR's *All Things Considered*®, *Talk of the Nation*, and *Science Friday*, as well as on Australian, British, and Canadian public radio.

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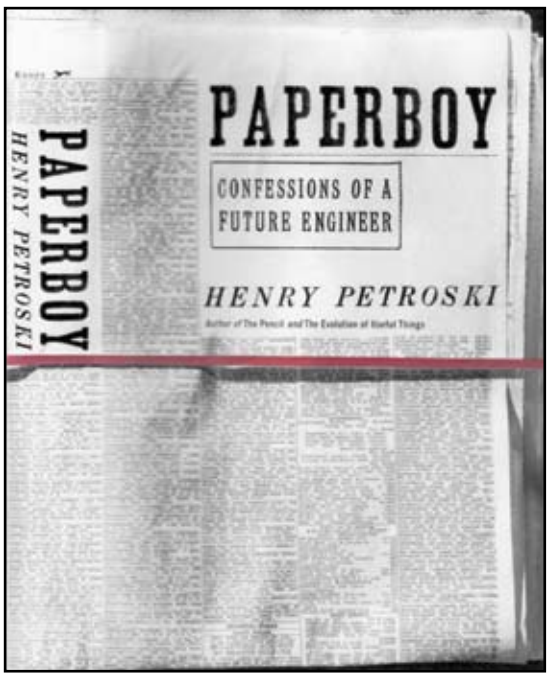

Cover of Petroski's 2002 autobiography Paperboy

America's poet laureate of technology is a fellow of the American Society of Civil Engineers (ASCE), Institution of Engineers of Ireland and American Academy of Arts and Sciences; a member of the National Academy of Engineering (NAE) and American Society for Engineering Education; and an honorary member of the Moles.

He has served as chairman of ASCE's History and Heritage Committee since 2001, and was a member of the National Academies' Science, Technology and Law Program Panel from 2000 to 2003 and NAE's Greatest Engineering Achievements of the 20th Century Selection Committee from 1999 to 2003. In 2004, he received a presidential appointment to the U.S. Nuclear Waste Technical Review Board.

Among Petroski's numerous prestigious honors and recognitions are the 2006 Washington Award from the Western Society of Engineers, Ralph Coats Roe Medal from the American Society of Mechanical Engineers, Civil Engineering History and Heritage Award from the ASCE, and distinguished engineering alumnus awards from the University of Illinois and Manhattan College.

He holds honorary doctorate degrees from Clarkson University, Manhattan College, Trinity College (Hartford, Connecticut) and Valparaiso University, and has received fellowships from Jonathan Edwards College (Yale University), John Simon Guggenheim Memorial Foundation, National Endowment for the Humanities, National Humanities Center and Alfred P. Sloan Foundation.

His research has been sponsored by the Corps of Engineers, the National Science Foundation, the Alfred P. Sloan Foundation and other organizations. In 2004, Petroski and his son Stephen obtained U.S. Patent No. 6,832,453 – the "Radial Store System," which, if wholeheartedly adopted by "big-box" retail stores, will revolutionize the way Americans do their shopping.

Many of Petroski's current research activities are focused on failure analysis and design theory. Ongoing projects include the study of key case histories to understand the role of human error and failure in structural engineering design, as well as the development of models for invention and evolution in the engineering design process.▪

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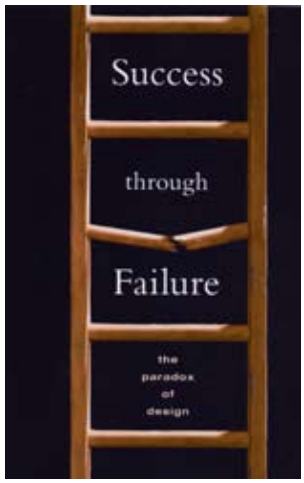
When writing about failures, remember that it is best to err on the side of caution and make your story as "generic" as possible; don't refer to specific names, but rather speak to the general nature of the failure, cause and effect, solutions, etc.



Cover of Petroski's latest book Success through Failure: the Paradox of Design. See page 62 for a book review.

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GOOD LUCK!