All in a Day's Work

2nd Edition

All in a Day's Work

Careers Using Science

2nd Edition

By Megan Sullivan for *The Science Teacher*

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CAREERS

INTRODUCTION

All in a Day's Work, 2nd Edition—with 15 new careers—is aimed at giving high school students a taste of the diversity of careers in which science is used and at making them aware of how increasingly important science learning is in today's world. The book is a collection of case stories about people who use science every day in their careers. This compendium of columns from the NSTA journal *The Science Teacher* looks at the many careers for which science is necessary. They range from the expected—high school science teacher, microbiologist, and forensics technician—to the perhaps unexpected—firefighter, landscape architect, and historical archaeologist—to the adventurous—astronaut, deep-cave explorer, and oceanographer—and to the offbeat—roller coaster designer, perfumer, and sport biomechanist.

Budget cuts in high school guidance offices often make it difficult for students looking for information about careers. It is easy—and common—to drift through school science and math classes wondering, "Why do I need to learn this?" Many students do not see a college science major or science career in their future, making the need to learn science less than obvious. Of course, the best reason for learning science is that understanding science is important in and of itself, as part of humankind's search for knowledge and meaning. Understanding science makes everything—a walk in the woods, reading a newspaper or watching the news on TV, a family visit to a science museum or beach—more *interesting*. The grand enterprise that is science springs from the most basic and fundamental of human desires: to make sense of the world.

But the next-best answer to the question—why do I need to learn this?—may be more practical and persuasive. As the stories in *All in a Day's Work* show, learning science and mathematics can lead to meaningful, interesting life's work. The careers featured in this book provide a good sense of the vast array of science fields that will be available to those having the interest and preparation. They are divided into categories that hint at this wide diversity: adventure, mystery, animals, health, technology, and art. Information also is provided about related careers. Taken together, the case stories provide essential perspectives on the many ways science learning is increasingly important in today's world of jobs and careers.

Photocopies of many of the stories found in *All in a Day's Work* have found their way into high school guidance offices and onto science classroom bulletin boards. They give a fascinating glimpse of what it is like to *do* science from people actually engaged in applying science in their daily work lives. The stories are interesting in and of themselves, but they also give practical information about educational and other career requirements.

Each of the people profiled here gives specific, no-nonsense insider's advice for those interested in pursuing the career, including where to go for additional information. Maybe even more important, reading these stories may trigger hidden interests. Gee, I didn't know I could do *that!* Or, Wow, what a cool job—I'd like to do *that!* As foodborne disease scientist Jack Guzewich observes (p. 124), "I had no idea such a career even existed when I was in high school or college." Perhaps reading *All in a Day's Work* will spare you a similar experience. Each of the 49 stories in this book is unique, and the advice about education and training is tightly focused to the particular requirements of each career. Still, common themes appear over and over:

The only thing certain is that nothing is certain. In these stories you will hear about the often-winding paths that take a person to a given career. Futurists predict that individuals will have many careers—and numerous jobs within each field—over the course of a life span. More than ever before, students today need to plan for different work roles and opportunities. Even people who share a common career usually come to it from varied backgrounds. *All in a Day's Work* contains stories of a hopeful Olympic gymnast who is now a sport biomechanist, a would-be accountant turned respiratory therapist, a music major now working as a video game designer, an aspiring science teacher who found a career as a food scientist, a roller coaster designer who originally planned to become an architect, and many other tales of false starts and changing careers. These stories demonstrate how rarely the path to a single career is straightforward, giving hope to those struggling to discover what they want to do in life. Most career paths are neither straight nor predictable—and who would want them to be? Careers can have as many sudden turns as life itself—it's one of the things that makes life interesting.

Education is more important than ever. The advice from these interviews appears loud and clear: Stay in school, study hard, take as much science and math as possible. Still, not every science career requires years and years of schooling or multiple advanced degrees. In fact, job growth for specialized PhDs will probably be flatter than for those with broader, more multidisciplinary training. Some of the careers in *All in a Day's Work* require extensive advanced

academic study, while others offer positions for those with a high school diploma. They all require a foundation of education and training that begins in high school or even earlier.

Learning is lifelong. After you accept that nothing is certain and education is more important than ever, it naturally follows that learning must be continued throughout life. Virtually every career in *All in a Day's Work*—from auto technician to artificial intelligence expert, bomb investigator, genetic counselor, and all the rest—requires lifelong learning.

There are many paths to discovering what you want to do and what you will become. *All in a Day's Work* profiles people who were inspired by high school teachers, parents, summer jobs and internships, after-school programs, and personal hobbies. Hurricane researcher Christopher Landsea became interested in meteorology though a community research program at his high school and also a love of windsurfing. Perfumer Christophe Laudamiel was inspired at a young age by the fragrances from his family's kitchen and gardens. As he was growing up, oceanographer Evan Forde always loved water sports and was inspired by a television show, *The Undersea World of Jacques Cousteau*. Arachnologist Paula Cushing became interested in spiders while in high school, through volunteer work as a park naturalist and a summer internship at the Smithsonian Institution. As these and other case stories demonstrate, there are many routes to a career that uses science. Visiting museums, watching documentaries, reading, and gaining work experience through summer jobs, volunteer work, or internships can all provide valuable guidance and direction. Paying attention in science and math classes can help, too!

Most careers require multidisciplinary approaches. Specialized scientists will always play an important role, but the case stories in *All in a Day's Work* show that cross-discipline problem solving is essential in a wide variety of careers. Auto mechanics apply chemistry and physics concepts; oceanographers require preparation in biology, geology, and other physical sciences; scientific illustrators need a good background in all the science disciplines. Art conservationist Susan Barger credits her success to a college double major in art and French and an interdisciplinary doctorate in materials science, chemistry, and the history of technology. A solid grounding in all the basic sciences is a good start for any career. Interpersonal skills and teamwork, as well as communication and critical-thinking abilities, can prove invaluable. These skills can be developed over time through inquiry-based science investigations and cooperative classroom activities.

Almost all careers in the 21st century require a working knowledge of science and mathematics. The case stories in this book only scratch the surface of the many careers open to

those who have a science background. The increasingly technological nature of modern society places a premium on those with science and math training. From 1980 to 2000 the number of science and engineering careers increased more than four times the rate of growth for all jobs, and expansion of S & E occupations is predicted to continue to remain higher than for the labor force as a whole (Science and Engineering Indicators 2004). It is difficult to imagine a future career for which a science background would not be at least helpful, if not truly essential. The pending retirement of 78 million baby boomers can only add to the need for science and mathematics training, as companies begin recruiting replacement workers in science fields, sometimes—believe it or not—as early as *middle school!*

Science is for all. While barriers still exist, science careers are opening up to underrepresented groups as never before. The story of NASA astronaut Ellen Ochoa is hopeful. In her case story she notes that women weren't accepted into the astronaut corps until she was halfway through college. Her science education ultimately allowed her to become the first Hispanic woman to fly on a mission to space—she now is a veteran of four missions—and to perform science and technology experiments aboard the Space Shuttle and International Space Station. In 2000 women earned between 40% and 60% of the bachelor's degrees awarded in mathematics and in physical, Earth, ocean, and atmospheric sciences. Their share of engineering degrees has increased dramatically from the mid-1970s to the present. Also during the same period, the percentage of nonwhite students earning science bachelor's degrees more than doubled (Science and Engineering Indicators 2004). The case studies in *All in a Day's Work* illustrate the wide diversity of people who are drawn to science careers.

Science is creative. The persistent image of the clipboard-holding scientist in a white lab coat does much to foster the illusion that science is dull, dry, and uncreative. Nothing could be further from the truth. Pure science is among humankind's most creative endeavors, and science is applied in a wide range of interesting, creative fields. As the case stories in *All in a Day's Work* show, science careers offer a place for art conservationists and illustrators, music majors and architects, perfumers and landscape designers, video game creators and cryptographers. Creativity is virtually a prerequisite for most science-related careers.

Science careers are among the most interesting and rewarding. The scientists of *All in a Day's Work* often are asked to describe a typical day at work, and animal nutritionist Mark

Edwards's response is shared by most: "There really isn't a typical day at work—an aspect of my job that I particularly enjoy." Science-related careers like those described in this book require tackling new challenges and solving interesting problems on a daily basis.

Chance favors the prepared mind (Louis Pasteur). In its own way, each of the stories in *All in a Day's Work* points out the importance of being ready for opportunities that often arise from chance events and encounters. A family illness led Robert Adams to a career in radiation therapy. Respiratory therapist John Hiser credits being drafted into the Navy during the Vietnam War for his ultimate career choice. Others in this book have similar stories to tell. The constant theme in these vignettes is that solid preparation in background science knowledge consistently opens doors to many career opportunities.

You can do it. Career counseling can be difficult to obtain as budget cuts force schools to reduce their guidance departments. The good news is that information about science-related careers has never been easier to find. The case stories in *All in a Day's Work* include suggestions about how to find additional career information, including links to the websites of relevant professional organizations and interest groups. So read the personal stories in *All in a Day's Work*, find ones that interest you, and go check out the recommended internet sites for more information. Even better, find someone in your area working in a particular career that you think might be interesting. Like the men and women interviewed for this book, most professionals love to showcase and discuss their careers with young people.

The advice found in this book is as ancient as Confucius: "Find a job that you love, and you will never have to work a day in your life." The people profiled here have found jobs that they love. Their careers are interesting, often exciting, and in ways small and large they help make the world a better place. And who knows? Reading about them might just inspire you to join their ranks.

Steve Metz
Field Editor
The Science Teacher

Reference

Science and Engineering Indicators 2004 (National Science Board). Accessed July 31, 2006. *www.nsf.gov/statistics/seind04*

CAREERS

Alphabetical List

ACADEMIC DEGREES

These are some of the degrees that people in this book have earned.

AA—associate of arts

BA—bachelor of arts

BFA—bachelor of fine arts

BS—bachelor of science

DVM—doctor of veterinary medicine

EdD—doctor of education

MAA—master of applied anthropology

MEd—master of education

MFA—master of fine arts

MPH—master of public health

MS—master of science

PhD—doctor of philosophy

VMD—see DVM

ABOUT THE AUTHOR

Megan Sullivan is the managing editor of *The Science Teacher* and a member of the National Association of Science Writers. Her background includes a BS in integrated science and technology and an honors education from James Madison University. She has conducted research in a National Aeronautics and Space Administration lab, mountaineered in the High Sierras, and lived in Italy. She is also a yoga teacher and a freelance writer/editor.

Animal Kingdom

SHARK ADVOCATE

Most sharks are the top predators in their ecosystems, yet they are often at the bottom of the conservation priority list. Because they are underprotected and exceptionally slow growing, and therefore vulnerable to overfishing, most of the world's shark populations are declining. In fact, 20% are threatened with extinction. To restore shark populations within the lifetimes of today's high school students, action is needed now. Sonja Fordham—the Policy Director for the Shark Alliance and Shark Conservation Program at the Ocean Conservancy—enjoys sticking up for these underdogs. Fordham believes the public, including students and teachers, are the key to turning this situation around.

OVERVIEW OF THE FIELD.

Shark advocates spend a majority of their time trying to convince officials at various levels of government that sharks are important, valuable, and deserving of conservation action. Sharks are essential for maintaining balance in marine ecosystems; offer insight into combating human diseases; and are a source for food, income, and recreation for people around the world. In order to provide these benefits, shark populations must be protected from overfishing.

Because my organization is a science-based advocacy group, I focus on translating advice from scientists and other technical experts into public policy. This involves distilling scientists' recommendations and transforming those points into language that the average citizen can understand and the average fishery manager can absorb in a limited amount of time. If we convey information that makes sense and if necessary actions are supported by the public, we hope that fishery managers will act. Usually this action takes the form of restrictions on fishing, habitat use, or trade.

SUPPORTING SHARKS.

Seventeen years ago—when I accepted a job in the fisheries program at the Center for Marine Conservation [now called Ocean Conservancy]—I had secret hopes of eventually transferring into the program focused on marine mammals, my high school passion. When I got "inside," however, and saw how the save-the-fish mail stacked up against the save-the-whales mail [not well] and how marine-fish restrictions compared to marine-mammal protections, I decided that fish were more in need of advocates and stayed put.

Fordham enjoys sticking up for sharks.

At the time, the wasteful and indefensible practice of shark finning—slicing off a shark's valuable fins for soup and discarding the body at sea—was still legal throughout the world, and fisheries targeting sharks off the U.S. East Coast were expanding without any restrictions whatsoever. As sharks generally grow slowly, mature late, and produce few offspring, it is easy to see how the situation amounted to a recipe for disaster.

Since then, I have done my best to make people realize that sharks are as vulnerable and deserving of effective protections as whales and dolphins. As the Ocean Conservancy's fish conservation program expanded, I pared down my responsibilities to only issues related to conservation of sharks and closely related skates and rays. I enjoy being on the forefront of untraditional campaigns. I also like the great variety of tasks and audiences that are associated with my job.

A TYPICAL DAY?

My day-to-day tasks are dominated by writing projects. I craft a lot of letters to government officials at state through global levels requesting safeguards for sharks—usually limits on shark fishing. To foster public awareness and support for these requests, I also write action alerts (to prompt our members to send letters to policy makers at major decision points), press releases, fact sheets, opinion pieces, magazine articles, testimony, in-depth reports, technical papers for scientific or legal journals, petitions, and text for cartoons and children's publications. Even an invitation to a reception [such as to launch a report or campaign] has to be carefully worded to optimize its impact.

My other main role is to directly appeal to people and decision makers through meetings with members of congress, parliament, and government administrations; special events; presentations at scientific conferences; rallies; and other speaking engagements. As part of this work, it is important to keep up to date on scientific developments, government proposals, and other news related to sharks, and to maintain cooperative working relationships with conservationists, supporters, scientists, government officials, industry, and the media.

BACKGROUND NEEDED?

I truly believe that it takes people from all walks of life to form effective coalitions. Naturally, a background in science [or law] is extremely helpful in building a career as an advocate for sharks and wildlife. I cannot understate, however, the importance of developing strong writing skills. So much of advocacy work involves writing, and there is a great need for people who can craft clear, succinct documents for a variety of audiences [from children to elected officials to scientists to journalists]. This is the number one skill I look for when considering prospective interns and employees.

I received a bachelor's degree in marine science. For many years, I expected that I would return for a graduate degree, but never found a time when I did not love my work enough to leave it or thought the sharks could fend for themselves! I am very fortunate to have found a wonderful, ever-changing, and challenging job at a great organization. I am happy about where my on-the-job training has taken me and honored that at least one of my publications has been used in graduate-level science courses to uncover the realities of the fisheries management process.

ANY ADVICE FOR STUDENTS?

I often wish I had studied public speaking and joined the debate club when I was in high school. Such endeavors can help to build confidence and serve as a strong foundation for any advocate. In the end, I believe the most important qualities are passion for the cause, tenacity, creativity, integrity, and respect for others' perspectives. A sense of humor can also help one through the tough times.

Students have the power to dramatically improve the outlook for sharks. Citizens of all ages should remember that their government officials work for and need to hear from them. A simple letter of concern, especially a personal one, can help to demonstrate support for shark conservation and spur decision makers into action. Such pressure represents the sharks' best hope—perhaps their only hope—for a brighter future.

BONUS POINTS

EDUCATION
BS, marine science

ON THE WEB
Shark Alliance *(www.sharkalliance.org)*; Ocean Conservancy *(www.oceanconservancy.org)*

RELATED CAREERS
marine-science technician, environmental planner, baykeeper, environmental lawyer, aquaculture veterinarian, ecotourism guide, underwater filmmaker

COSMETIC CHEMIST

Where do you turn when you have a bad hair day or need to cover up an unwanted blemish? From hair gels to concealers, cosmetic chemists use science and creativity to develop products that make us look and feel good. As the executive director of Chanel's Research and Development Formulation Laboratories, cosmetic chemist Amy Wyatt finds it exciting and rewarding to create useful, safe, and appealing personal care and pampering products.

DESCRIBE THIS FIELD.

In some ways, the process of formulating a cosmetic product is similar to cooking. With a scientific mind and an artistic eye, a cosmetic chemist carefully selects approved ingredients for an experimental formula. The ingredients can vary from natural or organic to highly advanced manmade substances. Ingredients must be evaluated and tweaked until the exact, desired product is achieved. This formulating expertise is gained over time through lab experience.

Chemists in this field can specialize in various areas. For instance, skin-care chemists create products such as cleansers and moisturizing lotions. With an eye for color, makeup chemists formulate decorative cosmetics such as lipsticks, foundations, and eye liners. Toiletry or fragrance-ancillary chemists focus on products such as body washes and lotions that support companies' signature fragrances. Hair-care chemists develop shampoos, conditioners, and fixative products such as gels.

SATISFACTION AT WORK?

Before I entered the cosmetics industry, I never considered where all of my skincare, makeup, and hair products came from. My first job out of college involved working as a technician in a printing and publishing lab. Fortunately, this lab experience, along with my bachelor's degree in biology, helped me land a cosmetic chemist position with Aveda. I immediately fell in love with the fast-paced field. I recall the challenge and excitement of creating my first product—an SPF 15 lip balm made with naturally derived ingredients. It was extremely gratifying to witness people actually buying something I made.

Working for Chanel, I am always thrilled to see the products I helped develop advertised

in magazines and on television, as well as used by celebrities and other customers. Aside from product development, my career has led to many interesting experiences. For instance, because my company is international, I have traveled to Europe, Japan, and throughout most of the United States. I also appeared on a *MTV House of Style* video to demonstrate how to make lipstick and powder products.

THE GOAL OF CREATING SAFE, APPEALING PRODUCTS.

It is my responsibility to ensure that our research and development team creates high quality, exciting, and luxurious products on time and in budget. This includes guiding the development of projects, managing personnel, establishing project budgets, and coaching and mentoring my team. I must also make certain the final products pass strict stability and safety testing; like many other cosmetic companies, we use alternative in-vitro safety testing rather than animal testing. As an international company, our products must be globally compliant with regulatory requirements, free of patent infringement, and proven to meet claims we are making. I work closely with other groups in the company [for example colleagues in quality assurance and marketing] and with my global counterparts in France and Japan.

ANY ADVICE FOR STUDENTS?

Most scientists working in this field have undergraduate and graduate degrees in chemistry, or a related science discipline. Chemistry is important to understand how ingredients will work together. Biology is needed to understand the effect of products on skin or hair. Physics, math, and engineering knowledge come in handy when scaling up the product through each stage of development: from the laboratory sample to the pilot quantity and then finally to the full-manufacturing volume.

To learn more about working in cosmetic chemistry, students can arrange informational interviews with scientists working in the industry and seek internships with cosmetics companies. Contacting the Society of Cosmetic Chemists is a good place to start.

BONUS POINTS	EDUCATION	ON THE WEB	RELATED CAREERS
	BS, biology	Society of Cosmetic Chemists *(www.scconline.org)*	perfumer, food technologist, microbiologist, quality-control chemist, technical salesperson, textile chemist

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