

Editor's Corner

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The Editor's Corner provides perspective from the Editor in Chief on critical topics for systems engineering, either through their own words or by inviting a guest writer.

25 November 2024

Walking with Giants

A lot of conversation in the systems community revolves around the future. What does a fully digitalized systems engineering approach look like? What does AI mean for the systems we build and how we build them? How should we be using machine learning and large language models to ensure that we maximize our data insights? These are valid questions and topics that are fun to debate. But for this post, we're going to focus on the past, particularly the debt we owe to those who came before us.

In 2024, the systems community has lost three giants in the field: **Wolt Fabrycky**, **Paul Collopy**, and **Bill Scherer**.

Each of these individuals contributed greatly to the field and systems would not be where it is today without them.

Wolt Fabrycky

Fabrycky joined the University of Arkansas as a faculty member in 1957, moving to Oklahoma State University in the 1960's. In 1965, transitioned to Industrial Engineering at Virginia Tech. He served at Virginia Tech for 30 years, truly embodying the school's motto *Ut Prosim* ("That I may serve"). In 1968, he founded and chaired the Virginia Tech Interdisciplinary Systems Engineering Graduate Program. He has published many books and journal articles over the decades which are still used in systems curricula today, providing insights into fundamentals of effective systems engineering and engineering economics.

Other people will enumerate the many awards he received during in his career, the initiatives he spearheaded (such as The International Systems Engineering Honor Society). My first introduction to the name was as a master's student in systems engineering, when *Systems Engineering and Analysis* was the primary text for our introduction to systems engineering course. As a novice to the field, I appreciated the book's straight-forward communication, providing insight without being yet another dry text book.

My instructor for that course, Dr. Dinesh Verma of Stevens Institute of Technology, was a student of Fabrycky's. Dr. Verma had this to say:

Ut Prosim was exemplified robustly within Dr. Wolter Fabrycky - as a citizen of the Hokie [Virginia Tech] community, as a citizen within his discipline, and with his students - and of many, I am one. He was a member of the Virginia Tech *Ut Prosim* Society and Life Member of the Virginia Tech Educational Foundation; he was singularly responsible for the acceptance of INCOSE as a participating body within ABET [Accreditation Board for Engineering and Technology] based on an enduring classification of systems engineering programs as either "system-centric" or "domain-centric." I first met Dr. Fabrycky in the spring of 1989 - little did I know then that the trajectory of my professional career was about to get re-vectored. I will be forever grateful for having him as my advisor, mentor, and friend over the course of the past 35 years.

I had the pleasure of meeting Fabrycky (or Wolt, as I

was quickly told to call him) at INCOSE events. I was always struck by his humility. Not every person who is so well-known in a field is also happy to answer a newcomer's (sometimes silly) questions. Wolt was one of those people.

Paul Collopy

Collopy's contributions to the field of systems engineering cannot be overstated. He published dozens of journal articles, conference papers, and book chapters and several of these publications have hundreds of citations. His work on improving technical risk using decision trees provided more rigor in the process and makes risk analysis and management a much more quantitative and holistic activity. And in today's climate where AI and its implications are top of mind around the world, his collaborations in the Systems Engineering Research Center (SERC) provided insight into what it means to actually systems engineer and validate AI.

Collopy highlighted critical shortcomings in the theoretical underpinnings of systems engineering and proposed approaches to alleviate them. In 2016, he co-lead a collaborative workshop between the SERC, the National Science Foundation (NSF), and the International Council on Systems Engineering (INCOSE) that explored the research required to improve and develop systems theory. The workshop focused on two activities that are foundational for systems engineering - abstraction and elaboration - and developed common definitions, understanding of the relationships between the two, and recommended approaches for improving systems theory.

A longtime colleague of Collopy, Dr. Val Sitterle of the Georgia Tech Research Institute, had this to say about working with him:

Paul was one of the most uplifting people I have ever had the privilege to know. He balanced his tremendous intellect with humor and joy, joy not only of learning but sharing what he knew. Kahlil Gibran described a teacher as one who “leads you to the threshold of your own mind”; that was Paul. Working with Paul, you always felt elevated. He quite simply made challenges fun and teams better. I’ve never known someone who could cut to the heart of a concept so directly, and with such keen insight, and yet so constructively. He

really touched so many people, colleagues and students alike. When you spoke with Paul, you were “seen”. I’m not sure how else to describe it. His was truly a soul many of us cherished and yet carry with us every day. Hopefully, we can live up to his example.

I first met Paul at a meeting of SERC researchers relatively early in my career. In a highly intellectual field like systems, especially in the SERC where many of the researchers have PhDs, it is not uncommon to have a discussion with a very bright person. But Paul was different. His intellect was incredibly bright - and a little humbling - but glowed warm rather than burning. He helped those around him shine brighter rather than overpowering them. And I will always remember the levity he brought to our work.

Bill Scherer

Bill Scherer dedicated his life to the University of Virginia, where he earned his B.S., M.S., and Ph.D. degrees in Systems Engineering before serving on the faculty for over 38 years. During his illustrious career, he rose to become Chair of the Department of Systems and Information Engineering. In his final years, Bill focused on steering the department toward a vision he termed "Systems 2.0," a forward-looking curriculum emphasizing the integration of human and machine intelligence within systems engineering.

Scherer was a pre-eminent systems thinker, and author or co-author of two seminal books and numerous journal articles. He was a revered teacher, advocate and mentor to many hundreds of students, receiving the Outstanding Undergraduate Teaching Award in Systems Engineering — selected by systems engineering students — more than a dozen times. He was a staunch advocate for using data to inform policy and decision-making. When asked to be the chief data scientist on the U.S. House Select Committee to investigate the Jan. 6 attack on the United States Capitol, he willingly accepted, serving from November 2021 until January 2023.

Reflecting on his legacy, Peter Beling, his colleague of many years, shared:

Bill was an outstanding researcher, making significant contributions in systems analysis and systems thinking,

Markov modeling, financial engineering, and sports analytics. But what set him apart was his dedication to education, which was clearly closest to his heart. He won every teaching award in his department, school, and university. More than that, he was a mentor and an inspiration to countless students, colleagues, and friends. Bill's impact extended far beyond his technical achievements. He will be remembered not only for his innovative vision and academic rigor but also for his unwavering commitment to cultivating the next generation of systems engineers. His legacy will endure in the many lives he touched and the discipline he helped to advance.

I have heard of Bill Scherer since I first started out in systems, though I never had the pleasure of meeting him personally. Since his passing, however, I have been perusing his many posts about systems engineering and systems engineers on LinkedIn. I'm struck by the passion that comes across, as well as the number of tributes from colleagues, students, and friends. He penned an OpEd shortly before his death entitled, "Time to Rethink Professional Training," a thought-provoking piece that questions the wisdom of siloed undergraduate education and challenges us to improve the way we prepare students for the workforce. As a long-time researcher in the field, this is a topic near to my heart and I appreciate the attention and care that he brought to it.

Moving Forward

As we evolve the discipline of systems engineering, tackling today's problems and preparing for the challenges of tomorrow, I encourage all of us to reflect upon the contributions of the past and consider how they can help us move into the future.

Below is a selected list of references about these giants and their work for your reading pleasure. I hope that you will explore these, learn a bit more about the work of these incredible systems engineers, and perhaps raise a toast to them. (Please feel free to provide additional recommendations in the comments.)

Wolt, Paul, and Bill: Terry Prachett once wrote, "No one is actually [gone] until the ripples they cause in the world die away." For your loved ones and your friends,

your work and the memories you gave will be with us for years to come.

Sincerely,



Learn More

Wolt Fabrycky

Oklahoma State University Page on Wolt Fabrycky:
<https://ceat.okstate.edu/iem/people/cowboy-academy/wolter-fabrycky.html>

Wikipedia page on Wolt Fabrycky:
https://en.wikipedia.org/wiki/Wolt_Fabrycky

Wolt Fabrycky's Obituary:
<https://obituaries.virginiacremate.com/obituaries/charlottesville-va/william-scherer-12057631>

Blanchard and Fabrycky. 2013. *Systems Engineering and Analysis*. 5th Edition.
<https://www.amazon.com/Systems-Engineering-and-Analysis/dp/1292025972/>

Fabrycky. 2010. "Systems Engineering: Its Emerging Academic And Professional Attributes." ASEE 2010 Annual Conference and Exposition.
<https://peer.asee.org/systems-engineering-its-emerging-academic-and-professional-attributes>

Theusen and Fabrycky. 1992. *Engineering Economy*. Pearson College Division.
<https://www.amazon.com/Engineering-Economy-G-J-Theusen/dp/0132799286/>

Paul Collopy

SERC Article on Paul Collopy's Leadership and Contributions to Systems Engineering:
<https://sercuarc.org/celebrating-dr-paul-collopy-s-leadership-and-contributions-to-systems-engineering/>

Paul D. Collopy and Peter Hollingsworth. "Value-Driven Design." *Journal of Aircraft* 48(3). May 2012.
<https://doi.org/10.2514/1.C000311>

Paul D. Collopy. "Managing Technical Risk." IEEE Aerospace Conference, Big Sky, Montana, March 8-12, 2015. <https://doi.org/10.1109/AERO.2015.7119093>

Jon Wade, Jorge Buenfil, and Paul Collopy. "A Systems Engineering Approach for Artificial Intelligence: Inspired by the VLSI Revolution of Mead & Conway." *INCOSE INSIGHT*. 23(1):41-47. March 2020. <https://doi.org/10.1002/inst.12284>

Paul Collopy, Valerie Sitterle, and Jennifer Petrillo. "Validation Testing of Autonomous Learning Systems." *INCOSE INSIGHT*. 23(1):48-51. March 2020. <https://doi.org/10.1002/inst.12285>

Paul D Collopy. "Systems Engineering Theory: What Needs to be Done." IEEE Systems Conference, Vancouver, British Columbia, April 13-16, 2015. <https://doi.org/10.1109/SYSCON.2015.7116807>

Taylan G. Topcu, Konstantinos Triantis, Richard Malak, and Paul Collopy. "An Interdisciplinary Strategy to Advance Systems Engineering Theory: The Case of Abstraction and Elaboration." *Systems Engineering*. 23(6):673-683. 18 August 2020. <https://doi.org/10.1002/sys.21556>

Dinesh Verma, Paul Collopy, and Spiros Pallas. 2018. Systems Engineering Research Needs and Workforce Development Assessment. Hoboken, NJ: Systems Engineering Research Center, Stevens Institute of Technology. SERC-2018-TR-102. https://sercproddata.s3.us-east-2.amazonaws.com/technical_reports/reports/1529521319-A013_SERC%20RT%20174_Technical%20Report%20SERC-2018-TR-102.pdf

Bill Scherer

University of Virginia *In Memoriam* page on Bill Scherer: <https://engineering.virginia.edu/faculty/memorial-william-t-scherer>

University of Virginia Dean's Message on William T. "Bill" Scherer: <https://engineering.virginia.edu/news-events/news/message-dean-william-t-bill-scherer>

Bill Scherer's LinkedIn Post on "Scherer and Smith. "Time to Rethink Professional Training.": <https://www.linkedin.com/feed/update/urn:li:activity:725>

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Gibson and Scherer. 2007. "How to Do Systems Analysis." Wiley Interscience. <https://www.amazon.com/How-Systems-Analysis-John-Gibson/dp/0470007656/>

Richards, Gorman, Scherer, and Landel. 1995. "Promoting Active Learning with Cases and Instructional Modules." *Journal of Engineering Education*, 84(4): 375-381. <https://onlinelibrary.wiley.com/doi/abs/10.1002/j.2168-9830.1995.tb00193.x>

Smith, Scherer, and Conklin. 2003. "Exploring Imputation Techniques for Missing Data in Transportation Management Systems." *Transportation Research Record: Journal of the Transportation Research Board*, 1836(1). <https://journals.sagepub.com/doi/abs/10.3141/1836-17>

Hauser and Scherer. 2001. "Data mining tools for real-time traffic signal decision support & maintenance." 2001 IEEE International Conference on Systems, Man and Cybernetics. e-Systems and e-Man for Cybernetics in Cyberspace, Tucson, AZ, 07-10 October 2001. <https://ieeexplore.ieee.org/abstract/document/973490>

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