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Lessons for Life

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Lessons for Life

Abstract

This piece explores the creation of character and talent through a wide diversity of education and experience.

Author/Artist Bio

Story Musgrave was born in 1935 on a dairy farm in Stockbridge, MA. He was in the forests alone at 3 and by 5 floated his homebuilt rafts on the rivers. He rode combines at 5, drove trucks and tractors at 10 and when alone in remote fields repaired them by 13. He never finished school, ran off to Korea with the U. S. Marines where he was an aircraft electrician and engine mechanic. He started flying with the Marines and over the next 58 years accumulated 18,000 hours in over 160 aircraft. He is a parachutist with over 800 freefalls. He has 6 graduate degrees in math, computers, chemistry, medicine, physiology, and literature. He has been awarded 20 honorary doctorates. He was a part-time trauma surgeon for the duration of his astronaut career. He was a NASA astronaut for over 30 years and flew on six spaceflights. He performed the first shuttle spacewalk on Challenger's first flight, was a pilot on an astronomy mission, conducted two classified DOD missions, was the lead spacewalker on the Hubble Telescope repair mission and operated an electronic chip manufacturing satellite on Columbia. He was the communicator in mission control for 25 missions. Today he is a producer/director of multimedia, a landscape architect, a heavy equipment operator, an innovator with Applied Minds Inc, and a professor of design at Art Center College of Design in Pasadena, CA. Story also performs multimedia corporate presentations on the topics of design driven innovation, project management, operations, human performance, reliability, quality and safety. He has 7 beautiful children: Lorelei, Scott, Holly, Todd, Jeff, Lane and Story, ranging from age 55 to 8 years, 3 beautiful grandchildren, and a beautiful wife, Amanda. More can be found about Story Musgrave here: www.storymusgrave.com

Keywords

astronaut, life story, multiple domains, childhood, education

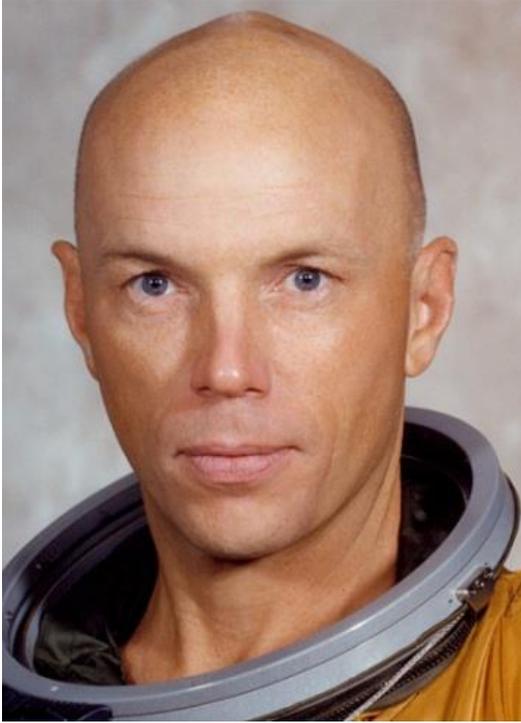
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Lessons for Life

Story Musgrave



I am a product of child labor. When the hay balers of 1943 could not tie twine knots I rode on a makeshift bench at age 8 and tied them by hand with needle-nose pliers immersed in clouds of dust so thick I could barely see my hands and I got my hands out of the action before the next cycle would have removed them. Without instruction, just “do it”, I operated every piece of equipment on the dairy farm by age 9. By 12 or 13, left alone in remote fields, I kept the machinery going even when it was badly broken--just figured it out and kept going. The state police would stop the truck going down the road because they could not see the head of the person driving it. “Son, you cannot possibly be 16?” “No sir, I am 12.” “Please be careful”, he would walk away and close his eyes to this situation because he knew without me the farm would go under. Despite my efforts the farm went under anyway when I was 16.

I put my mechanical skills to work as an oiler (grease monkey) and mechanic on heavy equipment constructing the Massachusetts Turnpike. The turnpike was finished by the time I turned age 17. I was then out of work and of course I never finished school. With all the graduate education and doctorates NASA insists upon for scientist astronauts I was very fortunate that they never asked if I had a high school diploma because I did not.

With no job and no education I joined the US Marines and of course they assigned me to being an aircraft mechanic, and I then, became accountable and responsible for a 3000hp (horsepower) turbo-compound aircraft motor. I advanced very fast with military aircraft as I was very creative with my diagnostics--what is broken and what needs to be done, but never ever creative on what I did about it. I never touched an aircraft other than exactly the way I had been taught and strictly by the book—creativity in my diagnostics and my plan, but only discipline in my actions. Within months of joining the squadron I was promoted to Crew Chief; I had an aircraft of my own, I took care of the motor, coordinated all other maintenance specialties and it was I who went to the head shed and signed off a hundred technicalities and the final sign-off that the aircraft was airworthy and fit to go to war. I was accountable and responsible for the airworthiness of military aircraft as an 18 year old Private Musgrave, yes, one stripe on my arm; exactly 40 years later this Private Musgrave would be the lead mechanic to repair the Hubble Telescope in orbit. I looked after my machines at airbase K-6 in Korea, on the aircraft carrier USS Wasp and at Kaneohe MCAS, Oahu but without a high school education my future was limited so I had to move on.

I did not get accepted to any university but on the day of admissions I knocked on the door of the dean, told them I had been turned down but they had all my paperwork and I was ready to go to work; no caring human could turn down this kid on the door step or pass up this opportunity to take some risk and responsibility for an exception to the rules. The door for me opened. 28 years later that kid gave the university-wide commencement address and received an honorary D.Sc. My entire life I had to look after every detail just to survive or hopefully to arrive at some desirable outcome, like herding a bunch of cats to the finish line. When I got to the university I discovered that if you could quantify the details there were ways to deal with them mathematically so my principal pursuit as an undergraduate was multivariate statistics and the mathematics of complex

variables. I have pursued details during my entire life that is the essence of who I am, how I got where I got and what I have to offer today—identify the details and their relations, figure it all out and control and bound them enough to bring the total system to the desired state. Informally I have been a systems engineer my whole life even before the field existed.

I loved the university life but I missed my Marine Corps ways: technology, education, discipline and especially the “*just figure it out and get the job done*” spirit; so, I joined the active reserve during my college years. The local outfit had no airplanes for me to mess with so I drove M47 and M48 tanks. The tanks did not fly but I was a 20 year old farm kid at this point and the tank got an 810hp V12 so how could I complain; little did I know that the rockets would come later. It was not intended that I work on my tanks but when they broke I usually got them fixed before the paperwork got filled out. I also drove and maintained heavy construction equipment throughout my college careers; I love machinery and I love dirt but this also paid for my colleges, the Corvette and the motorcycles.

After graduation I worked for a short time as a corporate mathematician then off to graduate school for more ways to deal with more details. Got into operations research, the early forerunner to formal systems thinking, and also got into the fastest computer of its day, the IBM709, as an operator, programmer, compiler and assembler. But, oh dear, machine “intelligence” turned me onto biological intelligence, the brain; I became obsessed, totally possessed with neurophysiology so after graduation I left the computer world for pre-med in chemistry and then off to medical school. The first week in med-school I got a part-time job in the Neurosurgical Research Lab at Columbia and worked there for the next 4 years; I learned the scientific method by doing it and I figured out all the little workings of the lab and how to get all the jobs done, again all the details—so, under everyone’s tender-loving-care I became a full-fledged member of the research team and

was presenting and publishing significant papers in neurophysiology as a freshman. I completed 16 years of college, that is about 160 courses and the most valuable, most essential course I ever took was Public Speaking. I was on about my 4th degree at some college and they looked over all my transcripts and found out I had never taken a course in public speaking. “Story, we know how educated you are but no one, not even you, is going to leave here without public speaking”—they were right on. Everyone has something to offer to the world, call it content; and everyone needs a way to give it to the world, call it form. No matter how good your stuff is you must have a way to get it out there—speaking, writing, art, media, diagrams, graphics, dance, piano and on. And again, for those of you that I left out in my brevity, I do know that you are out there. Recently, Intel asked me to give them a presentation on the future of the world. Evolution has created massive complexity in the carbon world; we are doing the same with the silicon world and tying them together in more and more complex knots. I could have told my ideas to Intel in words but instead I showed them my concepts by painting pictures of an ever accelerating complexity on our planet. Throughout this effort Teilhard de Chardin’s 1941 philosophical classic, *The Phenomenon of Man*, which dealt with the theme of planetary complexity, was running in the background of my heart and soul.

I was in my clinical training headed for neurosurgery and neurophysiology when I read in *Science Mag* of a proposed future program by the National Academy of Science and NASA to select and fly scientist astronauts. Oh dear, is this another unexpected fork in the road, they would not dare do this to me, but it really looks like they will and that job will challenge me to leverage without exception every skill that I had ever acquired, so here we go back into graduate school in biological physics and post-doc fellowship to get ready for the next playing field. I was a very experienced pilot at this point—get the details, figure it out and get it right the first time and every

time—seems like we have done this before. I was also a very experienced, pioneering parachutist at this point; I will not repeat myself again.

Even without a high school education I got taken by NASA in the mid-sixties, worked my details there for over 30 years, flew on 6 missions and was the lead communicator in mission control for 25 other missions. To maintain and grow my skills in medicine I trained and worked as a trauma surgeon 3 days a month for most of my astronaut career. This was a great fit, my systems thinking and aerospace principles could be more easily applied to this branch of medicine than most others. And of course, I have been fixing things my entire life so it makes sense to now fix people.

I had been the lead astronaut for all spacewalking suits, hardware and operations from 1972 forward. In 1975 I picked up the Hubble Telescope; it was to be the first satellite designed from the start to be serviceable, maintainable, and repaired by humans in spacesuits. Our team was tasked to identify all, that is every possible failure that could be encountered by the telescope and design it, the tools and the procedures such that all failures could be corrected by a spacewalker. I worked at that for 15 years till the Hubble got launched in 1990 and immediately got into piles of trouble right from the first moment it got to orbit. I was soon assigned as the mission payload commander and the lead mechanic to get up there, figure it out and fix it—the wrong mirror and 12 other failed systems. With a great team, never to be forgotten, I participated in the design of that mission, dealt with the finest and most nuanced details, went up there and got the job done—the telescope totally restored, every system performing as designed. From having read the preceding pages you know very well why I got assigned to all of this and how I got the job done. I am not one of the astrophysicists, astronomers, optical physicists, engineers or others that played such an essential and challenging role in this process; I am a pragmatist and empiricist in the

traditions of C.S. Pierce, William James and John Dewey. That was my role within this extraordinary team-to take the lessons and principles that I had learned from decades of critical personal experiences in a multiplicity of operational and mechanical domains and apply them to the Hubble case. It is an example of the spectacular creativity that accrues from dissecting the details of multiple diverse domains and disciplines and applying the discovered best practices to the dissected details of the case at hand. In this case of course it was required to transform, translate or transfigure the principles from working in coveralls or uniforms to working in a space suit in the free fall condition.

I have always lived in multiple domains by force, default or occasionally by choice. I got tossed onto one playing field after another- what are the rules of this game, what do I need to know, what new skills do I need and how do I get to the finish line. To survive or better yet, arrive at some desired outcome, I learned over the years how to leverage the obvious but often hidden synergies that really exist within and between all disciplines and from testing that thinking in real life scenarios eventually developed an operating methodology that I could live by and teach to others. As part of my current professorship I teach this methodology to the graduate students at Art Center College of Design, to many schools, universities and industrial clients and I have formally applied it in several industries to arrive at unique and non-traditional solutions. Critical to the optimization of this methodology is the understanding and acceptance that diverse domains and disciplines are purely human constructs; we have cut up a unified integrated cosmos into pieces such that humans can more easily organize it and deal with it but then like the Cartesian separation of body and mind we can't put it back together when we need to. Searching for unique and non-traditional solutions in the parallels and synergies across multiple domains and disciplines is simply looking at, accepting, and exploring the cosmos as a unified and integrated whole.

I have 7 children, the oldest is 55, the youngest is 9, and so far; I have one more opportunity to think about and play with a somewhat empty tabula rasa; what lessons for life do you start with, what can be done with early education and experiences? First of all we adore and support in every way the public school that our little 4th grader is in. It is like a second home, a second family, a comfortable, personable and serene place to take on the books. In addition to other current enterprises I am a palm tree farmer, a tree surgeon, a landscape architect, engineer, and contractor, an equipment operator, equipment mechanic and laborer. Did you really expect me to ever stop doing that stuff? I am an 80 year old farm kid playing to my strengths, leveraging all my past experiences and getting the job done. I am current in those domains and I bring synergies from them and other domains to the needs of my clients. But, I bring that stuff up at this point because it provides continuous rich opportunities for real life experiences of biology, earth and mechanics for my now 9 year old daughter, “Little Story Musgrave”. At 2 weeks I would cradle her in my arms while I ran the equipment, at 2 months her car seats would be strapped to various parts of the working equipment and she got her early math, geometry and engineering from those vantage points. At 6 she drove her own 600cc all-terrain vehicle with impeccable judgement. She is mechanically more precocious than dad; she helped with the landscaping by mowing with a 360 mower at 7, driving two John Deere and two Kubota tractors at 8 and of course helps dad with the maintenance. Youth is a singular opportunity; when they get it then it becomes part of their body and soul. Story handles the raccoons, armadillos, dragon flies, spiders, bees, snakes, worms and even our 100 “wild” turkeys. Killing roaches in our house is forbidden; you catch them and carry them out. She has been raised in the mud, the muck and the classical brown pond water that is possessed by every wiggly imaginable. She sits neck deep in it running algae and some kind of jelly through her fingers while fish and whatever else nibble all over her. When it is little Story’s

time to look after mother earth, it will not be an academic or political exercise; it will be from the heart and she will get the job done. Our little one has a very large arts and crafts table with all kinds of media all over it; the table is not in the attic, the basement or a backroom; it is front and center in the main living room. She and everyone play at the table continuously. Every wall in the house is reserved for her art; her hands are in constant motion like an athlete or musician practicing their art. At 3 one night outside of our attention she painted the whole house with indelible ink; we told her we loved her stuff and did not repaint the house till she was old enough to get it. We provide her essentially every digital device there is, great software and the internet and she takes it all seamlessly from there. But, even for an outdoor adventurous little girl, the digital world is very addictive, there is no better description, it is addictive and must be balanced with a row on the kayak, a bounce on the trampoline or some chess with dad.

Finally, I work with or for companies today that are at the scientific and technical far-out frontiers of a multi-path, multi-directional digital interaction between the machine and the human, between the digital world and a biological creature. This potential symbiosis is what led me from computers to neurosurgery and neurophysiology 55 years ago. We do some projection but we are injecting digital information directly into the brain and potentially the entire sensory system of the creature. We modulate our inputs to the creature based upon neurosensory and anatomic inputs from the creature and geometric and qualitative data from the environment the creature is actually living and moving within. The creature then experiences this stuff as if it is real world; the creature then exists in a real world but experiences it and the modified augmented reality that we create for it. On most projects I think that the creative ideation and concept development usually come prior to and guide the science and technology to the goal but in projects like this the science and technology are so disruptive I think they may have come first or at least simultaneous with the

ideation. But the digital interaction between the machine and the creature is only the beginning; we must provide human content to create a human experience and content is in the form of media, art, composition, graphics, animation, storytelling, drama, theatre and again, forgive me in my brevity if I left you out, I do know that you are there. The bottom line of all this is the user or customer experience. We must create a compelling, evocative, interesting and beautiful experience or our project won't get out of the lab. "Competitive edge" is always put forward to support pushing particular domains. The science, technology and engineering makes this customer interface possible but the experience is the perfection of this interface and things such as the psychologies of perception and consciousness and all of those contributing factors from the humanities that make for a walk in nature, multimedia experiences, recitals, theatre and film.

And, the competitive edge is not achieved even at the point of a great user experience. A project such as this requires brilliant thinking from a diverse set of very talented people and the whole thing must be choreographed to be on time, on cost and on spec by a great and creative project manager. And still we are not yet out the door with this product; we need a creative entrepreneur, a person with great business sense to attract the capital to even get started on the project and no matter how good our product, that same person must create the market for it.

As for little Story: her future lies at the intersection of her native talents, her education, experiences, her passions and the doors that will open for her. I try to provide a balanced set of book learning and real life experiences such that she can create her character and a skillset embodying multiple domains and disciplines but I never suggest the path that she should take; it is her life, not mine. When SHE expresses an interest I support that interest and assist her in finding opportunities to follow her passions.