



## **Mark A. Turnquist**

July 26, 1949 – December 5, 2016

Mark Alan Turnquist, Professor Emeritus of the School of Civil and Environmental Engineering, died in Falmouth, Maine due to complications from prostate cancer. He completed his Ph.D. at MIT in 1975 and spent his first few years as an Assistant Professor at Northwestern University. In 1979 he accepted a position in the Transportation Systems Engineering program in Cornell's School of Civil and Environmental Engineering, where he spent the rest of his distinguished academic career. In 1986, he was promoted to full professor. He retired in 2015 after 40 years of teaching. During his tenure at Cornell he served as Associate Dean of Computing for the College of Engineering. Most significantly, he was a co-founder and long-time Director of the Engineering Management Program for CEE. Through his leadership, this program gained national and international recognition, and was emulated at a number of institutions, including at MIT. He was particularly pleased to advise many accomplished graduate students who went on to contribute to technical advances and leadership roles around the world.

His research career encompassed the development of predictive models of complex systems in which uncertainty played a critical role. His superb analytical skills and experience allowed him to work on an impressive range of problems. As a result, not only did he excel in his purely academic endeavors, but he was also in high demand by agencies and organizations in need of a unique professional to help solve their most complex problems. He collaborated with several organizations, including CSX Railroad, Austrian Railway, General Motors Research Lab, Xerox, the Veterans Administration and Sandia Labs of the Department of Energy.

Early in his research career he made fundamental contributions for developing dynamic network models for railcar management. These models explicitly represented the complex interactions between evolving demands and stochastic availability of resources. They were both elegant and

effective and hence were used productively in the railroad industry for many years.

He also made fundamental contributions to modeling to support the movement of hazardous materials. His work established the need to consider variability in the performance of transportation facilities by time of day and firmly established the value of the availability of different types of information. These insights supported decision-making to strike an appropriate balance between commercial interests and public safety.

Perhaps the most fascinating work he produced concerns the development of a decision support system for weapons dismantlement. At the end of the Cold War, through treaty, the U.S. committed to reduce its nuclear weapons stockpile by dismantling a large number of old weapons. This created a large-scale “reverse manufacturing” problem with inter-twined production planning and logistics issues. Mark led the development of a model to support the dismantlement of nuclear weapons at the Pantex plant in Texas. For this work, Sandia was a runner-up for the Franz Edelman Award from INFORMS (the professional society for Operations Research and the Management Sciences) in 1999.

Mark also developed new ways to optimize the design of distribution systems and the manufacture of products. Among the many advances in this domain, he developed the first methods to effectively incorporate inventory analysis into facility location models for distribution system design and to consider multiple objectives in these decisions. Another advance he fostered was in the creation of analytic methods to manage production lines, which are also queuing networks. Much of this work has been inspired and funded by General Motors and Sandia National Labs. Elements of this work were a key part of the research that received the Franz Edelman Award in 2005.

In January 2017, Mark posthumously received the Secretary’s Appreciation Award from the Department of Energy for work with Sandia National Labs to “answer the President’s call for an ‘all hands on deck’ response to the Ebola virus global health emergency.” In collaboration with researchers at Sandia and the Veteran’s Health Administration, Mark developed a model that could be used both to assess hospital preparedness levels and to improve resource allocation when planning for a surge of Ebola patients. Mark did an incredible amount of work to develop the earliest versions of the model in a very short amount of time. Even after much of the concerns about a wide-scale Ebola outbreak subsided, Mark and his collaborators worked to generalize the model so that it would be “ready to go” for the next infectious disease scare.

His colleagues and superiors at these various organizations universally valued Mark for his contributions to their research progress and problem solving. Everyone praised his exceptional intellect, his creativity, his keen grasp of the analytical essence of problems, and his ability to solve these problems. In addition, they admired his quiet demeanor, his sense of humor, his friendliness and courtesy. With all this success and admiration that he generated, Mark remained a totally unassuming person. He was indeed a great colleague and friend.

Following are some retrospective quotes from professionals outside of Cornell with whom Professor Turnquist interacted on various research efforts:

*“Mark’s was among the first dissertations I supervised as a junior faculty member and now 40 years and many dissertations later, it remains among the best! Mark’s contributions to the field of transportation in research, education and service represent a legacy his colleagues and family can be very proud of.” (Professor, MIT) “Mark was a super human being, who was also an outstanding researcher. Brilliant, but modest and simple. It was a privilege to have known him and worked with him for about 30 years. ...GM showered him with many awards.” (Scientist, General Motors Research Labs)*

*“Mark spent a sabbatical year here (GM Labs) and continued consulting with us beyond that point for many years. ...His insightfulness on how to approach projects and his mentoring of young researchers ... have had a continuing impact at GM for many years. ... As one example, Mark provided some of the key insights for modeling the throughput of production lines. ... This research eventually involved many more people, led to the creation of throughput analysis software and a throughput improvement process that was and is used in [more than] 100 GM plants, [has] saved GM billions of dollars, and won the prestigious INFORMS Edelman Award in 2005. ... [We] have all felt that this was the model for what a successful academic-industry collaboration should be.” (Research Manager, General Motors Research Labs)*

Mark also received College teaching awards in 2003 and 2013 and was a recipient of the Chi Epsilon Professor-of-the-Year award in 2006. He was an excellent teacher with exemplary dedication to his students’ learning. Even though it was well known that his courses were challenging with difficult homework and exams, students flocked to his courses. Before upcoming exams, lines typically formed outside his office during his long office hours, and he patiently explained difficult subject matter until the last student was satisfied.

His commitment to his students was truly astounding. As he approached his retirement in 2015, his prostate cancer looked like a losing battle. He no longer had enough energy to stand in front of his class for a whole class period. Most if not all of us, no doubt, would have relinquished our teaching activities. Not so with Mark; he decided to find a way that he could still teach his classes. He videotaped his lectures and made them available online so that his students could hear/see his lectures at their convenience and in a manner that suited their learning preferences. Then, during the Friday lecture time, Mark would come to sit in front of the class to answer any questions about the material they had studied that week. Ultimately, the students enjoyed this approach to teaching.

Mark was known to be a highly intelligent, creative, deep and productive thinker. Yet in his patient thoughtfulness he was neither hasty nor verbose. During technical discussions with Mark, students and colleagues recall his long pauses – almost to the point of the listener perceiving a lack of focus. But the pauses invariably proved to be pregnant, as Mark’s eventual responses were insightful and valuable.

So, too, it was during faculty meetings, when a topic of future research or teaching direction arose, or when administrative procedures were discussed, the conversation would go on for quite a while to give all a chance to express their opinions. Even when the discussion would go back to the starting point and colleagues started repeating themselves, Mark typically did not render a word. Was he paying attention? Was he not interested? Was he quietly continuing to work on a

tricky research problem solution? When finally asked for his input, Mark would suggest an approach or a solution that was right to the point and tended to be accepted across the board by his more talkative colleagues. Gratefully, that also meant that the faculty meeting had finally come to an end!

Mark was born in Jamestown, North Dakota where he spent his early childhood, and then graduated from high school in Hastings, Minnesota. Mark was selected as one of two seniors from Minnesota to be a Presidential Scholar and meet with President Johnson. He was accepted at Michigan State University in the Honors College as a Merit Scholar. There he earned his B.S. degree in Engineering.

Those of us having had the pleasure of spending prolonged hours in a car with Mark on our way to conferences or meetings were sometimes privileged to learn about his childhood in North Dakota.

Mark's interest in transportation began at a very early age. Mark rode the mail car on the train with his father at work as a young boy, read a book on how to fly a helicopter in elementary school and was ready to try it himself, fixed the farm machinery with his grandfather on the farm, and learned to repair his own cars with his friend who was a mechanic. He knew from an early age that he wanted to be an engineer. Mark also enjoyed maps, remembered names and places easily, and had strong navigational skills. His family had a tradition of always trying to figure out the best path to go somewhere. As his engineering, math and computer programming skills increased, it was natural that he chose an education and profession in transportation engineering and applied operations research.

He had a lifelong enjoyment of baseball, beginning with listening to Milwaukee Braves games from Wisconsin on the radio in North Dakota (they won the 1957 World Series over the Yankees), and collecting and trading baseball cards from bubble gum packs with his best friend. After retirement, he collected baseballs from teams and players that he had followed since his childhood. His collection includes a baseball signed by his high school teammates from the year when they played in the Minnesota state tournament.

His favorite cars were Corvettes, for which he developed a passion after being allowed to drive one belonging to his high school teacher in his youth; he went on to own two of his own as an adult. A photograph exists showing a hillside on the Cornell campus filled with vehicles owned by the Turnquist family, including an inherited light truck from North Dakota, and the hood of an MG that was waiting for years in the Turnquists' garage for the moment when Mark would finally find the time to restore and reassemble it.

Mark was also fascinated by the sea throughout his life. When his elementary school music teacher played a classical piece, and asked the class to write what image it evoked, Mark wrote "a storm on the sea," which was a unique answer in landlocked North Dakota. As he grew up, he read sea and naval stories. He loved the idea of the ocean as a place of adventure. It is fitting, therefore, that after decades of residing in Ithaca, NY, he and his wife Lynn moved to the Maine coast at Falmouth to stay near family while his son, Matt, completed his residency in Family Medicine at Maine Medical Center, through which Mark also received his medical care. His final

months were spent enjoying the views of the sea from his windows and playing with his granddaughter Emma. His ashes were dispersed at sea in the presence of his wife Lynn, her siblings, their sons Alan and Matt, daughter-in-law Patty, his granddaughter Emma, and extended family members.

We fondly remember a wonderful friend and colleague of great intellect, dedication, creativity, kindness, humility and sense of humor.

*Written by Arnim H. Meyburg (Chair), John F. Abel, Kenneth C. Hover and Linda K. Nozick*