

**DETERMINED
TO BE
EXTRAORDINARY**

Spectacular Stories of Modern Women in STEM

EDITED BY: DAWN HEIMER

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DEDICATION

IN LOVING MEMORY OF LAURIE HALLORAN



Your unwavering dedication to advancing clinical research and your passion for leadership development and making a difference in the lives of patients have left an indelible mark on all who had the privilege of knowing you. Your courage, determination, and unwavering commitment to excellence serve as a guiding light for all aspiring women in STEM. May your spirit continue to guide us as we honor your memory and carry forward your legacy with pride and gratitude, and may your life's work inspire generations to come.

TABLE OF CONTENTS

01

CHRISTINA GOETHEL



07

LOLA ADEYEMI



10

ERIKA EBBEL ANGLE

Erika has been featured on Lifetime TV and Nova Science Now on "The Secret Lives of Scientists and Engineers."

17

EVA SUARTHANA

"I will continue teaching and doing research, as education is the key to strengthening our communities and the younger generations."

22

ANNE CAMILLE TALLEY

Volunteering helped Anne broaden and deepen her understanding of teams, mentors and advocates.

25

MELANIE L. FLORES



29

TRIKA GERARD

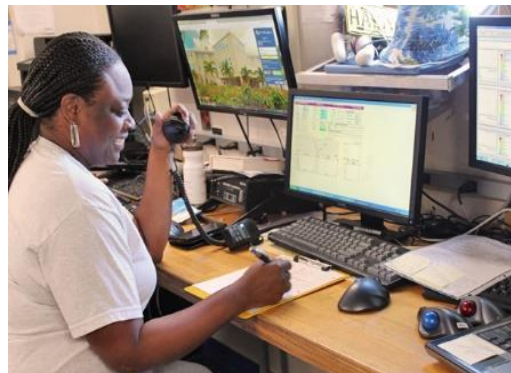


TABLE OF CONTENTS

33

SANDY JO MACARTHUR

Sandy Jo created a school within the LAPD police academy that serves underprivileged communities and prepares students for college and public service careers.

37

FELECIA BOWSER

Felecia is only one of two women and one of two minorities in her region to hold the post of Meteorologist-in-Charge.

39

KIMBERLY SMITH



44

SELINA WEBB

Give back when you can, and you will be rewarded beyond measure.

46

LAURIE HALLORAN

“Trying and failing at something new is much better than sticking with something that does not make you happy.”

54

NIKITA ANGANE

“The world needs women like us: Leaders who do not doubt themselves.”

57

LAURA GUERTIN

Laura was one of 100 female scientists selected for the INSIGHT into Diversity Inspiring Women in STEM Award.

61

MICHELE FINN

Positive and negative input made her stronger, better and more resilient. As a woman in a traditionally male-dominated positions, she needed to meet or exceed the standards set for her male peers.

65

SANDRA LOPEZ LEON

Sandra was recognized in the US as “101 most influential Latinos” in 2022.

68

ERIN SAWYER



TABLE OF CONTENTS

70

ROKELLE SUN



74

EMMA TOWLSON

Most of the outstanding mentors in Emma’s professional life were people she approached out of admiration for their work, and she set out to develop working relationships with them.

79

DARCY GAGNE

You will stand apart from the crowd if you are willing to do what no one else will. Always take things to the next level, and don’t let anyone tell you can’t - including yourself.

83

LATHA PARVATANENI



87

ELSA SALAZAR CADE

Elsa has been named one of the ten best science teachers in the United States by the National Science Teachers Association.

97

CANDICE HUGHES

Candice has been the CEO and Founder of multiple venture companies.

102

ADRIANA L. ROMERO-OLIVARES



106

CHARLOTTE SIBLEY

Follow the ABCs: Aim for progress, not perfection; Be curious; have the Courage to speak up and let people hear your ideas.

TABLE OF CONTENTS

111

KARIN HOLLERBACH

“Keep checking in with yourself, and if you’re not doing what you want, revise your goals and come up with a plan on how to get there.”

114

FATEMEH RAZJOUYAN



LOOK NO FURTHER

The female STEM role models you've been looking for are right here, right now, to inspire you!

So many STEM books for young girls are history books. This book is full of living, real-life examples of women who are succeeding in STEM. Inspiring women leaders in STEM have come together to contribute to this collective memoir. They have original, passionate stories that describe their perseverance, spirit, brilliance, success, commitment, personal transformation, and growth through words and photographs.

They have chosen to contribute for some of the following reasons: they believe their life experiences are inspirational to young girls, sharing their story advances ideas they care about, they want to highlight the vital work they have accomplished, and they want to elevate their field of study.

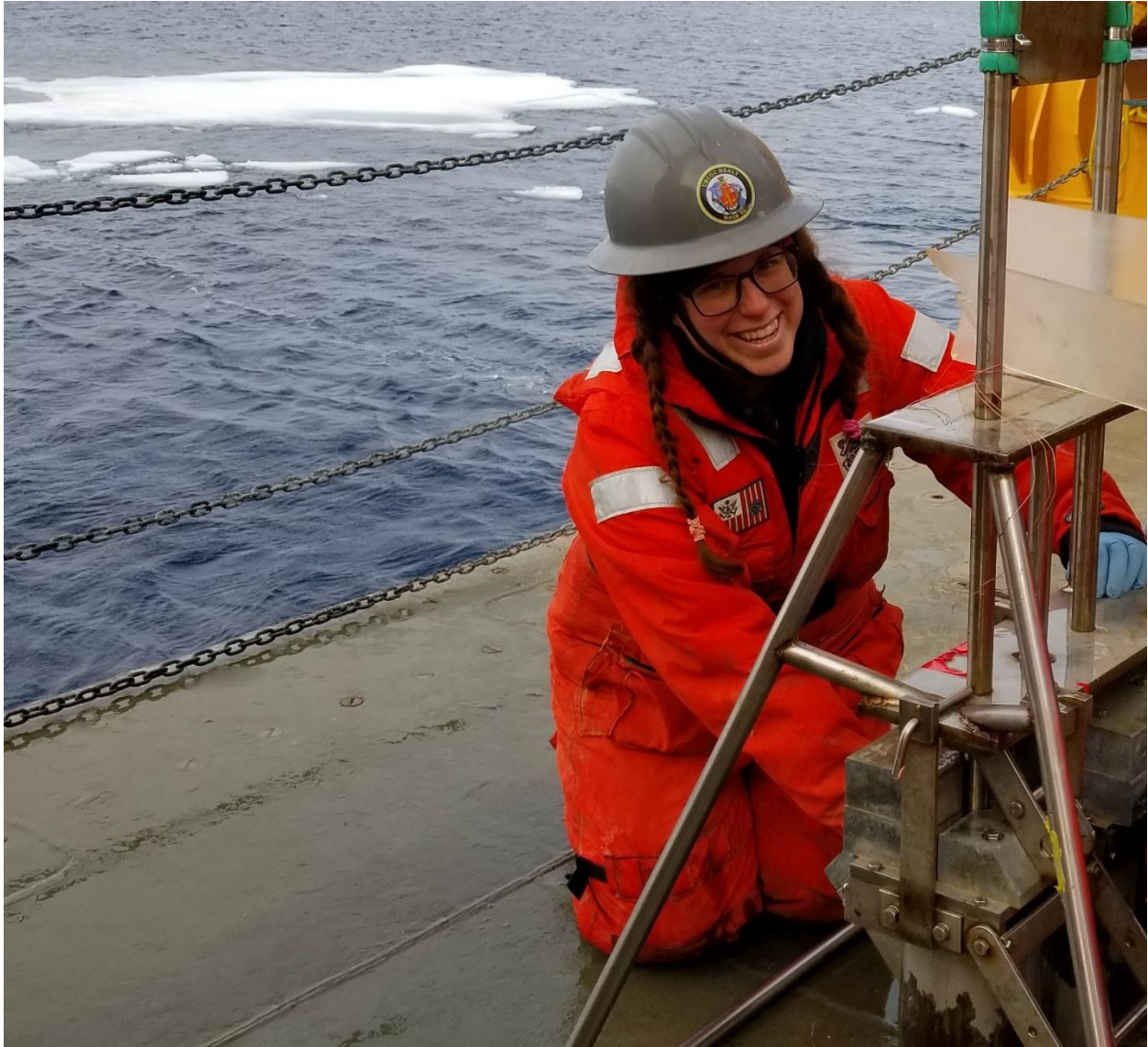
This book will show you that you can pursue ambitious goals and succeed just like us! My 10-year-old and I were frustrated with the quality of STEM books. Most of the women in those books were dead (not contemporary), the stories were written by someone else, and all the books were illustrated. We felt strongly that this downplayed their work's significance (by portraying them always as cartoons). Also, as a woman in STEM and an abstract photographer, I sought a way to highlight the fantastic STEM women I work with. We are often invisible. Yet, you bump into us every day but don't realize the extraordinary scientific work we do because we look just like everyone else and don't always have a forum to tell our stories. I felt their stories needed to be told in their own words, with pictures, and I wanted to give them a voice.

When I was young and trying to decide my path in life, there were very few STEM female role models to look up to. I hope this book changes that for you!

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DAWN HEIMER
EDITOR



ASSISTANT PROFESSOR
ASSISTANT RESEARCH SCIENTIST

CHRISTINA GOETHEL

“The people you know and the places you see shape you into the person you dare to become. With a mix of high aspirations, persistence in the face of obstacles, and belief in yourself, you can become that daring person.”

The first two ingredients to becoming the person you want to be are persistence and belief in yourself.

When I was little, I used to walk up and down the beach in New Hampshire with my aunt. She taught me about the ocean and everything that

C. GOETHEL

lived in it. I loved those days. I had many questions about the animals, plants, and rocks. I wanted to learn more about the ocean and understand how it worked, but I did not realize how much until a wonderful opportunity came along when I was fourteen years old.

I was invited to take a trip to the Arctic as part of the People-to-People Student Ambassadors. I had already participated in two other trips with them. This trip would highlight one of my greatest passions, the ocean and the animals that called it home. I never thought I would go from the beaches of New Hampshire to a ship in the Arctic, but that is what happened. It was the trip of a lifetime! We would sail around Iceland, Greenland, and northern Canada for two weeks. We would be with experts in whales, glaciers, chemistry, and tiny plants called phytoplankton. I wanted to go and learn everything I could, but with two disabled parents and little money, I didn't know how I could pay for another trip. Also, my mom is terrified of the ocean, and letting her only child go on this trip was a big decision for her. Despite it all, my parents encouraged me to find a way. I didn't know how to make it happen, but I couldn't let money get in my way. I would never forgive myself if I missed this chance.

Over the next few months, I put all my energy into raising money for the trip. I ran bake sales and wrote for support to my state and federal government officials, local charities, and community groups. I had raised funds to attend the other trips, but this one was different; this time, I would sail on the ocean. After many months of hard work and help from friends and family, I raised the money. I couldn't contain my excitement. I was about to embark on what I knew would be a remarkable journey, but I never imagined how much it would change the course of my life. Looking back, I am so grateful I did not let money stop me. Money is

an obstacle, but there are ways to overcome that hurdle if you love the goal and work hard enough.

The third ingredient to becoming the person you want to be is experience. Six months later, I traveled over 4,000 miles from Galt, California, to Reykjavik, Iceland, and got on a ship that would be my home for two and a half weeks. The ship was a classroom like no other; lifeboats hung off the side, water surrounded us, and there were no desks. I learned about glaciers, how changes to phytoplankton affect large animals, and how climate affects this ecosystem. A teacher showed us photos of whales and dolphins he had seen on other trips. One of the photos was of a blue whale, the largest animal on the planet. Like our nostrils, the blowhole of a blue whale is the size of an adult human head! We asked him about the chance of seeing a blue whale on this trip. He said there was less than a 5 percent chance we would see one on this trip.



“Despite it all, my parents encouraged me to find a way. I didn't know how to make it happen, but I couldn't let money get in my way.”

Later that week, I would find myself on the deck of the ship, staring at one of the most breathtaking sights I had ever seen. Although it was summer, the wind was blowing, the air felt fresh and cool, and sometimes small pieces of ice floated past the ship as we made our way through the Denmark Strait. As my teacher stared out at the horizon with his binoculars, he said excitedly, “No way! Could it be?” The joy on his face made me feel like I was watching a kid on Christmas Day. He pointed, and we saw

C. GOETHEL

two puffs of air and water above the surface. They were from the blowholes of a blue whale and its baby. We couldn't believe it! There we were, standing on the ship's deck, watching blue whales on my first Arctic trip. At that moment, I understood how unique and remarkable the Arctic is. We spent the next two hours following the whale and its baby. It did not matter that we were now going in the wrong direction and running late. This was what the trip was all about. We were sharing space with the largest animal on Earth in a place many people only dream of visiting. We experienced a part of the ocean's wonder and beauty with experts to answer all our questions. Later, we learned this was the first time anyone had seen the baby or calf (baby whales are called calves). At fourteen years old, I was on the cutting edge of scientific knowledge, and it changed my life.

Finding the right people is the fourth ingredient to becoming the person you want to be. I came home from that trip knowing I wanted to go back and understand the Arctic better. I had full support and encouragement from my friends and family and especially from my high school chemistry teacher, Mrs. Crawford. She was a great mentor to me. I stayed in touch with her after I graduated high school, and we became friends. I was not good at chemistry and swore I was done with it. She reminded me that I was a strong person who could do anything and encouraged me to believe in myself. She pushed me out of my comfort zone and forced me to learn more. I said high school chemistry was as far as I would go. Despite her encouragement, I lost belief in myself along the way, but being a science major in college meant I would have to study more chemistry anyway. Back then, in my college classes, if I had a good experience with chemistry, I would tell her about it. Her continuous encouragement made me a better scientist and a better person. I carried her reminders with me

throughout college. Mrs. Crawford passed away in 2015. I miss her every day, but her words of support have stayed with me.



The final ingredient to becoming the person you want to be is to try everything that comes your way! With Mrs. Crawford's advice, I started college and returned to the Arctic on a scholarship. I could not contain my excitement! I was getting paid to work and learn about the place that had a lasting impact on me.



My project was on the importance of the Pacific walrus in Alaska. I worked with Dr. Thomas Litwin and talked to scientists on the US Coast Guard Cutter Healy, the latest and most advanced polar icebreaker in the US at the time. He interviewed the scientists on board and recorded those discussions. In his videos, I saw Dr. Jacqueline Grebmeier for the first time. As I interviewed scientists for my project, her name came up, and I thought nothing of it.

C. GOETHEL

During my junior year of college, I took classes through a non-profit organization called the Sea Education Association (SEA). During one of the seminars, a teacher spoke about the Arctic and encouraged us to meet with him if we wanted to learn more. I took him up on his offer, and he suggested I look up Dr. Grebmeier. I started researching her, and her face looked familiar, but I couldn't place her. Finally, it hit me - she was interviewed on the ship! I watched Dr. Litwin's videos again and looked back in my notes; she popped up everywhere. I decided to reach out to her.

I emailed her and waited patiently for her reply. Months went by, and it was time for me to use the persistence I developed during my earlier fundraising efforts. I wanted to meet Dr. Grebmeier, and I knew I could make it happen with hard work and help from someone I knew. That help came from Tom, my advisor from the scholarship program. He was a great mentor of mine. I met with him and explained what I wanted to do. He put me in touch with Dr. Grebmeier; she answered within hours this time! I didn't give up. I got help from someone who believed in me, and it paid off.



“Find someone that supports your goals and never let the rest of the world tell you that you can't do something.”

Over the next few months, Jackie and I emailed back and forth. Finally, in May 2013, I spoke with Jackie and Dr. Lee Cooper about their Arctic research lab. I was nervous as Jackie and Lee were considered the greatest experts in their field of study. What if my experiences and thoughts didn't match up well with theirs? Yet, with these doubts, I understood how believing in myself could push me forward. My skills had led me this far, and I had to trust that they were

good enough. Within minutes of answering the phone, my fears washed away. They were easy to talk to and cared to get to know me. During the call, they offered me the chance to return to the Arctic. Lee was serving as chief scientist on an upcoming research cruise. There was an extra spot on the ship, so they invited me to come along to make sure this was still what I wanted to pursue. Once again, I was dreaming big, being persistent, and working hard to get where I wanted to be.

Three months later, I flew to the Aleutian Islands of Alaska, boarded the largest ship I had ever been on, and set off on my second trip to the Arctic. I spent the next three weeks learning how to collect and study ocean water and animals. We used special tools to collect water, tiny sea animals called zooplankton, and other critters from the seafloor. I saw my first basket star and various worms, clams, and shrimp-like creatures called amphipods.

During the trip, Jackie asked if I was interested in becoming her graduate student, and I said, “Yes!” I will never forget the magical feeling from my first trip of standing on the ship's deck in Iceland, watching the blue whales. That trip and the people who encouraged me led me to this extraordinary opportunity.

Since I started working with Jackie, I have been part of 23 Arctic research cruises on four different ships from the United States and Canada, including one trip all the way to the North Pole! On the research cruises, my work consists of water and animal collections at all hours of the day. I have met and sailed with national and international scientists, many of whom have become people I know I can rely on. Sometimes, during cruises, we only sleep two hours a day, but every minute is worth it when I look out and see breaching humpback whales, walrus, and all the cool critters we collect from the seafloor. When I am not in the

C. GOETHEL

field, each day looks a little different. Some days, I review the data we collected or write about what we have found; other days, I look into a microscope for hours, identifying the animals we gathered on the ship. I completed my master's degree in 2016 by studying how acid in the ocean affects animals that make shells, in this case, clams. While doing my research, I spent my days keeping Arctic clams alive in a cold room in Maryland. Since Maryland has a very different climate, we had to learn how to keep the room at the correct temperature so the clams would live. I also organize supplies for the research cruises and write about our research to get donations to

keep working. Just like the fundraising I did on my early trips! I finished my PhD, one of the highest levels of college degrees, in 2021, and since then, I have used my passion for the Arctic and the sea to teach students in Iceland, and now a little closer to home in Maryland. I spend my days inspiring college students and hope to have the same impact on their lives that so many people in this story had on mine. I have learned many new skills and continue to build my life as an environmental scientist and teacher. I want to leave you with one final ingredient that combines all the previous ones: Take every chance you get and embrace what might seem crazy!



Trip to the North Pole

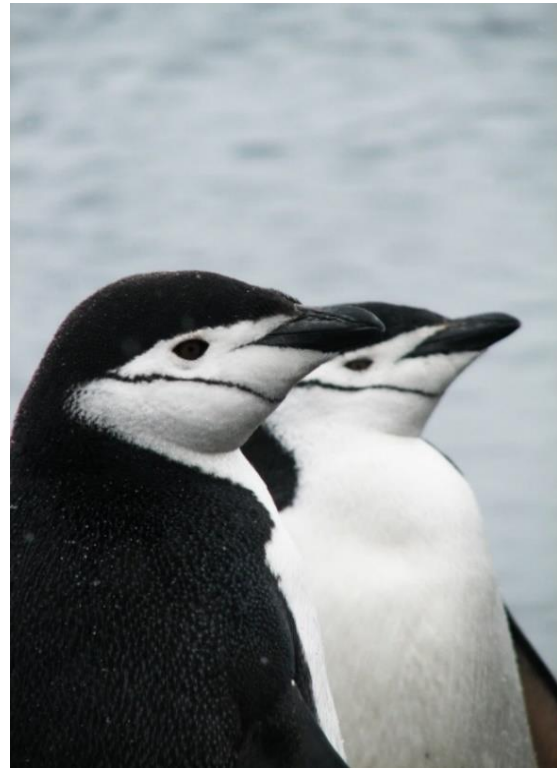


“Take every chance you get and embrace what might seem crazy!”

During my 8-week trip back from the North Pole, I discovered my dad had passed away. He was my hero and encouraged me to go to the Arctic for the first time. I still had three weeks left on my trip when I received the sad news. My dad struggled with health complications throughout his life, but this was sudden. A large part of me wanted to get off the ship and go home, but I stayed. I always promised him if anything happened, I would finish whatever I was doing, no matter how crazy it seemed. He encouraged my crazy ideas, and my life is richer and fuller because of it. I honored his lifelong, unending support for me by staying on the ship. When I returned from the trip, I was awarded the US Coast Guard Arctic Service Medal. What an honor for my hard work!

Jackie and Lee joined me on that trip, and their constant support and motivation helped me finish those last three weeks. They also made the journey a lot more enjoyable for me. Certain special people can truly make you who you are and give you the confidence to continue. Keep them, cherish them, and honor them by throwing yourself into what you love.

Life can be challenging. So many of my happiest and saddest moments have been out at sea doing what I love. But by mixing the right ingredients, time, and effort, you can overcome any problem. I waited eight years between my first and second journeys to the Arctic. However, I have made it to the Arctic at least once every summer since 2013. I have completed my graduate research and gained a lifelong mentor, colleague, and friend in Jackie.



ACKNOWLEDGMENTS

First and foremost, this book would not have been possible without the amazing women who shared my vision for this book, graciously contributed their stories, and entrusted me with them. Your passion, tolerance, and praise were genuinely humbling.

To my children, Gala and Hans Peter, the inspirations for this book, thank you for sacrificing our family time and inspiring me to make the world a better place for you. Gala, thank you for always believing that I can do anything I set my mind to.

Thanks to my husband, Todd, for providing me with a supportive environment that enabled me to complete this work, tolerate my long hours, and allow me to live like a hermit on the weekends for those long years. By the way, we can officially tell the neighbors that I am not in the witness protection program. Without you and my mom, Rose, we would have gone without dinner many nights.

I want to thank Cindy Simpson, the Association for Women in Science, Jennifer Scott, and the Society of Women Engineers for giving me a platform to find contributors. Even though we were strangers, you believed in me and my dream. Your early support fed my enthusiasm and helped make this book possible.

A very special thanks to Kathy Bowen, Auburn Cole, Dean Eklof, and their students for allowing me to test drive my stories. I cannot thank you enough for the feedback I received; I am indebted to you. Anne Camille Talley, it was your idea in the first place. I am very grateful for your advice and encouragement.

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My gratitude to Ashleigh Kyle for her expert legal reviews and practical viewpoints. You are an inspiration.

To delve deeper into the journeys of the phenomenal women who contributed their stories to this collection and discover additional resources, scan the QR code on the back of the book or visit dawnheimer.com. Connect with us online and join us in empowering young girls to become tomorrow's STEM leaders!

YOUR THOUGHTS MATTER TO US!

Thank you for joining us on this journey!

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Thank you for taking the time to leave your mark on our story.

Warmest regards,

Dawn Heimer
Editor