CAREERS IN SCIENCE

Editor: Brittany Sanchez

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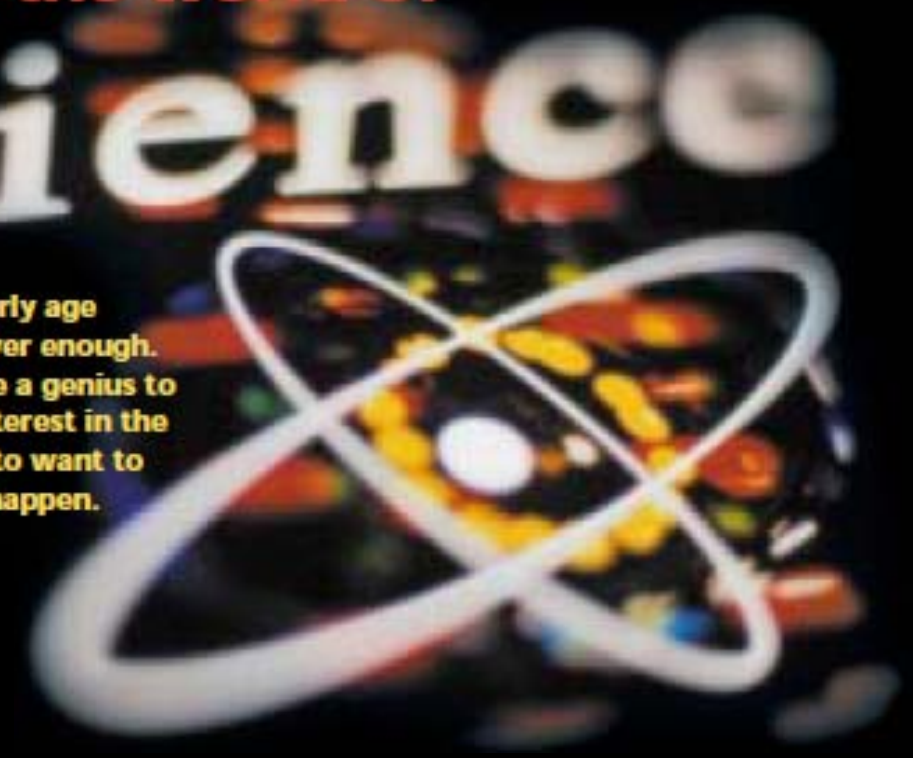
This article is from Volume 44, Number 2, July 2002 of *Archimedes*, a magazine of the Foundation for Education, Science and Technology, an agency of the Department of Arts, Culture, Science and Technology.

You don't have to be a rocket scientist ... ... to be a part of the world of science



Many people are put off science at an early age because they think that they are not clever enough. But the truth is that you don't have to be a genius to be a scientist. What you do need is an interest in the world around you and enough curiosity to want to know how things work and why things happen.

The word "science" means different things to different people. But, more often than not, when we think of science we think of men in white coats in a laboratory surrounded by glass test tubes and Bunsen burners. The Times English Dictionary describes science as: " a systematic study of the nature and behavior of the material and physical universe, based on observation, experiment and measurement, and the formulation of laws to describe these facts in general terms". The " material and physical universe" does not exist in a laboratory, it is everything around us, which means that we can all be scientists by studying the world around us and finding explanations for why things are the way they are. However, studying the world is quite a challenging task, as it presents us with some astounding phenomena, which often take a while for us to get our heads around.

Never accept something as fact unless you have satisfactory proof, but never dismiss something just because it goes beyond your under-standing and what you prefer to believe.

Thankfully, there have been many scientists throughout history who have already dedicated their lives to studying and formulating laws for things like gravity (Isaac Newton 1642-1727), chemistry (Robert Boyle 1627-1691), and electric current (Luigi Galvani 1737-1798). This has resulted in us getting the benefit of these discoveries. For instance, we can now defy gravity and travel over the seas in airplanes; we can prolong our lives by taking medicines that cure our ills; and we can live our lives in comfort with access to an uninterrupted electricity supply. If it had not been for these people, whose curiosity drove them to uncover these basic laws of nature, our history would have been very different. Today, history is still being written by scientists of this kind - people who do not accept things at face value. Good examples include the work that is being done into:

- developing genetically modified foods which are resistant to bugs;
- cloning and stem cell research which could result in finding a cure for cancer; and
- laser surgery which negates the need for someone to be cut open in order to have an operation done.

These are all advances that could never have been imagined 10 years ago and which could

very soon change our way of life. No doubt you will have heard the heated debates that surround some of the above, but remember that throughout history scientists have met with resistance when they have challenged the *status quo and* suggested new ways of thinking. For instance, Polish astronomer, Nicolaus Copernicus exploded the myth that the Earth was the centre of the universe when he discovered that the Earth and other planets actually rotated around the sun. His ideas were so upsetting to the Catholic Church at the time, that he was only persuaded to put his theories down on paper in 1543, the same year that he died. It took the Catholic Church another 360 years before it finally acknowledged that Copernicus' theory was right! Had it not been for the Catholic church, the science of astronomy would have developed more quickly. In the same way, if the ancient alchemists had not shrouded their experiments in secrecy, the science of chemistry would have developed more quickly. These true stories go to show that you need to have an open mind if you want to be a scientist. Never accept something as fact unless you have satisfactory proof, but never dismiss something just because it goes beyond your understanding and what you prefer to believe.

In this issue!

In this issue of *Archimedes we touch on but a few* of the career choices that are available to you, the aspiring scientist or " techno-geek". At the end of the day, it is up to you to do your homework and find out what it is that you are meant to do with the rest of your life. Because, as Prof. Les Underhill says in his article: "A career of 40 years is a desperately long time to be doing something you hate!" When you are still at school it is inconceivable to be worrying about your future career. However, it is important to keep it in mind when you make decisions, such as, what subjects you are going to take and whether you are going to do them on higher or standard grade. Don't let a difficult teacher or a bad mark get in the way. If you have a love for science, but are struggling to relate to the teacher, approach her and voice your concerns, rather than dropping the subject and giving up on your dreams. If you are not coping with higher grade maths, but still find that you enjoy the subject, ask your teacher for advice on how to improve your marks before dropping to standard grade. No one achieved anything by giving up.

YOU have to make the effort if you want the career of your dreams. But, be warned. Making excuses for why you couldn't do what you really wanted to do is much easier. You can always find someone else to blame or you can blame your circumstances for holding you back. At the end of the day, if you can read and write, you have access to all the information you need to make things happen for yourself. On page 46 you will find news about the SciTech Web Awards, which provides you with a starting point if you still haven't decided where your interest in science lies. Go surfing and spend some time exploring all the different areas of science from which you can choose. Whatever you do, don't sell yourself short. Whether you want to be an electrician or an astrophysicist, if you have faith in your ability to reach your goal, half the battle is already won. After that, all you have to do is follow the famous catchphrase that Nike uses and " Just Do It".

When you are still at school it is inconceivable to be worrying about your future career. However, it is important to keep it in mind when you make decisions, such as, what subjects you are going to take and whether you are going to do them on higher or standard grade.

Are you Einstein in the Making?

Take this fun questionnaire to see how you do!

1. You are busy doing an assignment on your Dad's computer when, all of a sudden, the cursor freezes in the middle of the screen. What do you do?

A. Quietly go and switch the computer off at the wall, clear up any traces of your being there and hope that you haven't broken it.

B. Press Control-Alt-Delete and reboot the machine and make sure that you save your work regularly in case it happens again.

C. Press Control-Alt-Delete and reboot holding down the Shift key in order to disable the Extensions. You run NAV to check that you haven't picked up a virus after which you defragment the hard drive, etc, etc.

D. Give the tower a good whack ... that always works!!

2. You learned in biology that the biological name for humans is *homo sapien*. "Homo" means human in Latin. What does "sapien" mean?

A. The wise

B. The great

C. The brainy

D. The complex

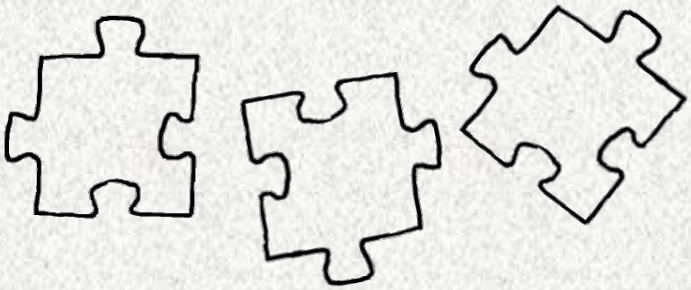
3. Your little brother is struggling to do a 50-piece puzzle, but is too proud to ask for help. What do you do?

A. Grab the puzzle away from him and finish it in 10 seconds flat while telling him what a loser he is.

B. Leave him to figure it out for himself as it will teach him to be independent and to persevere.

C. Go and sit with him and throw him some helpful hints so that he can finish the puzzle without thinking that he had to have any real help.

D. Sit down and explain to him that the puzzle is too cognitively advanced for him and that he should actually only be attempting 36-piece puzzles for his age.



4. What was the Philosopher's Stone?

A. The name of a Harry Potter book.

B. A stone that Sigmund Freud kept on his desk which helped inspire him.

C. A mercury powder which alchemists believed would turn lead into gold.

D. A tablet that was found in one of the Egyptian pyramids with the philosophies of the time inscribed upon it.

5. What shape is the Earth?

A. wide oval

B. tall oval

C. circle

D. hexagonal

6. Your science teacher organizes for your class to visit the planetarium. What's your first thought?

A. I wonder how I can make sure that I end up sitting next to my friend on the bus?

B. Oh cool! I love astrology. Maybe they will read my stars and tell me what the future holds.

C. Perfect timing. I was just reading about the latest photos from the Hubble Telescope and I have some questions. I had better write them down and make sure I am prepared.

D. I will not go! Too much money is wasted on exploring space. The money would be better spent on alleviating poverty. I will not support such wasteful and fruitless endeavors.

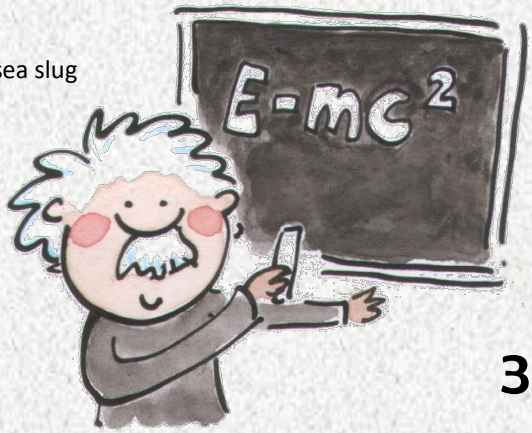
7. What living creatures are used in some hospitals to clean dead tissue out of wounds?

A. Fly larvae

B. Maggots

C. Leeches

D. The five-eyed sea slug



8. You are flicking TV channels on a Saturday evening and come across a couple of heavyweight boxers beating the daylights out of each other. What is your first thought?

A. I wonder how many brain cells a boxer loses, on average, during a 12 round boxing match?

B. I wonder if boxers have any brain cells to willingly take part in such a mindless sport?

C. I wonder with what force the one boxer will have to hit the other, in order to knock his feet out from under him?

D. Oh cool - here are two guys beating the daylights out of each other. I wonder how much I have missed?

9. Why is an X-ray called an "X"-ray?

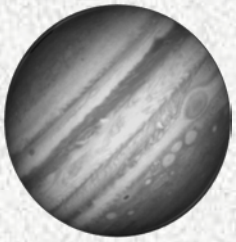
A. When doctors used to send patients to have X-rays done, they used to draw an "X" on the spot that they wanted X-rayed.

B. When William Roentgen discovered X-rays he didn't know what they were and so used X, the symbol for something unknown in Algebra.

C. Mr. Roentgen loved to read pirate stories and his discovery of X-rays reminded him of the skull and cross bones, hence his use of the X to represent the cross bones.

D. X-rays used to be the last thing that a doctor would do to try and find out what was wrong with someone, and X is the last letter of the alphabet.

10. How many moons does Jupiter have?



A. 11

B. 19

C. 28

D. 39

FOR FIVE BONUS POINTS: What is the name of the satellite that was sent to Jupiter, to help us find out more about the planet and its moons?

To find out more about Jupiter and its moons visit:
http://www.jpl.nasa.gov/galileo/ or
http://www.sciam.com/2000/0200issue/0200johnson.html

NOW WORK OUT YOUR SCORE

1. A=0; B=3; C=5; D=0	2. A=5; B=0; C=0; D=1	3. A=0; B=1; C=5; D=0	4. A=1; B=0; C=5; D=0
5. A=5; B=0; C=0; D=0	6. A=0; B=0; C=5; D=1	7. A=0; B=0; C=5; D=0	8. A=5; B=1; C=5; D=0
9. A=0; B=5; C=0; D=0	10. A=0; B=0; C=3; D=5		

Answer for 5 bonus points: Galileo

(Note for question 10: Until recently it was believed that Jupiter had 28 moons but new research recently revealed 11 more moons that were missed by previous studies.)

Results

0 - 15: You have a little bit of work to do if you want to get up to speed. But all is not lost. If you really want to become a scientist, there is still time for you to put renewed efforts into developing your science skills ... it'll just take a bit of commitment and hard work on your part.

16 - 39: Not too shabby. The interest and curiosity is there, and it seems that all you now need to do is explore your potential in order to work out where your strengths in science lie. So, keep reading as much as you can about science and technology and who knows where your talents will take you.

40 - 49: Fantastic ... you obviously have a passion for science and technology. Keep up the good work!

50 - 55: If you keep going at this rate, you are going to go far - so, don't stop now!

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Science against crime!

The job of a **forensic investigator** can be very exciting and fulfilling. This type of job is in high demand and there is always call for those that can perform this work. Here are the basics of being a forensic investigator and what that entails.

Education

In order to secure a job in the field of forensic investigation, you will need to obtain a degree in forensic science. You should be able to get a bachelors degree in this field from a number of different universities across the country. If you are interested in this type of work, you should start taking math, chemistry, biology, and computer science during high school. This will give you a head start on the course work that you should expect in college. You will also have to engage in continuing education throughout your career. Eventually, many in the field obtain masters or doctorate degrees.

Basic Tasks

A forensic investigator deals with many different aspects of crime scene investigation. They will visit crime scenes, auto accidents, and other sites in order to collect evidence. This is a very detailed process that involves a lot of complicated work. You have to make sure to maintain the integrity of the evidence at all times. You will then take the evidence to a laboratory and evaluate it for potential clues that can help in the case. A forensic investigator commonly works with computers as well as performs basic laboratory tasks. Therefore, they have to be very proficient in chemistry and computer use. A forensic investigator has to pay close attention to detail as their work can have a vast impact on the outcome of a criminal case. Ultimately, they are attempting to help serve justice when a crime is committed.

Work Schedule

A forensic investigator will have to work a variety of different work schedules throughout their career. Usually, they will have a set schedule that they will be on duty. However, forensic investigators also have to be on call and could work at any time of day. If a crime is committed in the middle of the night, a forensic investigator will have to be on the scene.

Salary

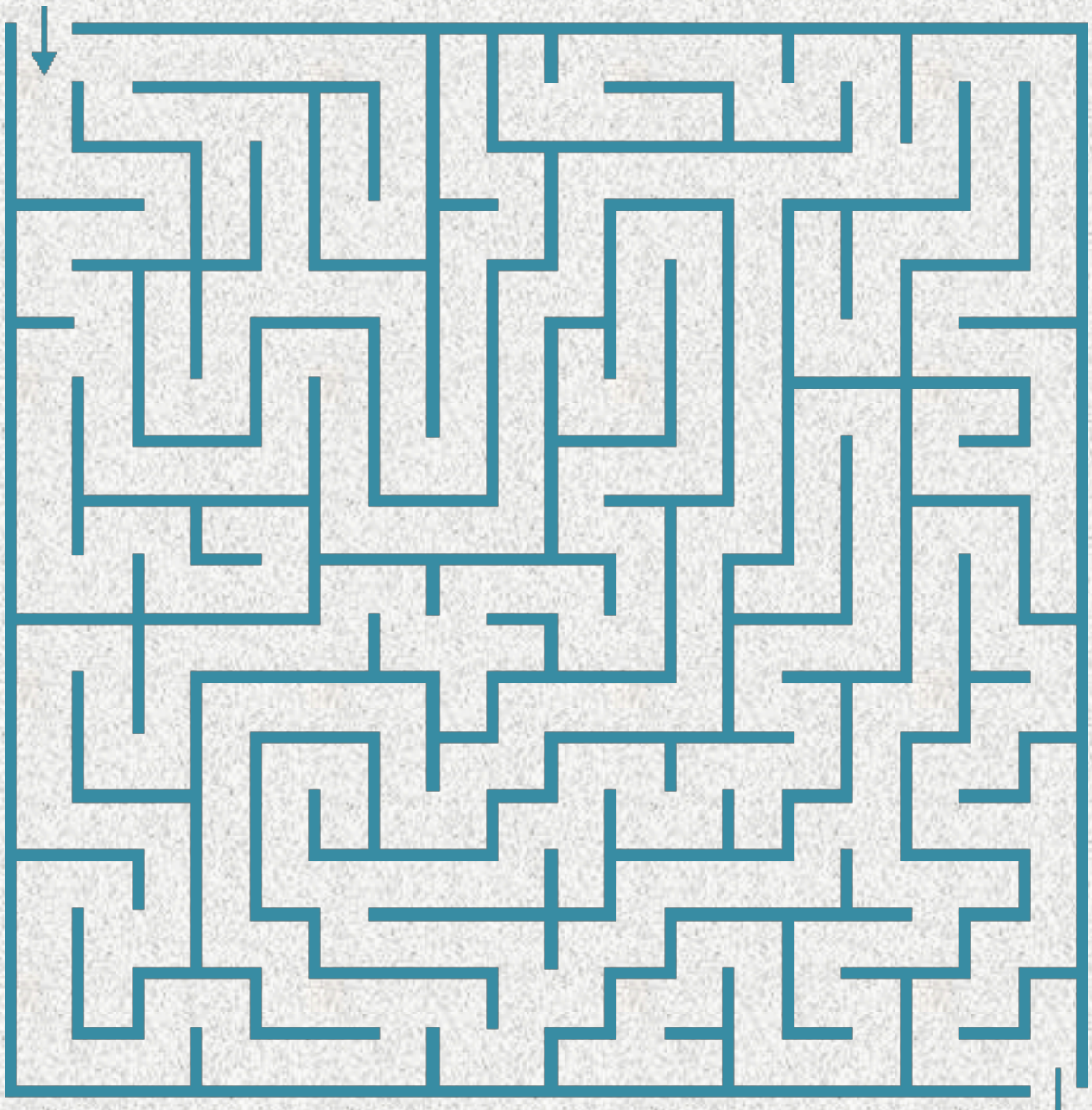
The average forensic investigator will earn approximately $40,000 per year. However, if they pursue a master's degree and get a certain amount of experience under their belt, they can earn as much as $70,000 per year.

Opportunities for Advancement

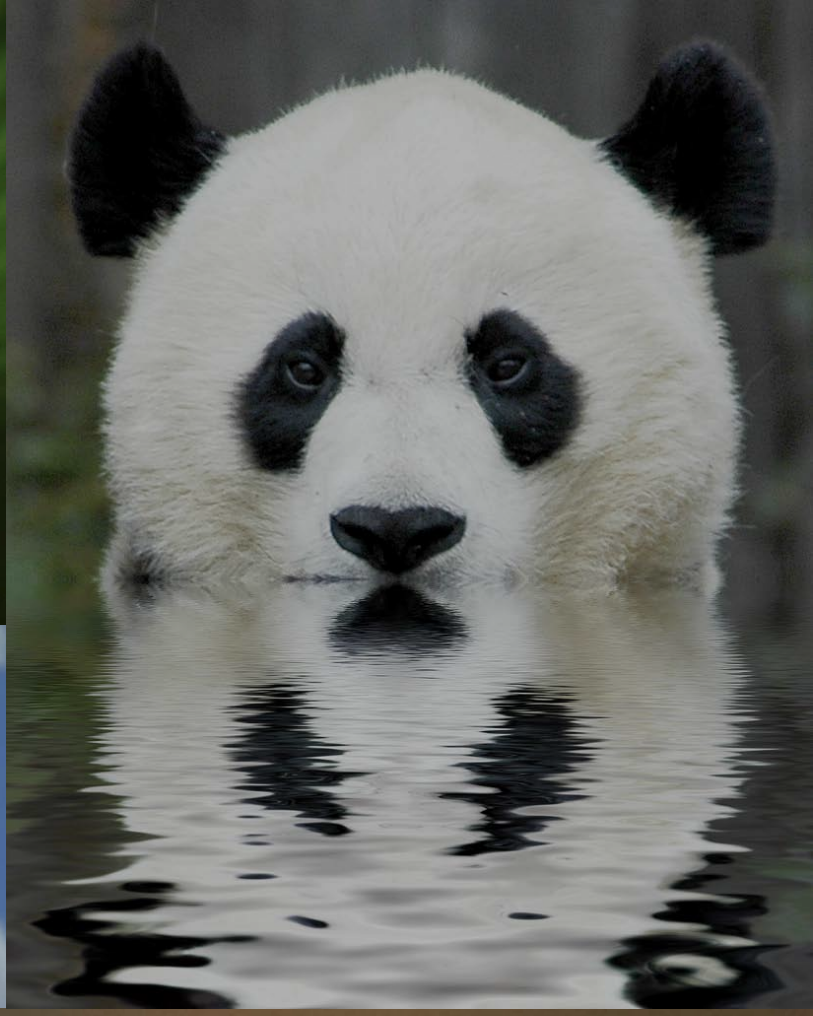
The job outlook and potential opportunities for forensic investigators looks promising for the future. This field is rapidly expanding and requires many more investigators in the future. A forensic investigator could advance to a management position in the laboratory in which they work. They could also develop a consulting business on their own after obtaining a certain amount of experience. If you are a successful forensic investigator, you will find that there are more opportunities in front of you. However, many people choose to remain a forensic investigator throughout their career.

A-MAZE-ING SCIENCE CAREERS!

Help these students find their way to a career in science!



Here are some other careers in science you might find interesting!



Zoology

The science and study of the structure, function, behavior, and evolution of animals.

This article is from *the American Association of Zoo Keepers* (AAZK), a nonprofit volunteer organization made up of professional zoo keepers and other interested persons dedicated to professional animal care and conservation.

So You Want to Be a Zoo Keeper, Trainer, or an Aquarist?

For those that enjoy being around animals and have a drive to make a difference, a career in a zoo may be just for you. But, do you have what it takes?

Keeping in mind that this field is very competitive and to help you make that decision, here are some things to do…

Intern at a zoo or an aquarium o Can be three months or more at some institutions

- Very valuable in understanding the field
- Normally unpaid positions
- Normally work 40 hours per week, including weekends
- Interns are frequently hired for permanent positions

Volunteer at a zoo or an aquarium o Most schedules are flexible

- Can volunteer on a set schedule: weekly, biweekly, monthly
- an volunteer for just special events: pregnancy watch, medical watch, animal introduction watch just to name a few
- Volunteer for special activities: SCUBA diving, camps, etc.

Get SCUBA certified (open water) o If you already have this certification when applying for an aquarist position, you will have an advantage over the other applicants who are not certified

- Some aquariums may pay for you to get this certification
- Must feel comfortable underwater and be aware of your surroundings
- Depending on insurance of the aquarium, you may be required to get a dive physical every couple of years and go through a check-out dive □Check-out dives include: setting up tank successfully, clearing mask, clearing regulator and following radio/safety procedures correctly

Obtain CPR/First Aid certification - This is mandatory if you are SCUBA certified

Become familiar with Microsoft Word®, Microsoft Excel®, and PowerPoint®

Understand that the job is not glamorous…you will get dirty!

Understand that the job involves a lot of strength, flexibility and stamina

Most cases, must be able to lift 50 pounds

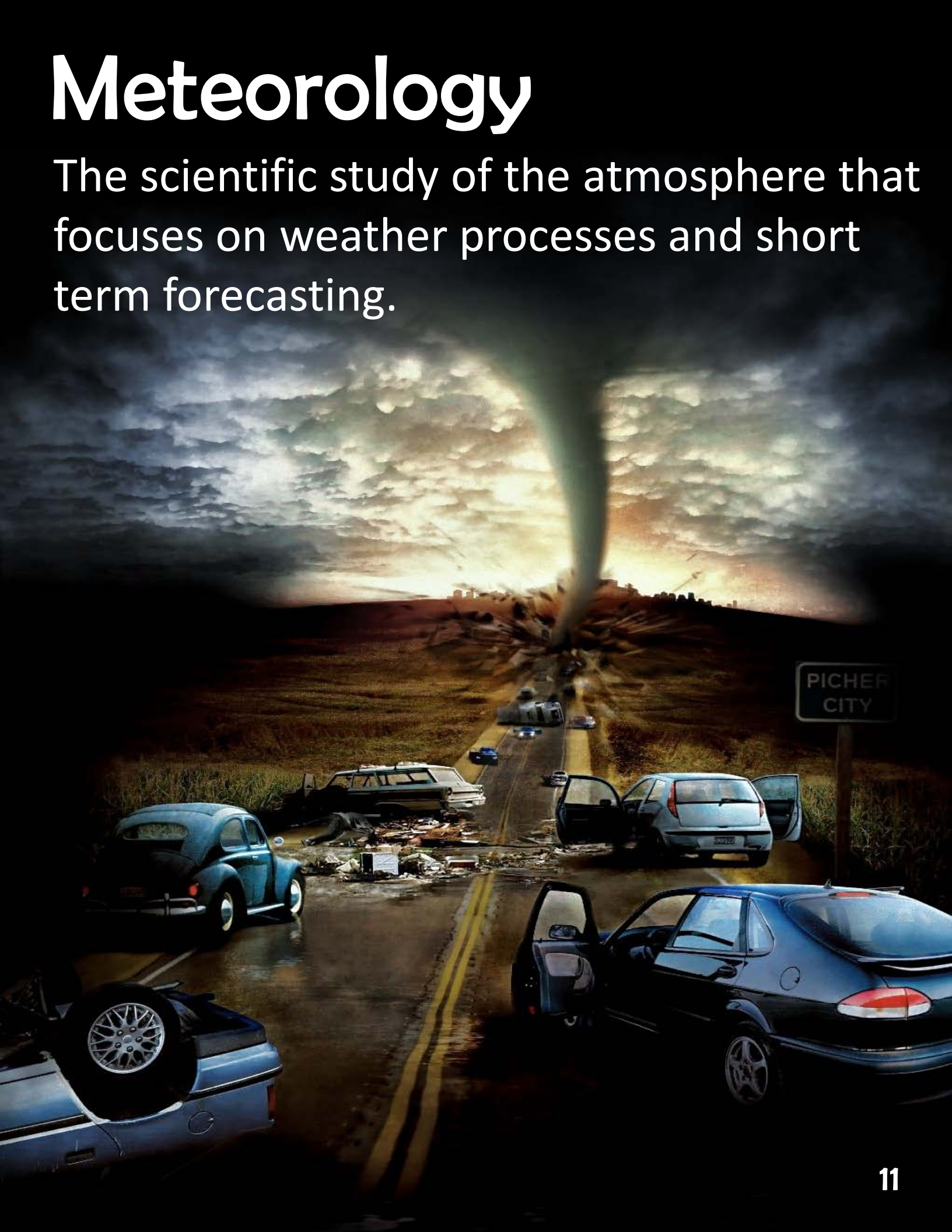
- Must be willing to work variable shifts, weekends and holidays
- Understand that animals can be stubborn, so having a high level of energy and determination is extremely valuable
- Although this is a very rewarding career, understand that it normally doesn't pay as well as other professions where a college degree is desirable.
- Pay is based on experience
- Pay is also based on cost of living for zoo's geographic area

Obtain a college degree in a biology related field

- Math and science are very important in this field
- The best form of communication is written communication
  - o You must be able to write clearly when entering data in the daily logs
  - o Having some public speaking experience also helps in your interactions with the visiting public

Meteorology

The scientific study of the atmosphere that focuses on weather processes and short term forecasting.



CAREERS IN METEOROLOGY

Ever wonder how our meteorologists decided to be meteorologists? Want to learn more about how to become a meteorologist? You've come to the right place! You'll learn all kinds of cool facts like their most memorable weather moments growing up, and how they decided to become meteorologists.

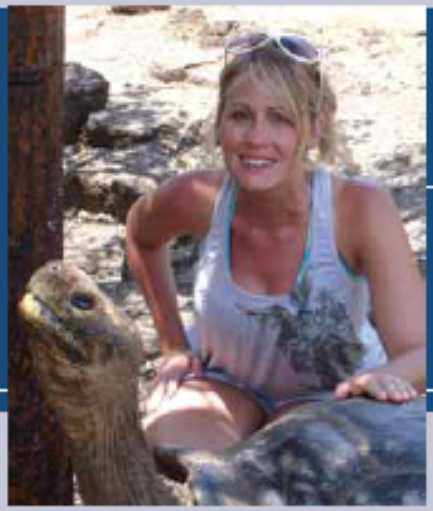
To get started, go to http://www.theweatherchannelkids.com/flash/games/careers_in_meteorology/ and follow the instructions....and have fun getting to know all about our weather experts at The Weather Channel!

Pick a Question. | Select a Meteorologist. | Get an Answer!

Oceanography

The branch of Earth science that studies the ocean.

Student Connection —
OCEANOGRAPHY



Ruth Mullins

Distinguished Graduate Student — Teaching

RUTH MULLINS IS BECOMING AN OCEANOGRAPHER BECAUSE THE DISCIPLINE HAS SOMETHING OF EVERYTHING IN SCIENCE.

By Carol Trono

"Oceanography includes a little of every major scientific discipline, and the disciplines are interrelated," Ruth Mullins said. "It is an exhilarating science and the fieldwork opportunities are amazing. Your lab is the ocean, and that is a luxury not many students experience." A native Texan from San Marcos, Ruth did her undergraduate work in biology at A&M before entering the Oceanography graduate program.

"When I decided to go into oceanography, I looked at grad schools objectively and evaluated all the options, but the stipends and teaching opportunities here are just top notch and with the standard of living, graduate school at A&M is extremely affordable," she said. "Even though we are not on the coast, I have been to sea more times than coastal school students."

While Ruth enjoys research and has done extensive work through her MS and Ph.D. programs, she credits graduate school for helping her discover a true passion for teaching.

"I never considered teaching as a career because both my parents were teachers and you tend to always say 'I am not going to do what my parents do.' But then you try teaching, and you realize you have a talent," Ruth said.

For the past year and a half, Ruth has participated in a National Science Foundation GK-12 teaching fellowship, the PEER program (Partnership for Environmental Education and Rural Health), under principal investigator Larry Johnson. She spends 15 hours a week working with 6th graders in science teacher Naveen Cunha's class at Stephen F. Austin Middle School in Bryan and during non-school months develops curriculum and classroom activities.

> "Your lab is the ocean, and that is a luxury not many students experience."

PEER trains graduate fellows to improve the science, technology, engineering, and mathematics (ST EM) content in sixth- to eighth-grade classrooms. Fellows are role models who convey the excitement of science research and discovery. "It's been a real challenge, but I love it," Ruth said. "Only two of my 80 students have ever been to the ocean. They love learning through my experiences. I think my greatest impact is showing them that college is an opportunity to learn any aspect of science anywhere in the world and that anybody can be a scientist."

Ruth used video conferencing to share her experiences on a research cruise. "We took the students to sea with the Internet while I was in the Galápagos last fall. Before the trip, students conducted experiments in the classroom to learn about what the scientists were measuring on the cruise. They also learned about the Ecuadorian and Galápagos culture and what is out there in the world."

While her students all know that Ruth is an exceptional teacher, she received formal confirmation of that last spring when she won a Distinguished Graduate Student Award for Teaching from the Association of Former Students and the Office of Graduate Studies. She would like to continue teaching at the university level after completing her Ph.D., although she hopes to work in industry first.

"I hope to start in environmental and oceanography research for the oil industry and then transition into an academic teaching career," Ruth said. "Eventually, I would like to be at a Tier 1 teaching university where I could focus on mentoring, small scale research projects, and engaging graduate students in the importance of quality teaching."

Ecology and Environmental Science

The study of the interactions between organisms and their environment.

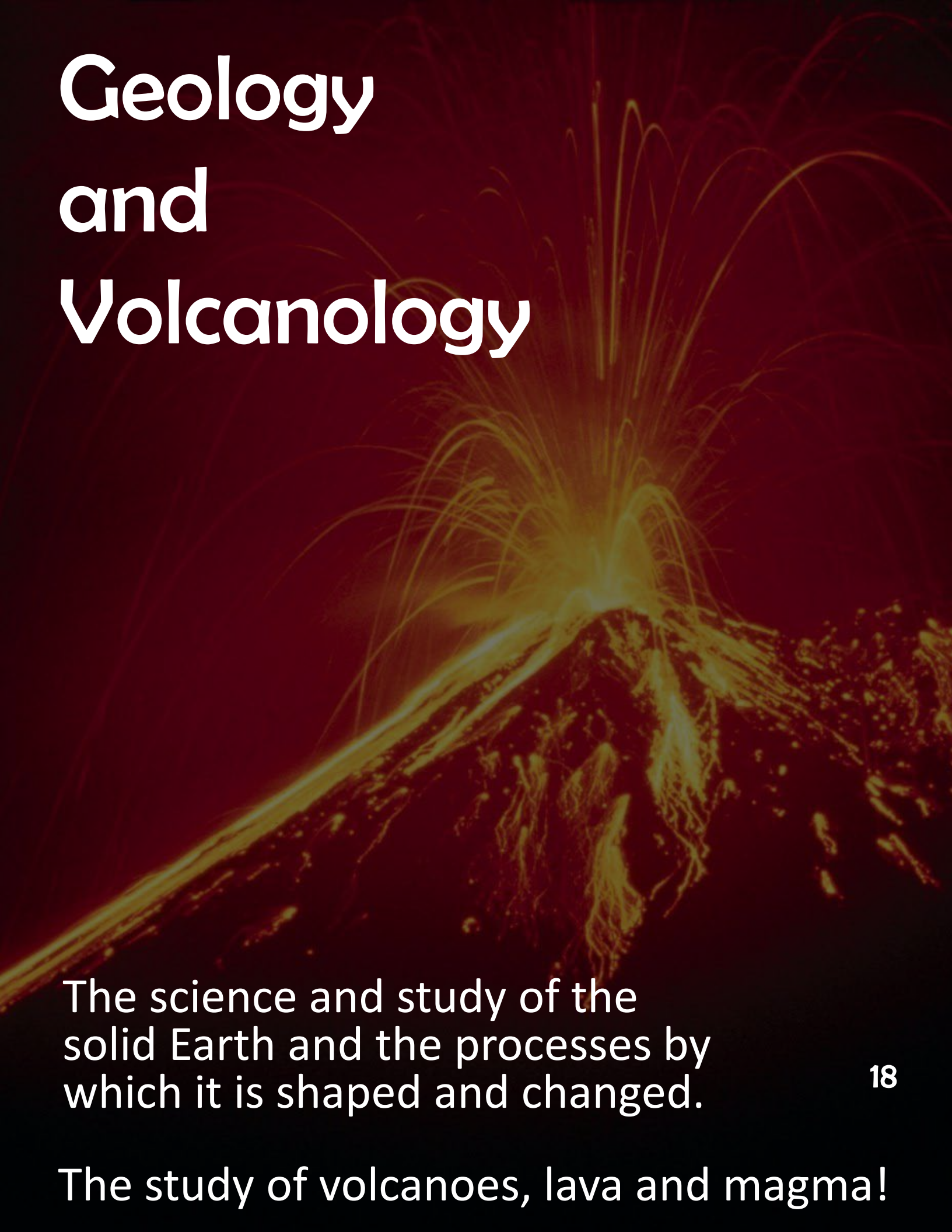
Astronomy

The study of celestial objects such as stars, planets, comets, nebulae, star clusters and galaxies.

Horticulture

The art and science of the cultivation of plants.

Geology and Volcanology



The science and study of the solid Earth and the processes by which it is shaped and changed.

The study of volcanoes, lava and magma!

This article is from Oregon State's Volcano World.

Do you want to become a volcanologist?

What does a volcanologist do? A volcanologists' work, to say the least, can be very exciting. When talking about his volcanology career, Robert Tilling states that "the present is the key to the past - In a sense, we're detectives, trying to decipher clues that rocks tell us." Another volcanologist, Ken Hon, says that being a geologist is kind of like "putting together the pieces of a puzzle." Indeed, both geology and volcanology are very investigative types of work. There are new things waiting to be discovered constantly and a scientists' application of these discoveries to everyday life is never-ending. Richard Fiske probably states it best when he says, "Once you get started in volcanoes, you become a junkie. The Earth is changing and you try to outfox it, understand its past activity and predict what it's likely to do in the future."

While many may think, that a volcanologist's work consists solely on the exciting, adventurous work performed at the lip of an erupting volcano, they would be wrong. In fact, most of a volcanologists' work is done studying the remains of either dead or dormant volcanoes, or by monitoring volcanoes that are dormany, but may become active or "reawaken.". A significant portion of a volcanologists' work is also done in the laboratory and office, analyzing rock samples, reading and writing scientific papers, performing computer modeling of various aspects of eruptions, and interpreting the data that they have collected from the field. Basically, the goals of volcanology are to understand how and why volcanoes erupt, how to predict eruptions, their impacts on the history of the Earth and how they may affect humans and their environment. It is also important for volcanologists to be able to interpret and publish/present their findings in such a way that it is easy for the general public to understand.

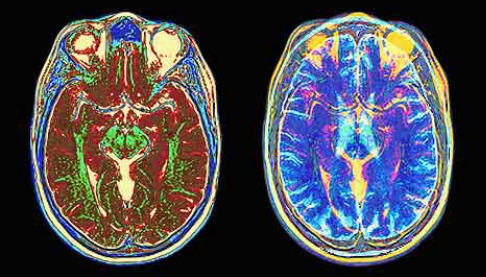
Essentially, volcanology can be broken down into four major groups of study. First, physical volcanologists study the actual processes and deposits of volcanic eruptions. Data gathered through this type of study gives volcanologists information about where and how volcanoes are likely to erupt, especially if nobody has seen them presently active. Collecting this data is very time-consuming. Mapping of the distribution of the rocks that make up the volcano, as well as chemical and dating analyses of the samples, leads scientists to information concerning the volcano's past. Second, geophysicists mainly deals with volcanic seismicity, gravity and magnetics. Third, volcano geodesists look the ground deformation that occurs at prior to, during, and after volcanic eruptions. Lastly, geochemists deal with the makeup of the Earth as well as volcanic products, such as emitted gases.

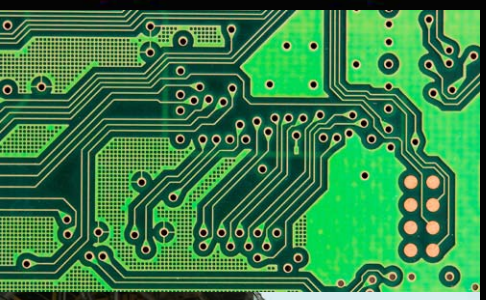
Where can I apply for a job as a volcanologist? Is it hard to find a job as a volcanologist? In general, jobs in volcanology are difficult to find. This is because funding is limited and there are typically many people applying to the few jobs that are available. In reality there are only two options for employment in volcanology, the government or academia. Some federal, state, or provincial governments do employ volcanologists. For example, the US federal government employs a significant number of volcanologists in the US Geological Survey. States, for example Alaska, also occasionally employ volcanologists. Depending on the position, government jobs are typically available to people with both Masters and PhDs. Academic positions typically require a PhD, are few and far between, and are heavily contested. Also, many volcanologists in academia do not hold positions that are specifically volcanology, rather they hold positions in some related field such as igneous petrology, geomorphology, geodesy, seismology, remote sensing, etc.

Is volcanology dangerous? Volcanology is probably less dangerous than the image presented in the movies, where every film has at least one volcanologist being killed by the volcano! The reality is that most volcanologists, especially those studying actively erupting volcanoes, take safety very seriously and are extremely careful when on a volcano. Because of this the number of volcanologists killed in the line of duty is very low. Nonetheless, there are some inherent hazards involved in the job. Hazards that apply to any job requiring field work in remote locations, such as falls, helicopter crashes, etc., are the primary risk. Nonetheless, volcanoes do present some rather unique hazards, such as volcanic gasses, being caught in an eruption, etc. Again though, I must emphasize that most volcanologists take rigourous safety precautions and will not work in an area that they think is too dangerous.

Careers in the Medical Field

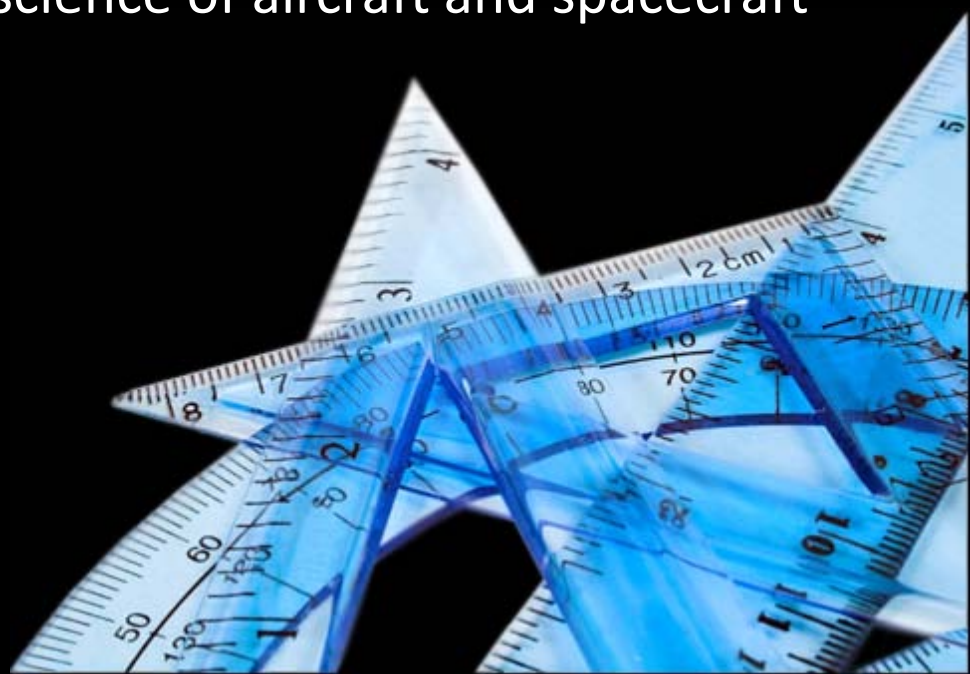
- Medical doctor
- Pharmacology
- Public Health
- Research
- Veterinarian





Engineering

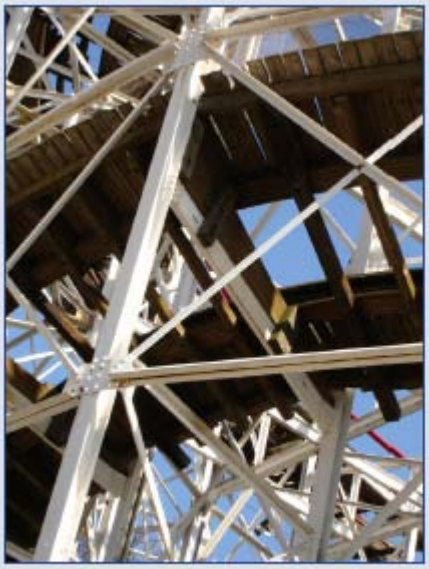
- Mechanical - aircraft, robotics, motor vehicles
- Biomedical – x-ray machines, prosthetics, artificial organs
- Electrical - power, electronics, telecommunications
- Civil - bridges, roads, canals, dams, buildings
- Environmental - pollution control, recycling, waste disposal
- Industrial - applied in every industry, manufacture better products
- Chemical - converting raw materials into useful and valuable forms, petroleum, alternative fuels
- Aerospace - design, construction and science of aircraft and spacecraft



This article was taken from Discover Engineering at discoverengineering.com.

Cool Engineers

The Discover Engineering Theme Park



Where is the first place you will want to go? I don't know about you, but I am running to be the first to ride the biggest and baddest roller coaster they have in the park!

Well unless you are lucky, the first thing you encounter is a long line of people waiting to get on the ride. Even though there are a lot of people waiting, the line seems to move fairly quickly. There must have been a lot of thought into getting us through the line and onto the ride in as short a time as possible. Who do you think did this?

Industrial Engineers use their skills to develop systems to move people! While waiting in the line, you have probably had plenty of time to see people on the ride get flipped and corkscrewed through the ride. (Sometimes there are video monitors that show this as it is happening!)

It takes a lot of expertise to design a ride that will use motors and gravity to get you from start to finish in one piece. Who would help make this happen?

Mechanical Engineers and Civil (Structural) Engineers are among those that analyze the forces in the loops, turns and hills and develop the mechanisms that allow the ride to run smoothly from start to finish!

When you get to the front of the ride you notice a lot of gates and locking mechanisms that are typically controlled by an operator at a panel and assistants.

Who develops the control system that makes the roller coaster start and stop at the right times? Electrical and Electronics Engineers use their skills and education to develop control systems!

Now it is time to get into your seat and ride! Let's select one of the ten most popular roller coasters, buckle up and ride like the wind!

Agriculture

Production of agricultural goods:

- Growth of plants
- Raising domesticated animals

Entomology

The scientific study of bugs!

Where Have All the Bees Gone?

Jennifer Cutraro

Entomologists—scientists who study insects—have a real mystery on their hands. All across the country, honeybees are leaving their hives and never returning. It doesn't take long before a hive is nearly empty. Researchers call this phenomenon colony-collapse disorder. According to surveys of beekeepers across the country, 25 to 40 percent of the honeybees in the United States have vanished from their hives since last fall. So far, no one can explain why. Colony collapse is a serious concern because bees play an important role in the production of about one-third of the foods we eat, including apples, watermelons, and almonds. As they feed, honeybees spread pollen from flower to flower. Without this process, called pollination, a plant can't produce seeds or fruits. Now, a group of scientists and beekeepers has teamed up to try to figure out what's causing the alarming collapse of so many colonies. By sharing their expertise in honeybee behavior, health, and nutrition, team members hope to find out what's contributing to the decline and to prevent bee disappearances in the future.

Sick bees?

It could be that disease is causing the disappearance of the bees. To explore that possibility, Jay Evans, a research entomologist at the United States Department of Agriculture (USDA) Bee Research Laboratory, examines bees taken from colonies that are collapsing. "We know what a healthy bee should look like on the inside, and we can look for physical signs of disease," he says. And bees from collapsing colonies don't look very healthy. "Their stomachs are worn down, compared to the stomachs of healthy bees," Evans says. It may be that a parasite is damaging the bees' digestive organs. The bees' inability to ward off such parasites suggests that their immune systems may not be working as they should. The honeybees have other signs of troubled immune systems, such as high levels of bacteria and fungi inside their bodies, says Dewey Caron, an entomologist at the University of Delaware. He's one of the leaders of the colony-collapse research team. But why would parasites, bacteria, or fungi in the body cause bees to leave their hives? After all, when you're sick, you want to stay at home, right? Caron says that some of these disease-causing agents may lead to disturbances in bee behavior. "It may be that sick bees are not processing information correctly and learning where home is," he says. In other words, a sick bee might leave the hive and simply forget how to get back. If enough of the bees in a colony can't find their way home, he says, it's just a matter of time before the colony collapses. Being social insects, even healthy bees are unable to live long on their own. And once the bees vanish, the crops that they usually pollinate are in trouble.

Environmental clues

Another cause of colony-collapse disorder may be certain chemicals that farmers apply to kill unwanted insects on crops, says Jerry Hayes, chief bee inspector for the Florida Department of Agriculture. Some studies, he says, suggest that a certain type of insecticide affects the honeybee's nervous system (which includes the brain) and memory. "It seems like honeybees are going out and getting confused about where to go and what to do," he says. Adding to the mystery, Hayes says, is an observation about moths and other insects that frequently use empty beehives to raise their own young. "Usually, they move right into an empty hive," he says, "but now they're waiting several weeks before they do." As Hayes sees it, this suggests that something repellent in the hive may not only be driving out bees but also keeping other insects from moving in, he says. So far, scientists haven't identified what that repellent thing could be.

Looking at bee genes

If it turns out that a disease is contributing to colony collapse, bees' genes could explain why some colonies have collapsed and others have not. In any group of bees—or other animals, including people—there are many different kinds of genes, because each individual has a slightly different unique set of genes. The more different genes a group has, the higher the group's genetic diversity. And genetic diversity is a plus as far as survival is concerned. Some scientists are now studying genetic diversity in honeybee colonies to see if it has an effect on colony collapse disorder. "If a colony is genetically diverse, it's less likely the colony will be wiped out completely from a sweeping infection or disease," says David Tarpy, a University of North Carolina entomologist. That's because at least some bees in a genetically diverse group are likely to have genes that help them resist any specific disease that gets into the colony, he says. Scientists haven't determined the role of genetic diversity in colony collapse, but it's a promising theory, says Evans. He and his colleagues at the USDA bee lab are currently running genetic tests on bees from collapsing colonies. Their goal is to find out whether there are genetic differences between the bees that vanish and those that remain in their hives. Scientists are working hard to figure out the causes of colony collapse. Meanwhile, bees continue to disappear. Can anything be done to help them survive? Tarpy suggests that more people could raise bees to help restore their numbers. "Given this decline in honeybees, if you want to get active in helping to promote pollination, the best thing to do is to become a beekeeper and keep your own bees," he says. Don't be put off by the possibility of a sting, says Dan Geer, who raises bees in North Smithfield, Rhode Island. First of all, beekeepers can wear protective gear. And bees, he says, have a bad rep. "You'd be surprised by how gentle they are," he says.

Sports Medicine

An area of health that applies medical and scientific knowledge to prevent, recognize, manage, and rehabilitate injuries related to sport, exercise, or recreational activity

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