Mike Who?

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I told them I was leaving and they were all thrilled.
(A phenomenon I have often observed.)

- John Ashbery, “In One Afternoon,” *Planisphere*, 2009

Friday, June 28, 2013, was my final day at NASA-Ames. I started in 1987 as Assistant Division Chief for Research in the Human Systems Integration Division. I transferred to the Intelligent Systems Division in 1999 and, from March, 2012, until my retirement, I had the privilege of serving as the Acting Chief of that division. The following is an expanded version of the informal remarks I made at my retirement reception on June 26, 2013.

I would like to thank the people who made my NASA career more and more enjoyable as it went along, culminating in the Greatest Job in the World (as my predecessor, Dave Korsmeyer, accurately described the Intelligent Systems Division Chief job.)

In fact, **Dave Korsmeyer** is first on the list to be thanked, for steering the division through some very rough times, and for establishing it as the premier force in NASA for advanced software and cyber-physical systems, spanning the range of Technology Readiness Levels (TRLs) from TRL-1 (basic principles observed and reported) to TRL-9 (successful mission operational capabilities). With the division configured as Dave left it, my last NASA assignment was a piece of cake.

Sonie Lau and **Dennis Koga** always provided the exceptional management skills required to stabilize this large, diverse division in NASA's turbulent political and economic environment.

Joe Totah and **Dave Alfano** made the division's working relations with Aeronautics and Space constituencies as consistent, complete, and productive as humanly possible. **Mike Lowry** and **Bob Duffy** contributed their unique leadership skills in Computer Science and Software Engineering, respectively, to the great benefit of Ames, other NASA Centers, and other federal agencies.

Ernie Smith maintained the best possible relationship between Ames and the Mission Operations Directorate (MOD) at Johnson Space Center (JSC). This relationship was critically important in enabling Ames and JSC to demonstrate the true capabilities of advanced software systems for automated and autonomous mission operations. Even before I came to NASA in 1987, a major goal of Ames Research Center was to demonstrate advanced software systems in real mission operations. Only recently (2005-2013) were we able to achieve that goal in a convincing manner. Our success was due to a fortunate confluence of events, but foremost among these was the leadership provided by Ernie Smith and Dave Korsmeyer. Other important factors included visionary leadership in the JSC Mission Operations Directorate and some amazingly agile technical work in the Ames Human Systems Integration and Intelligent Systems Divisions.

Thanks to all the Technical Area Leads and their deputies (**Joseph Coughlan**, **Guillaume Brat**, **Richard Papasin**, **David Maluf**, **Ann Patterson-Hine**, **Kai Goebel**, **Chad Frost**, **Kalmanje Krishnakumar**, **Maria Bualat**, and **Kevin Wheeler**) in the Intelligent Systems Division. To be honest, NASA's upper management pays much less attention to technical excellence now than they did a few decades ago. The majority of upper-management time and attention is spent on bureaucracy and administrivia. By default, first-line managers, as well as the natural leaders in the technical workforce, have had to take the lead in ensuring high levels of professionalism and technical competence. The Tech Area Leads stepped up to this responsibility in a manner worthy of NASA's reputation.

Kelly Kremer, Administrative Assistant and Giants Fan Club President: Thanks for adding so much value and for always being ahead of the curve.

Thanks to **Steve Zornetzer** for his leadership at the Office of Naval Research (ONR) and at NASA-Ames, and especially for hiring me into my first federal government job at ONR in 1984. I was at ONR from 1984 until 1987, and it was like a postgraduate school for R&D management. This isn't the place to go into detail, but suffice it to say that the ONR model will never be surpassed as a pragmatic approach to R&D excellence. At a personal level, Steve always impressed me with the breadth of his understanding of science and technology. This was concretely demonstrated by his unerring ability to suggest improvements in the technical presentations of his staff. Regardless of the topic, after one quick run-through Steve could always make some concrete, actionable recommendations that would improve any presentation by 50-100%.

Thanks to **Eugene Tu**, **Rupak Biswas**, and the staff of the Exploration Technology Directorate for proactively looking out for the best interests of the Human Systems Integration and Intelligent Systems Divisions – especially for exploring all possible options to attract and maintain the superior technical staff and leadership that those divisions deserve.

Before I became Acting Division Chief, I had the incomparable opportunity to work for two years in the NASA Office of the Chief Technologist (OCT) and in the office of the Ames Center Chief Technologist (CCT), **John Hines**. Thanks to John and his entire staff for providing a stimulating and collegial work environment dedicated to the kind of technical innovation for which NASA and Ames are recognized.

During my time at NASA, the Intelligent Systems Division was primarily known for its Space-oriented work. Many people might be surprised to learn that the Division's largest single source of funding was from the Aeronautics Research Mission Directorate (ARMD). It was not just the quantity of ARMD funding that is important – the *quality* of the work supported by ARMD was deeply appreciated. **Tom Edwards** – Ames Director of Aeronautics – and our many colleagues in the Aeronautics Directorate were critically important to our success in this area.

In addition to Steve Zornetzer, **Jim Clement** and **Irv Statler** have been role-models for me of good management practices. I also learned a tremendous amount about R&D management from all my colleagues at ONR, especially **Marshall Farr**, **Henry Halff**, **Harold Hawkins**, and **Susan Chipman**.

At NASA-Ames I was fortunate to work with many outstanding colleagues in the Intelligent Systems and Human Systems Integration Divisions, from whom I have learned much more than I could ever properly acknowledge. It is futile to try to list them all, but here goes (with apologies for the many inevitable omissions): Charlie Billings, Fred Styles, Bill Reynard, Curt Graeber, Clay Foushee, Linda Connell, Ev Palmer, Mike McGreevy, Kevin Corker, Jim Hartzell, Roger Remington, Jim Johnston, Mike Freed, Asaf Degani, Barbara Kanki, Judith Orasanu, Key Dismukes, Mike Feary, Dave Foyle, Mary Kaiser, Durand Begault, Steve Casner, Beau Watson, Al Ahumada, Jeff Mulligan, Steve Ellis, Beth Wenzel, Dov Adelstein, Alonso Vera, Trent Thrush, Bill Clancey, Maarten Sierhuis, Charlotte Linde, Chin Seah, Roxana Wales, Neha Rungta, Mike Sims, Mike Lowry, Dan Cooke, Ken Ford, Jack Hansen, Serdar Uckun, Robert Morris, Jeremy Frank, Ashok Srivastava, Jessica Nowinski, Jay Trimble, Joan Differding, David Bell, Rich Keller,

George Meyer, Charlie Hynes, Vic Lebacqz, Chuck Jorgensen, Barney Pell, Pat Langley, Bruce Webbon, Vic Vykukal, Sandy Hart, Cynthia Null, Immanuel Barshi, Tom Chidester, Tony Gross, Joan Vernikos, Brian Glass, Curt Graeber, Mark Rosekind, and Mary Connors.

I have also enjoyed working with many colleagues at NASA HQ and at other NASA Centers, such as Bill Rock, Barbara Brown, Tim Barth, Edgar Zapata, Carey McCleskey, and Mike Conroy at Kennedy Space Center; Tandi Bagian, Marianne Rudisill, Matt Barry, Tom Diegelman, Alan Crocker, Tim Hall, Aaron Allcorn, Jane Malin and Lui Wang at Johnson Space Center; John Mankins and Chris Moore at NASA HQ; Sam Morello, Ricky Butler, Sharon Graves, Anna-Maria McGowan, Ed Glaessgen, and Paul Miner at Langley Research Center; Claudia Meyer at Glenn Research Center; Walt Truszkowski, Jacqueline LeMoigne and Peter Hughes at Goddard Space Flight Center; Stephen B. Johnson, Don Monell, and Andrew Keys at Marshall Spaceflight Center; and Mike Sander, Tom Starbird, Kenny Meyer, Ken Hicks, Len Day, and Rich Doyle at JPL. To any new Ames employee, I would offer one piece of advice: Get out and work with people at other Centers and HQ as much as possible!

That ends the “thank you” section.

Here is an overview of the rest of this essay:

- Capsule career summary, or “How did this happen to me?”
- Some reasons for retirement and goals after retirement
- Lessons learned, or “Twelve Tweets of Wisdom”
- The story of Jonah

Capsule career summary: “How did this happen to me?”

My entire career has consisted of working on just three things. These emerged before I ever saw a computer: (1) an algorithm, (2) a simulation, (3) a language/parser/translator. My first published algorithm was

Shafto, M. (Feb., 1962). An iteration process for cube root. *Bulletin of the Kansas Association of Teachers of Mathematics*, Vol. 36, No. 3, pp. 23-24.

Although I did not realize it, I had discovered a special case of Newton's Method. At that time in Kansas, Isaac Newton's work was virtually unknown.

My first simulation was an updatable fantasy-baseball simulation based on statistics from baseball cards. I sold one copy for $2.00, ca. 1960.

My first (concurrent!) “programming” experience consisted of writing arrangements for the Rick Hilleary Band, 1962-1966. Music synthesis remained a lifelong interest (http://piltdown.com/Boxcars.html). It's a great example of concurrent real-time programming, especially since the advent of MIDI. In fact, MIDI is a real-time multi-robot control language, a “show-control” language (http://www.midi.org/aboutmidi/tut_protocol.php), in which music plays a small part.

People who hear my music often say, “You're a programmer, right?”

My professional computer programming career began in 1967. The three simple ideas were highly reusable -- algorithm, simulation, translator -- but each was implemented many times, on many different computers, using many different programming languages.

The **machines** included IBM 1620, DEC PDP 8/L & 8/I, HP & Wang programmable calculators, CDC 6600, IBM 360/91, Univac 1100-series, Harris S-110, Data General Nova, TRS-80, Amdahl 470, DEC VAX, IBM PC, Osborne OCC-1, Xerox D-Machines, Apples, and Macs. My home computers are a three-year-old Gateway running Windows 8.1 and an Acer laptop running Windows 7.

The **languages** included various assembly languages (even Pascal P-Code), FOCAL, Fortran (II, IV, 77), PL/I, SPSS, P-STAT, roff/troff, BASIC, C, Pascal, Ratfor, SNOBOL4, Icon, Interlisp-D & other Lisp dialects, awk, Mathematica, R, Java, and MIDI.

People sometimes ask me what I plan to do after I retire. I haven't given it much thought, but it's probably not going to be anything beyond an algorithm, a simulation, and a translator.

Some Reasons to Retire and Goals after Retirement

Reasons:

- Peter Principle -- check!
- Failed to learn Python (due to boredom) and Haskell (due to cognitive decline); this tipped me off that the end was nigh.
- “A man of science after the age of 60 does more harm than good.” [attributed to Thomas Huxley]
- Permanent déjà vu is setting in, along with other symptoms of cognitive aging. My daughter is a cognitive neuroscientist specializing in cognitive aging, so there is no way I can kid myself.

Goals:

- Volunteer work, preferably at NASA's Koke’e Park Geophysical Observatory (Kauai) http://www.flickr.com/photos/wallyg/4689369589/
- Increased physical activity: especially my long-time goal of watching a marathon: https://www.ashanet.org/siliconvalley/marathon/runnernet2/public.php?2013TASVR1054 (Persi Shafto is my daughter-in-law.); http://www.marinij.com/westmarin/ci_20815881/dipsea-winners-jamie-and-roy-rivers-cherish-ancient (Roy Rivers is my wife’s cousin.)
- Spending more time with my Followers on Twitter, as well as
- Extending and ptimizing my MP3 collection

The following section is symptomatic of the retiree’s irresistible urge to pass along nuggets of alleged wisdom.

Twelve Tweets of Wisdom: Lessons learned during 29 years (1984-2013) as a Federal R&D manager at ONR and NASA

1. Reality must take precedence over public relations, for Nature cannot be fooled. [Richard Feynman, physicist]
2. Programming is fun. Computer Science is interesting. Software Engineering is hard work. I started learning to program in 1967, yet knew nothing about Computer Science until 1982. After that, I was enthusiastic about Computer Science, but knew nothing about Software Engineering until 2006. Sadly, it's all too easy to know a lot about one of these topics and nothing about the other two. Recently it occurred to me that this could be generalized to "Craftsmanship is fun. Science is interesting. Engineering is hard work." Obviously, an individual might make significant contributions along any one of these dimensions; increasingly, however, the impactful work is done by teams that put it all together.
3. The devil usually appears much sooner than the details.
4. Anything that has happened can happen. (What goes around – and is not solved – comes around; I learned this in aviation safety, but it's also relevant to putting people on Mars.)
5. A wealth of information creates a poverty of attention. [Herb Simon, Turing Award Winner] This is clearly applicable to the design of information systems, but also to science, engineering, and mission management.
6. You have to be able to manage people who are smarter than you are. [Marshall Farr, ONR]
7. The price of reliability is the pursuit of the utmost simplicity ... a price which the very rich find most hard to pay. [Tony Hoare, Turing Award Winner]
8. It's a **TEST**, not a **DEMO**! Why risk running a "demo" for the NASA Administrator, when you could instead be allowing an honored guest to witness one of your "tests"? *Demo* implies "can't fail." *Test* implies "we're engineers, doing something really hard, learning as we go."
9. In NASA, every year is a "transitional" year.
10. R&D is a momentum game. [Jimi Crawford, NASA] Note: momentum = mass x velocity; velocity = speed with direction. Jimi's short statement speaks volumes about R&D management. You need a critical mass of expertise moving at appreciable speed in a well-defined direction. Speed is not the same as velocity. Anything that undermines mass or velocity undermines R&D. Specifically, driving out talent (critical mass) or square-waving the mission (redirection) is a serious offense.
11. Bad money drives out good money. [Susan Chipman, ONR] – "bad" here means big, short-term money, usually aimed at some kind of stunt or gimmick; "good" means steady, long-term, goal-directed money (see [10] above); a related saying is, "It's easy to overestimate what can be done in three years and underestimate what can be done in ten years."
12. *Procedite donec apprehensi*: Proceed until apprehended. [Traditional, especially at Ames]

The Story of Jonah

In closing, I would like to turn to Scripture, specifically the Book of Jonah.

The plot centers on a conflict between Jonah and God. God calls Jonah to proclaim judgment to Nineveh, but Jonah resists and attempts to flee. He goes to Joppa and boards a ship bound for Tarshish. God calls up a great storm at sea, and the ship's crew throws Jonah overboard in an attempt to appease God. Jonah 1:15 (King James Version): “So they took up Jonah, and cast him forth into the sea: and the sea ceased from her raging.”

Well, for a long time it was hard for me to escape the feeling that I was Jonah and NASA was the ship bound from Joppa to Tarshish. Almost as soon as I came on board, the ship of NASA seemed to be tossed this way and that by huge storms: the 1989 earthquake, the George H. W. Bush on-again off-again “Mars initiative,” turbulent political controversies, declining resources, the inability to send humans into space at all, and finally sequestration. I could not help thinking that, if only the NASA crew took me up and cast me forth into retirement, the sea might cease from her raging.

But, of course, this egocentric analogy ignored two sources of evidence: (1) the problems that NASA encountered well before 1987, say, from the cancellation of Apollo in 1972 up through the Challenger accident in 1985; and (2) the great accomplishments of NASA between 1987 and the present, including the Hubble Space Telescope, the International Space Station, Cassini, MER, MSL, Kepler, and many others.

During the same period, changes at Ames have maintained traditional strengths while developing new ones. We experienced substantial changes in the Intelligent Systems and Human Systems Integration Divisions, especially the growth and development of an outstanding younger generation of researchers. Today both divisions are strong, agile, and well-adapted to the NASA of the future.

In brief, I have good news and bad news. The good news is that NASA incurred no significant damage by taking this old Jonah on board for a few years. The bad news is that my dive into the sea of retirement is not likely to end the storm. Major storms raged around the founding of NACA in the early 20th Century, and similar storms will continue to rage. The ship of NASA will survive, as always, by the intelligence, ingenuity, and skill of the NASA crew.