LIFE LESSONS OF A FAILURE ANALYST

Mac Louthan

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To my wife Fran, our children, and especially our grandchildren, who have brightened our lives and provided the inspiration for many of the stories in this book and for many stories yet to be told.
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was a first-year high school math teacher, newly married, just beginning my professional career in Augusta, Ga. My dad, Mac Louthan, was speaking at a civic gathering in North Augusta, S.C., practically the midpoint between Augusta and Aiken, S.C., where he lived. The title of his talk that night was “Why Stuff Falls Apart.” It was the first time I heard the lecture, an hour-long talk on ethics viewed through the lens of failures of various types and degrees of severity. Dad said something in the introduction of his talk that startled me. He was describing how he had come to be a Ph.D. metallurgist, research scientist, and college professor with a specialization in failure analysis. In other words, he was trying to answer the question, “Why is Mac Louthan the authority on ‘Why Stuff Falls Apart’?” He described growing up in Bluefield, Va., and his parents’ efforts to help him find direction in life as he prepared to enter college at Virginia Polytechnic Institute (now known as Virginia Tech) in the fall of 1956:

“What major should I choose in college?” Dad recalled asking.

“Well, Dickie [Mac was not always known as Mac!], you should study something you are good at,” my grandparents replied.

My dad then followed a familiar path of self-deprecation as he addressed the audience: “The thing I was best at was failure, so I decided to become a failure analyst.”

Failure? This was not what I envisioned as my father’s greatest skill! In fact, failure was something I did not associate with Dad at all. I loved the stories of his high school basketball team winning the Virginia State basketball championship in 1956. I knew my dad could put us onto fish whether we were in a lake, on the river, or in the surf in the Gulf of Mexico. With great pride I had followed my dad down the steps at Cassel Coliseum for our front row seats behind the VPI bench (Dad still won’t legitimize the name Virginia Tech) with tickets we possessed because of Dad’s former playing days. I remember going to graduations at Virginia Tech—I mean VPI—as Dad was recognized many times for excellence in teaching. I was afforded many
opportunities to travel across the United States, and even into Singapore, because Dad was sought out as an engineering consultant and conference speaker. Dad was not best at failure, though he was apparently very good at analyzing it.

If not failure, then just what was Dad best at? I have come to realize over the years, even decades now, since that night in North Augusta, S.C., when a Ph.D. research scientist from Savannah River National Laboratory spoke to a Rotary Club audience that included local businessmen, workers, and at least one high school teacher and coach, the answer to that question is probably revealed in the fact that Dad was asked to give that lecture to that audience in the first place. He has delivered the same speech hundreds of times to numerous types and sizes of audiences ever since. “Why Stuff Falls Apart” has been heard by audiences all over the world, from large auditoriums to high school classrooms, to corporations and colleges, to scholars and athletic teams, because Dad has a unique way of making very complex ideas and systems—and yes, failures—understandable. Dad demonstrates engineering principles, not merely through hard-to-read textbooks and formulae, but also by twisting carrot sticks until they break or pulling apart Snickers bars. Dad sees engineering in daily life and is able to bridge the intellectual gap and make it understandable.

Dad never used “Why Stuff Falls Apart” to amaze people with his knowledge. He used it instead to say that the things that tend to create failure in bridges, crane arms, drive shafts, and other engineered systems composed of engineered materials are the same as the things that cause failures in careers, marriages, churches, and other human relationships. Stuff falls apart because people, not just engineers, tend not to do what we ought to do—the heart of ethics. Dad understands this. Dad needed a Ph.D. to study some failures that are visible only to an electron microscope, but he has a unique way of taking those same principles and seeing how they are repeated in our daily experience.

Raising three children in a disciplined household gave Dad plenty of case studies in failure. Spoiling nine grandchildren as he erodes the whole concept of discipline in an act of revenge against our childhood rebellion has given Dad countless anecdotes and stories. He has editorialized his family and friends repeatedly in technical journals and
lectures. Why? Because his ability to relate, and relate to almost anyone, is Dad’s greatest skill.

In the pages that follow, you will read stories that do in fact relate to the science of engineering and the study of failure. But you will find them intertwined with names and life experiences of people Mac Louthan loves dearly and very well. Some of the experiences have been funny from the start. Some have been very difficult, even in the memory of them. All of the anecdotes relate to some engineering principle, ethical idea, or both. But the engineering principles and ethical ideas are not limited in their application to the industries and sciences they support. So Dad weaves them all together. For Dad was never able, nor willing, to separate his observations about the life he experienced with his family from the systems he analyzed in the laboratory. May we all learn the lesson of living such an integrated life, a life of integrity, like my dad, Mac Louthan.

Keith Louthan
Many people consider engineers and scientists to be technical geeks involved in academic exercises designed to satisfy intellectual curiosity. This opinion contrasts the self-image of most practitioners working in these arenas. We generally consider ourselves to be family members working for the good of our corporation, state, and nation. Engineers and scientists are active leaders in community and church activities, activate the moral compass of professional organizations and nonprofits, and provide a positive influence on youth as well as the elderly. Unfortunately, this more human side of the engineering and scientific community often goes unnoticed and unrecognized. This lack of recognition deflects the attention of service-oriented youth toward other professions and creates an ever-increasing need for technically educated professionals.

The stories collected in this book were written over a twelve-year period as part of an editorial series published in the journal originally named Practical Failure Analysis (2001 to 2003) then continued as Journal of Failure Analysis and Prevention (2004 to present). The goal of the editorials was to use examples from everyday life to illustrate how family and friends, recreation and responsibility, work and leisure tie together to make a person. Written to influence the failure analysis community, it became apparent over time that the lessons in most editorials had broad applicability. The importance of study, hard work, goal setting, and practice are demonstrated, as is the influence of integrity on success and satisfaction. The editorials revolve around observations made in classrooms, lunchrooms, gyms, highways and back roads. Lessons are taught by children, grandchildren, friends, and acquaintances. This collection illustrates that professional activities cannot be isolated. Life’s lessons surround us if we will only recognize the teachers. Engineers and scientists may be technical geeks, but their professional and social interactions play a major role in determining the quality of our lives.
ACKNOWLEDGMENTS

This book resulted from the trust my family, friends, and ASM International placed in my storytelling ability. Mary Anne Fleming, senior content developer, journals, at ASM International, continually provided encouragement and support throughout my tenure as editor of the Journal of Failure Analysis and Prevention. My wife Fran actually encouraged me to short cut family time to write the editorials and often edited a story before it was published. Friends and family served as examples for many of the stories, and occasionally a story was referenced or given to a group of students. Several colleagues suggested that the stories be published as a collection. However, this publication is due, almost solely, to the efforts of Ann Britton, associate product manager at ASM International. When the decision to publish was reached, Ann took charge and carried the project to completion. Publication of this collection of stories would not have occurred without Ann’s insight and efforts.

All of the editorials included in this publication have been republished from Practical Failure Analysis (2001 to 2003) and Journal of Failure Analysis and Prevention (2004 to 2011) with kind permission from Springer Nature.
ABOUT THE AUTHOR

Mac Louthan is a retired senior consulting scientist from Savannah River National Laboratory, where he spent over 30 years working in research and management. He taught metallurgy and engineering science at the University of Notre Dame and Virginia Tech, where he was elected to the Academy of Teaching Excellence and received the Sporn (student-elected) and Wine (faculty-elected) Awards for teaching excellence. He is an ASM International fellow, past president of the International Metallographic Society, on the board of trustees of the National Youth Science Foundation, founding editor-in-chief of Practical Failure Analysis/Journal of Failure Analysis and Prevention (2001 to 2011), and past member and chairman of the National Nuclear Security Administration’s Network of Senior Scientists and Engineers. The author also served as organizer and/or chairman of eight major technical conferences, was on the editorial review board of several peer-reviewed journals, and edited five volumes of Microstructural Science. He has given invited lectures throughout the United States, Canada, Europe, Asia, and Australia, published over 200 peer-reviewed papers, edited seven books, received several Best Paper awards, and presented conference keynote addresses to various professional societies. His professional awards include: the Orth Award (SRS), several Westinghouse Signature Awards for Excellence, the Sorby Award (IMS), Distinguished Life Member of Alpha Sigma Mu, the Putman Award for Service to ASM International, the President’s Award from IMS, election as a Distinguished Educator by the Materials Engineering Institute, a Certificate of Achievement for a distinguished career in Hydrogen Effects on Materials, and election as a Distinguished Scientist by Citizens for Nuclear Technology Awareness. Mac has coached Little League and college sports, held leadership and teaching positions in his church, been active in high school booster clubs in Virginia and South Carolina, was a founding member of the University of South Carolina Aiken’s Pacer Club, and is most proud of Fran, his wife of 54 years, his three children, their spouses, and his nine grandchildren.
Failures do not just happen, they are caused by the actions or lack of actions by people. A good failure analysis will determine the cause of a failure and establish preventive measures to mitigate the potential for similar failures in the future. The six fundamental causes of failure are:

- Improper design
- Poor materials selection
- Defects in materials
- Improper processing
- Errors in assembly
- Inadequate service

These causes are referenced in many of the stories in this book and readers are asked to reflect on how continual effort to avoid the failure causes can lead to success in life’s endeavors.