Dr. George Castro – Engineer & Associate Dean

I grew up in east Los Angeles during the 1940's and 1950's, which was a very exciting time. The older generation's stories of the difficult times they had endured inspired us to hope for something better for our generation. Our family slowly worked its way out of poverty, and by the time I got to high school, our standard of living had improved quite a bit.

School was always relatively easy for me, with the exception of English, which I really didn't master until college. Whenever I wanted to excel in any subject I could, but usually I was just an average student. My curiosity in the sciences began before high school. As a kid I enjoyed tearing things apart to figure out how they worked. My friends and I even dissected rats in our attempts to identify their physiology. My accidental placement in the college-bound track in high school furthered my interest in science. I actually found chemistry and physics fun!

My fascination with the sciences brought me to study physics at University of California, Los Angeles (www.ucla.edu) as an undergraduate. However, my pursuit of a physics degree did not last long and shortly I switched to chemistry. My college experience made my life very different than the friends I had grown up with in East Los Angeles who were all Chicano and never had any college aspirations until they came back from the military service. In college, my friends were the Jewish and Asian students (mostly Japanese) who carpooled with me to UCLA. Growing up in Los Angeles with Chicano, African-American, American Indian, Asian, and poor white children from Oklahoma gave me a strong awareness and appreciation of diverse cultures and the common struggles that all people have growing up.

I was not a very motivated undergraduate student. I received mostly C grades. It was circumstance and luck that brought me to graduate school. During my undergraduate years there was a draft for military service and I knew that when I finished school I would have to go into the army.

I had never thought about graduate school before, but it sounded a lot better than going into the army. When University of California at Riverside (www.ucr.edu) invited me to attend their graduate school, with tuition paid for, and a research job, I joyfully accepted. The only provision that the school mandated was that I receive B grades in my final semester at UCLA. For the first time in my life I had an academic goal. I worked hard and obtained A's. The following semester I began UC Riverside graduate school. The experience of attending graduate school changed my whole world, I lived on campus, I did research, and earned a 4.00 grade point average. I loved graduate school.

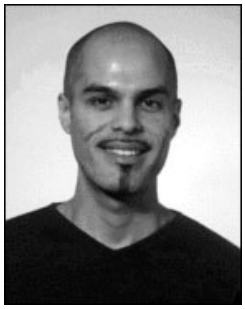
My attendance at UCR enabled me the opportunity to be one of the few students in the United States working on an exciting new research project. Specifically, we experimented with organic materials that conduct electricity when you shine light on them. My research helped to create the understanding that the creation of charge carriers occurred very close to the surface of the material and that the oxygen in the air residing at the materials surface was acting like a solid state impurity and causing other complicated effects to occur. By having a very clean surface of an organic materials, such as you have in a high vacuum, the material behaved in a predictable manner. This was a big scientific discovery, at the time, which was 1965.

Due to the success of my research, IBM hired me after I finished some postdoctoral research. The first project I worked on for IBM was an organic photo (light) conductor, a polymer film, which is used by copying machines. Our invention allowed IBM to break into the market dominated by Xerox with a machine that provided consistent high quality copies.

After twenty-seven years in a fulfilling career with IBM, I became an Associate Dean for the College of Science at San Jose State University (www.sjsu.edu). I have been here a little over three years. I have a job that I helped to create and now I fund the position with government grants. I spend my days working with schools to help students take more math and science classes, and to be successful in these two disciplines. I help all kids, but in particular I focus on Latino, African-American, and Native American kids.

In my life, I definitely got a few lucky breaks, like attending UC Riverside; but, I now realize that determined students will make their own breaks. If you are motivated, and you really believe you can do something, just push at it. The breaks will come, and you will take advantage of them. The obstacles will come, and you will surmount them. You have to believe that you can succeed. You cannot let anyone else determine what you are capable of doing because nobody knows, and you will never know until you try.

Dr. John Victor Cortinas, Jr. – Meteorologist



I grew up in Omaha, Nebraska in a mixed heritage family. My father is Mexican-American, and my mother is German-American. I have three brothers and one sister, all younger than me. There were few Hispanic students in my elementary and high schools, so my exposure to Latino culture came primarily from my father and my grandmother.

Growing up, I did not feel as though I had any large obstacles to overcome. I did well in school and my family environment was always supportive. The difficulty I did experience was financial. My parents couldn't afford my Catholic high school and college education, so I had to work to pay for my tuition. This experience taught me how to manage my time between working and going to school. I valued and appreciated my education even more because I had paid for it.

Originally I wanted to be a veterinarian; but it was my eighth grade science teacher, Ms. Bruckner, whose enthusiasm for science motivated me to pursue meteorology as my field. In Nebraska, severe storms occur frequently each year. I particularly remember a tornado that occurred on May 6, 1975 near our house in Omaha, Nebraska. That tornado, the costliest tornado in United States history, caused over one billion dollars of damage to our city. This display of the awesome power of nature also increased my interest in weather.

I knew that I wanted a Ph.D. even before I started college. One of the reasons I went to graduate school was to increase my opportunity to get a job doing exciting meteorological research. More importantly, I wanted to learn as much as possible to become a successful scientist. I did well in my undergraduate years of college at the University of Nebraska at Omaha (UNO) (www.unomaha.edu), and later at the Metropolitan State College of Denver (www.mscd.edu), although working while I attended school in order to support my education was hard. I pursued my graduate degree at Georgia Institute of Technology (www.gatech.edu) in Atlanta. The transition from a four-year college to a large research university was difficult for me. There were times that it was so tough I actually considered leaving school. However, the values I learned from both of my parents, and the continued support I received from my family and friends, carried me through the difficult times, enabling me to be persistent and complete my Ph.D. when I was 28 years old.

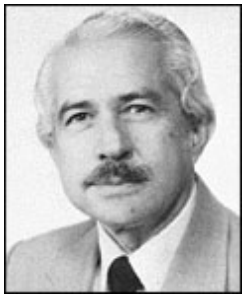
Currently I am a research meteorologist for the University of Oklahoma (www.ou.edu) and the National Severe Storms Laboratory (www.nssl.noaa.gov). My main responsibility is to study hazardous weather. More specifically, I study ice storms, storms during which falling rain freezes as it hits the ground causing a dangerous accumulation of ice. Some of you may have hit these patches of ice on the road and know how dangerous they can be.

I have compiled national statistics on where and when freezing rain occurs to help meteorologists predict these storms accurately. However, statistics won't tell us why an ice storm occurred. From the results of a previous study, I found that freezing rain occurs less often along the western shores of the Great Lakes than at locations farther away from the lakes. Because of the complexity of weather, meteorologists create computer models to help understand the physical processes that occur during a particular phenomenon. However, due to the atmosphere's complexity and limited computational resources, these computer

models ignore certain aspects of the problem, and may over-emphasize other aspects. Nonetheless, the computer simulations provide us with key information. Using data from computer model simulations, coupled with a knowledge of how scientists believe the atmosphere behaves, I hope to explain why freezing rain does not always occur near the western shores of the Great Lakes. When I believe I understand why this occurs, I will publish my results in a scientific journal, such as Weather and Forecasting, making my results available to the scientific community and the general public. It is my hope that my research eventually helps to minimize the death toll and destruction of property from winter weather events.

In order to be a scientist a lot of time and money is invested in earning the necessary university degrees. It is important to truly love what you're doing. Explore your options. If you are in high school or college, many opportunities exist that allow you to explore if a career in science is for you. For example, there are science camps for high school students and internships for college students. Take advantage of these opportunities if you can. Become better educated about your career choices, and don't be afraid to rely on others to help you achieve your goals. Know that school and life can be difficult at different times. By being confident and persistent you can get through many things. Keep mindful of your goals and believe in yourself. These things will help you get through those tough times.

Dr. Jose Dolores Garcia, Jr. – Physicist



I was born in Santa Fe, New Mexico, and I grew up in Alcalde, New Mexico. Alcalde is a very small village in northern New Mexico, which was started by Spanish speaking people hundreds of years ago. It is somewhat isolated from the rest of the world, and has a culture that is very rich in tradition and folklore. The people in the village value education.

When it came time for me to go to high school, I had to make a decision. The nearest high school was about fifteen miles away. My parents wanted me to go to Santa Fe (about thirty miles away) to Saint Michael's, a boarding school, because it was supposed to be very good. I told them that I did not want to go because I did not have any friends in Santa Fe. In the end I went to Saint Michael's, and it turned out to be a great experience. I learned a lot, made many new friends, and was still able to keep the old ones. St. Michael's had excellent mathematics and science teachers. It was amazing how much fun it was to learn mathematics and science. My parents were really supportive, and it was their belief in a good education that helped me to appreciate the importance and fun of learning new things.

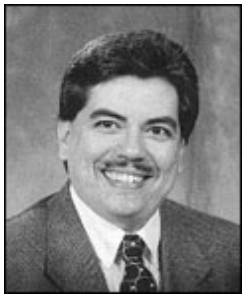
When I was growing up in northern New Mexico, nobody had a lot of money and everybody had to work hard. I would not have been able to go to college, except that by attending the high school that I did, I was able to get a cooperative student scholarship to New Mexico State University (www.nmsu.edu/). This type of scholarship meant that I went to school six months out of the year and worked the other six months in a technical job. This turned out to be a good combination. I learned a lot in my classes at the university, and I was able to use what I had learned in my job. Similarly, the new skills I learned in my job helped me appreciate what I was learning in my classes. I worked hard and competed for the opportunity to study further. I was able to go to Germany for a year as a Fulbright scholar and study at the University of Göttingen, where some of the physicists I had read about taught and did research. I received my Ph.D. from the University of Wisconsin, Madison, in 1966. Of the many different types of physicists, I am called a "theoretical physicist." I use mathematics to describe the atom and how it works.

Imagine trying to figure out a jigsaw puzzle given only a few of the pieces to begin with. What picture will finally emerge? This is what I do in studying atoms. Atoms are everywhere, but they are too small to be seen individually. In fact, there are more than a billion atoms on the period at the end of this sentence. Imagine trying to study just one atom on that period. This is the challenge that I am interested in. Because physicists cannot see the atoms, sometimes the only information we have about them is the pieces that come out when we smash two atoms together. I try to predict what will happen, and then use that information to understand how the atoms were put together to begin with. Because I only have pieces of the puzzle, it can be very difficult. I don't even know if I have all the pieces.

Physics is the study of how nature works. What are the forces that make atoms move and form molecules? What keeps an atom together? What are the rules for our universe? How do stars form? These are the kinds of questions that I work on. I try to understand nature by using equations to calculate what happens when atoms collide. Sometimes it takes very large computers to figure out a problem. Other times we can do the calculation without a computer, just using logical thinking and carefully talking out an idea. I also help people design how they will do their experiments so that their measurements will yield the most information for us to use.

I work at a university, so I teach undergraduate and graduate students about physics as well. I also help high school teachers sponsor a high school physics competition every year. One of the neat things that our physics department does every year is put on a physics "phun night" where the public comes to watch demonstrations of experiments. We draw a large crowd of people who want to see someone's hair stand on end, or wonder how holding a spinning bicycle wheel can make a person turn around. The best part of my work is helping students and others learn about the world we live in.

Dr. Carlos Gutierrez – Physicist



My mother came from Alamogordo, New Mexico. My dad is from Mexico but he grew up in Laredo, Texas, and my two younger sisters and I grew up in San Antonio, Texas. It was a very stable environment, as we only moved once in the entire time I was growing up. While my dad's side of the family is from Mexico, they are largely from European and Spanish ancestry, so they are lighter skinned than my mother's side of the family where there is great cultural mixing between the Mexican and the indigenous cultures of Mexico. This mix of cultures has always been something I'm aware of, because it showed me how differences in skin color really affect the way people view you.

My mom's side of the family can be traced back to the Aztecs. My grandmother used to tell me about how the tribes could use the stars to understand nature. These stories helped me to become interested in science and especially physics because that is the branch of science that astronomy fell under. My early interest in science shaped the first twenty-two years of my life.

I always knew that I wanted to be an astronomer, but it was not until I was in graduate school that I found out I should change to astrophysics. I learned early that everyone who seemed to be doing astrophysics was a Ph.D. or going after a Ph.D., and yet there really weren't any role models that helped show me it would possible to be get all the education that I would need to become an astrophysicist.

I was a pretty good high school student, but when I got to college I remember thinking, "This is hard!" I think the problem was that when I was in high school things were too easy. I had picked up some bad study habits so school was rough for a few years, and in some ways I lost quite a bit of self-esteem as an undergraduate. I was even wondering if I had what it took to go on to graduate school. I can trace my problems in school back to not being as prepared by high school as the other students who came in.

Physics was a difficult undergraduate major, and my family suggested that I go into something more applicable, such as law or engineering. However I really wanted to be an astronomer. I knew the only way that I could do that was to get a physics degree. I stuck with it knowing somehow that I would do it. There was a department chair at the University of Dallas (www.udallas.edu) who was sure that I was a very bright student. He gave me some encouragement even when there were other faculty who were not so supportive. Fortunately, I took a year off from school, and I got a very boring job. That helped me realize that having a boring job was not the way I wanted to spend the next forty years of my life! I decided I wanted to go ahead and become an astrophysicist. I eventually applied to Johns Hopkins University (www.jhu.edu) in Baltimore, Maryland, because the Space Telescope Science Institute (www.stsci.edu) had just been established there. Baltimore had no Chicano or Latino community at that time and for a while I hated it there. I thought seriously about dropping out of the program and transferring to another university. However, over time, I really grew to love the city. I eventually earned a Ph.D. in physics.

I am now anassociate professor of physics at Southwest Texas State University (www.swt.edu) in San Marcos just south of Austin, Texas. I am responsible for educating students who are interested in becoming physicists or engineers. The other part of my job is research. My research now contributes toward the development of very thin film coating materials for the magnetic sensor and semiconductor and microfabrication industries. For example, video cassettes use magnetic films to record information. These

films are sometimes only a few atoms in thickness! To get an idea of how thin these films are, a dime is about five million atoms thick!

Probably the best way that I have to connect with students right now is advising a group here on campus called MAES (Mexican-American Engineers and Scientists). I talk to the MAES (www.maes-natl.org) students and encourage them to become involved in K-12 outreach efforts. What I say to them is never underestimate the power of education, and never stop learning, no matter what your career is. People who do this are the people who always succeed in whatever they choose to do with their lives.

Dr. Vicente LLamas – Physicist

I was born and raised in Boyle Heights, a barrio in East Los Angeles. Although my Mexican-born parents had very little schooling, they instilled in my two sisters and me the importance of education. I attended Catholic schools throughout my elementary, secondary, and university education. In high school, I did very well in the sciences and mathematics. However, I didn't do well in high school physics, which was surprising to me because I loved building things and always thought I'd become an electrician or some other kind of mechanical technician. My love of building started when I was a kid. I was always fixing things like radios and television sets. I even built my own stereo with the help of my dad.

My high school teachers recommended that I take the "college track" courses rather than the strictly technical courses I planned on taking in order to become an electrician. I had no idea I was capable enough or even eligible to go to college. But, I was accepted to Loyola Marymount University of Los Angeles, which was exciting and scary at the same time, since my family, not wealthy by any means, had to come up with the high cost of college. At the time, we didn't know that there were federal aid and loan programs to help offset the costs of higher education, so along with my mother and father, I worked constantly for four years. By the time I graduated from Loyola, my education had been completely paid for.

I entered college still interested in being an electrician, so I majored in electrical engineering, not knowing how vastly different the two fields are. One of the required courses was engineering physics taught by a professor named Father Cooney, who became a mentor to me. Father Cooney was absolutely fantastic— he always challenged us to do better and he did it in a tough, yet caring way. I loved the work and I loved the excitement of physics, so I decided at the end of my first year to pursue physics as my major. Everyone thought I was crazy given that I hadn't done so well in my high school physics class. I wasn't a stellar student, but I did finish my physics degree in four years and received a full scholarship to attend graduate school at the University of Missouri.

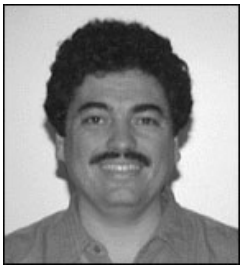
My experience in Missouri was a hard one. Not only was it an adjustment going from an urban environment like Los Angeles to a rural one, but the Midwestern culture was so different. There was virtually no ethnic diversity. I had never felt like a minority before because, living in East L.A., we were the majority! Except for another Hispanic student with the surname Romero, all my classmates were white, and there were very few women. I had good friends, but the small community of Rolla is where I had the difficulty. Townspeople didn't respond to me very comfortably. I think it had as much to do with their ignorance of who I was as with their lack of experience with people from different backgrounds. However, I decided to get involved in the community and my last two years were much easier as the townspeople appreciated my efforts.

After applying to 268 colleges for a teaching position once I received my Ph.D., I landed a job at New Mexico Highlands University in Northern New Mexico and was there for 24 years before retiring in 1994. In addition to my teaching responsibilities, I began to get involved in developing organizations that helped increase minorities in the science fields, both academic and professional. That's how the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) began— a group of Hispanic and Native American scientists in the early 70s who shared the similar experience of discrimination and isolation in the sciences.

It was a natural progression for me to continue my minority advocacy work after I retired. Currently, I spend a great deal of time working on programs to improve mathematics and science education in southwestern Native American and rural Hispanic communities.

As much as I enjoy traveling the country with my science/mathematics education consulting business, I miss teaching. I really loved the one-on-one interaction I had with students. I was considered a tough but caring professor like that of my mentor Father Cooney. I believe that one of the qualities of an excellent teacher is to accept the fact that he/she doesn't have all of the answers. For me, this made for an exciting exchange with students whose questions always gave me new information and new insights. Although I no longer teach, I do have the satisfaction of knowing that I've come a long way from building radios to helping build future communities of minority scientists throughout the country!

Dr. Ramon E. Lopez – Physicist



My parents were from Puerto Rico. My father was an army officer surgeon and my mother was an elementary school teacher, and they always encouraged learning. My parents bought me a telescope for my tenth birthday. When the astronauts landed on the moon, I remember running back and forth between the television set and my telescope trying to see if I could catch a glimpse of the men on the moon. When I was in sixth grade my father left the military, and my family moved to Freeport, Illinois, where my father went in to private practice. It was then that I decided I wanted to be a physicist, sparked mainly by reading and the Apollo moon landings. I wanted to know how the universe worked. In ninth grade we moved outside of town, where I had to start a new school, Pearl City High School (PCHS), without any of my previous friends. At PCHS I had a wonderful science teacher, Jerry Heinrich, who loved science and loved to teach it to others. In 1974, Mr. Heinrich taught me to do a small amount of programming on an early computer he had. For me, science was always a large and important part of my life.

Technically, I never graduated from high school. Stemming mainly from my "outgrowing" PCHS, I decided to go to college early. In the fall of 1976, I entered the University of Illinois (www.uiuc.edu) as a physics major. It was quite a step going from a high school of 200 students to a major university with 35,000 students. At first I did very poorly, as I felt significantly under-prepared for the challenges of college. In my first semester I earned under a C average. During the second semester I remember a particular calculus test. I had worked through many of the difficult problems at the end of the book, and I felt very prepared for the exam. I received a D, which was an eye-opening experience to me. I knew I wasn't stupid; I had just studied stupidly. During that semester I finally learned to study wisely. I mastered the concepts rather than very specific problems, and I aced the next calculus test. Also during my first year, I studied very hard to fill in the gaps that were apparent from my lack of preparation. During my third semester at UI, I received straight A's.

Though I was indisputably a physics major, I had other interests as well. In fact, if I wasn't a physicist, I think I'd be a historian. During school I worked in the physics department setting up lecture demonstrations, which was a great job for a student. I could study, and I came into contact with many of the professors I wouldn't have known otherwise. I also wrote articles about physics for the school newspaper as an undergraduate, which helped me immensely later in life. Though it doesn't seem like it, scientists actually write for a living; so the experience of writing for the newspaper was invaluable. I was even encouraged to go to school and receive a Master's in journalism. But I'd wanted a Ph.D. in physics since middle school, so I pursued that dream instead.

I received a National Science Foundation minority graduate fellowship to attend graduate school, where I knew I would study space science. I decided to attend Rice University (www.rice.edu) in Houston for graduate school partly because I was tired of the cold winters in Illinois. At Rice, things were different than at UI. The graduate students in space science were a close knit group as opposed to the large department I'd come from. It was very difficult in graduate school, and all of us in the program had to become more serious and focused. I even thought about dropping out after the first year due to isolation

from the other things that I loved, such as literature, history, art and philosophy, which I was used to being a part of at UI. However, I persevered; and in 1986 I received my Ph.D. in Space Physics.

Fresh out of graduate school, I began doing pure research in space physics at the Johns Hopkins Applied Physics Lab (APL) (sd-www.jhuapl.edu). I left APL because I wanted to put more effort into educational projects, which I did at the University of Maryland at College Park (UMCP) (www.umd.edu). When I was 34, I became the Director of Education for the American Physical Society (APS) (www.aps.org); and for five years I ran all of the education programs for APS while still working half time at UMCP. However, after five years doing both jobs, I'd had enough. I wanted a faculty position. In 1999, I obtained a position at the University of Texas at El Paso (UTEP) (www.utep.edu). I was appointed C. Sharp Cook Distinguished Professor of Physics and Chair of the Department of Physics at UTEP.

Dr. Luz Miranda-Martinez - Physicist

I distinctly remember being told by a non-Puerto Rican college professor that I shouldn't continue with my graduate studies because I "was wasting the federal government's money." It stung me emotionally but I had the resolve to not let this discrimination affect me. Instead, experiences like this one and others that left me feeling as if I was caught between two worlds have made me even more determined to succeed in my career as a female physicist.

I was born in Bethesda, Maryland and moved to Puerto Rico with my parents and twin brother when I was five. My parents were both Puerto Rican and chemists, so growing up in the world of science became like second nature to me. You may think it odd to have a mom who is a chemist, but in Puerto Rico it's very common for women to pursue academics and careers in the sciences such as biology, chemistry, and engineering.

Growing up and attending high school and the University of Puerto Rico was a positive experience because of the similar cultural background I shared with others on the island. (http://www.upr.clu.edu) However, returning to the U.S. in my 20s during the early 1980s proved to be a challenge. Even though Puerto Rico is considered a commonwealth of the United States (we are born with American citizenship), discrimination still prevailed twenty years ago. Having taken the lead from my parents, I fought hard against this discrimination, particularly while working on my Ph.D. at the Massachusetts Institute of Technology (M.I.T.). (http://web.mit.edu)

I can't imagine an environment more different from the tropical island of Puerto Rico than New England. Not only were there few minorities at M.I.T., but also very few women. There were 68 students in my entering class for the Ph.D. physics program and only eight females. Out of the eight, six of us graduated with our doctorate in physics. Although I was born an "American," as a female minority student I always had the feeling that my male professors were doubtful of my abilities. There never seemed to be any question that my male classmates could do the work. However, given the stereotype that Puerto Ricans are "lazy," I felt that I had to prove myself all over again. This was terribly frustrating because I had already proven that I could do the work back home!

One of the reasons I decided to obtain my Ph.D. on the mainland was because the University of Puerto Rico did not offer a Ph.D. in physics nor the research opportunities in my field of liquid crystals. It was also important for me to have a career position in which I could make my own decisions. I couldn't see myself always working under someone else who already had a Ph.D. Thus, I knew obtaining a doctorate degree was essential for me.

In addition to my work as a researcher in the Department of Materials, Science, and Engineering at the University of Maryland, College Park, I teach undergraduate and graduate level students as well as graduate level students who are working on research projects. (http://www.umd.edu) I consider myself fortunate to be at this university because of its high level of diversity and a better-than-usual female student representation in the areas of science and engineering. The field of physics is wide open, and I encourage students to explore the many opportunities available in industrial companies, educational institution, medical centers, and government laboratories.

Currently, I'm also involved with a program in College Park that encourages K-12 students to explore areas of science and engineering. I believe that by being a minority woman, I am providing a role model for the students I've encountered, especially the girls. Teenage girls have the misconception that being a female scientist will prevent them from having a social life. This isn't true! I also try to get across to students I meet, no matter whether secondary or college level, the importance of "balance" in one's life. For example, I've spent most of my life playing the piano. In fact, I received my bachelor's degree in music while at the University of Puerto Rico (and almost completed a second degree in chemistry). I know for me, having another interest was nice because it got my head out of just doing science-related studies. I don't believe that one's life can always be about work!

Dr. Karen Magnus – Biophysicist

If you had asked me twenty years ago about how being part Chippewa had influenced my life, I probably would have told you it hadn't. But as I have had more contact with my tribe, the Fond du Lac Ojibwe (http://www.indians.state.mn.us/fondlac.html), and read more about my family history, it seems like a lot of my world-view and attitude about women's independence and intelligence is in fact a reflection of how the Chippewa culture operates.

My feeling that women are able to do anything also comes from my parents. I grew up during the 1950s and 60s when the idea that women were just around to get married and have kids was pretty common. However, from a young age, my parents treated me as though I was going to be a member of the workforce. They also helped foster my early interest in science by taking my brother, sister and me to junior scientist meetings and to visit museums and power plants.

When I was a kid, science and technology was definitely on the minds of the American people. America was in the middle of what was called the "Space Race," (http://www.nasm.si.edu/galleries/gal114/) which grew out of the Cold War (http://www.coldwar.org/index.html) between the United States and the Soviet Union (now Russia). The race to develop rocketry and space flight helped cultivate a focus on science and technology that resonated throughout the country. In my school district, students with any talent for science were grouped together and we were particularly encouraged to pursue higher education in the sciences.

My early introduction to science and the subsequent encouragement by my teachers led me to attend the University of California, Davis (http://www.ucdavis.edu/) where I majored in chemistry and biology. College was a big transition. In high school we received individual attention from teachers; in college there were just the "teeming masses!" I didn't do as well in the classes where there were hundreds of other students and multiple-choice tests. But when I got to the smaller courses where I was able to interact with the other students and the professor, I did much better.

I entered college with the goal of becoming a physician. However, towards the end of my sophomore year, I realized that to obtain the necessary letters of recommendation to get into medical school, I needed to have more contact with my professors. I got a job in my advisor's lab where I had the opportunity to work on my own experiment and I became hooked on research. I really liked the independence of lab work where I got to think of what to do and then do it!

While the transition from high school to college was challenging, my move to Baltimore, Maryland to attend Johns Hopkins University (http://www.jhu.edu/) was even more difficult. I had never lived outside of California and found the culture of the east coast took a lot of getting used to. I decided to give it a chance and after six years I earned my Ph.D. in 1980.

It was in graduate school that I started working with x-ray crystallography (http://news.uns.purdue.edu/html4ever/9804.Crystallography.html) which is a technique used to create three-dimensional models of proteins. X-rays are the same kind of radiation as visible light, but have a much higher energy. When sunlight hits a crystal and the light diffracts into rainbows; it is similar to when x-rays hit a sample that has been crystallized, they diffract into a pattern. This pattern is different

depending on how the atoms are arranged around it. From this pattern you can work backwards to calculate the atomic structure of your sample.

In my current work as a research scientist at Duke University Marine Laboratory (http://www.env.duke.edu/marinelab/), I use x-ray crystallography to study proteins in the blood of horseshoe crabs. Instead of being red, like human blood, horseshoe crabs have blue blood. Hemoglobin is the protein in human blood that carries oxygen between the lungs and the tissues. Hemoglobin is made up of iron and is responsible for the red color of our blood. On the other hand, instead of hemoglobin, horseshoe crabs and other arthropods (http://www.ucmp.berkeley.edu/arthropoda/arthropoda.html) contain hemocyanin, which is made of copper. It is the presence of the copper, which makes the crab's blood blue. By researching how oxygen is transported by hemocyanin, I am attempting to provide the basis for further understanding of oxygen transport in humans.

My scientific work has taught me lessons that I value in all areas of my life, specifically about independence. The ability to set goals and work independently is an important skill to have, especially if you don't always like being told what to do! But, science has also taught me about flexibility, and the fact that you always have to be able to change your mind. For example, you may come up with a hypothesis, but your experiments may not show the results you expected. When this happens you have to be able to admit you were incorrect and move on! Most of all, my scientific work has shown me the importance of pursuing what you love.

Dr. Jose "JV" Vergara Martinez – Physicist

To this day, living in Northern Arizona makes it difficult to ignore the manifestation of natural phenomena and not contemplate how such wonders come to be. I am one who has always been curious. However, my curiosity about nature did not blind me to the status of the Mexican American population at the time. Growing up in the Southwest in the mid-1900s I became aware that a colonial mentality existed, left over from the U. S.-Mexican war of the 1840s, a war that resulted in a loss of half of Mexico's land to the U.S. Although my parents immigrated to the U.S. after that war, even the Mexicans that had resided in the Southwest and their descendants were treated as a conquered people, viewed as second-class citizens. Use of the Spanish language was an easy marker for discrimination. I experienced numerous instances of discrimination. My elementary school was segregated, reserved only for children of Mexicans like myself. Though we spoke Spanish at home, I easily mastered English. In elementary school I found myself attracted to mathematics, music and spelling. These subjects have a strong analytic content requiring less mastery of English and may have been the reason I gravitated toward them.

High school was difficult because I had to socialize into the "main stream". This resulted in being subjected to overt discrimination. An extreme case was the principal, who told me that I had to settle for second place after I called to his attention discrimination tactics used by a teacher. On another occasion he told me, "Mexicans don't do science." Eventually I was able to reconcile Anglo community values with those of my Mexican upbringing. Engaging in competitive sports presented a relief throughout high school. I was one of possibly two Mexican Americans that did well in science and mathematics, as well as in English in high school. I was editor of the newspaper during my senior year, won the school's American Legion oratory contest two years in a row and took second prize in a national art poster contest. My high school transcripts show two tracks of study, one that prepared me for semi-skilled labor and the other for college. Mexican American students were not viewed as destined for a college education.

Upon high school graduation, I enrolled at Northern Arizona University (http://www.nau.edu/text/) in 1950. A scholarship paid tuition and staying at home minimized my expenses. Expenses were critical, much as it is today among too many Hispanics. I was the only Mexican American in mathematics and science college classes. Nevertheless, I was able to complete my bachelor's degree in 1954 and then began my graduate studies with support of a teaching assistantship in graduate school.

As a graduate student at Oregon State University (http://oregonstate.edu/) and a post doctorate at Cornell University (http://www.cornell.edu/), I merged my lifelong interests in chemistry and physics and continued to build a competency in mathematics, which underpins all of science. Calculus and differential equations are fundamental for the precise formulation of physics and chemistry. Mastering mathematics is a continuing process. Entrance and success in college begins with the study of algebra, geometry and trigonometry in high school and continues without end. The last formal courses in mathematics I had were in graduate school, vector spaces that help describe molecular structure and differential equations that describe the motion of waves. In physics, this mathematics explains motion and energy exchange; in chemistry, how chemical bonds are formed to accommodate structure, molecular stability and energy content.

I found research a pleasant challenge particularly since it required making original contributions. For my master's degree, I found how the unrestricted motion of a particular molecule in the gas phase is modified when incorporated into a crystal. Such results are fundamental to new discoveries, such as predicting outcomes of chemical reactions and syntheses of chemicals. For the doctorate, my original contribution was to show that light passing through a carefully designed ultrasonic field in a gas can be used to measure exchange of energy when molecules collide.

After a successful period in the corporate world and a decade as a professor of physics, I became a program manager with the Atomic Energy Commission in 1974 (http://ma.mbe.doe.gov/me70/history/index.htm). This Commission was superceded by the Department of Energy (http://www.doe.gov/). As a result of an agency-wide competition, I was awarded a 12 month resident Sloan Fellowship in 1977 that allowed me to earn a Masters in Management Science at the Massachusetts Institute of Technology (http://mitsloan.mit.edu/). As a program manager for atomic, molecular and optical physics, I supervised and managed the disbursement of as much as 10 million dollars a year to U.S. scientists. This duty involved receipt of proposals, managing their evaluation and funding the more meritorious ones. Monitoring these projects provided me a vicarious living since the scientists invariably reported their new findings to me before they were submitted for publication. I found this role an exciting one. After 25 years of program management, I became a science advisor.

Realizing that so few minorities were following scientific careers, I help found SACNAS in 1973 and served as one of its presidents. I sincerely hope that those days of blatant discrimination are far behind us. Nevertheless, even when others think less of us, our own inner strengths along with our education and organizations like SACNAS aid us to conquer adversities.

Dr. Carmen Nappo - Meteorologist

When I was a kid, I loved going to the movies with my uncle. During the 1950s, science fiction films became really popular. They had titles like *Teenagers from Outer Space* or *When Worlds Collide*. Even though these movies may have been far-fetched, they led to my first interest in science.

My uncle was not only my movie buddy. He also opened up the world to me. He taught me algebra, literature and philosophy, and he also showed me how to tap dance! He and my mother grew up in show business as part of a traveling vaudeville act. They were Oglala Sioux, and although my grandfather was not proud of his culture, the family earned their living performing in costume as an Indian act. He did not teach his children about the Sioux heritage. At that time, there was a tremendous amount of prejudice toward Native Americans, and my grandfather did not want his children to identify with a group that was so discriminated against.

My father, who emigrated with his family from Italy, was also a vaudeville musician and eventually became the musical conductor for the Holiday on Ice show. My mother ice-skated in the show. My brother and I often traveled with them when the show was on tour. But during the school year, we were enrolled in military or boarding schools. We lived in a lower-middle-class Italian neighborhood in Chicago. We spoke Italian, and my brother and I went to a Catholic school after my parents separated. My mother had a lot of grief because the community did not accept her. Even though she wasn't raised Sioux, she looked Native American. We had further difficulties, since divorce was also not accepted in our primarily Catholic neighborhood. But I felt like I was a pretty normal kid.

My mother remarried when I was 13, and my stepfather moved us to Victorville, California, in 1958. I was taken from a city of five million people to a city of 5,000 people located in the Mojave Desert. That was a lonely time for me and I experienced a lot of culture shock. I spent most of my time reading and doing homework, since I was planning to go to college. When I was 17 or 18, I became inspired by the autobiography of Benvenuto Cellini, an original renaissance man. Like Cellini, I wanted to become an expert in different subjects. Going to college was not expected back then, because you didn't need a degree to get a job. But I wanted to learn about literature and science, and get my Ph.D.

I decided to pursue a career in physics because I liked the subject in high school. I started at the University of California, Riverside, in 1959. I got married at age 23, and we had our first child, Cora, after I completed my degree in 1966. During this time, I worked for the university while my wife worked for the phone company. I paid my way through school without any financial assistance. After I finished my master's at the University of Washington in Seattle in 1968, we were tired of being poor, so I took a job with the National Oceanic and Atmospheric Administration (NOAA) researching atmospheric diffusion. I studied how air quality in our country is affected by the dispersion of pollution from sources like smokestacks or cars.

Later in life, when my first daughter was old enough to go to college, I went back too! With a scholarship from NOAA, I commuted weekly to the Georgia Institute of Technology, and completed my Ph.D. in 1989. Besides being a personal goal, completing my education made it possible for me to become a professor.

I took the opportunity to take my research in a new direction, and learned about atmospheric gravity waves. I had always wondered why trees sometimes rustle at night, even when there shouldn't be any wind. One theory is that these turbulent events are generated by atmospheric gravity waves. These waves are similar to the waves on the sea, except air is pushed up and down, instead of water. Atmospheric gravity waves can be created by thunderstorms, fast-moving cold fronts, or air moving over mountains. The turbulence generated by these waves can increase the spread of pollutants, and so it's important to study how the waves are created. When I decided to research this field, there wasn't much information out there. It has been said that the best way to learn a subject is to write a book about it, so that's what I did.

Maybe it was my fascination with the Italian Renaissance, or maybe it's from growing up with multi-talented vaudeville performers, but I have always loved learning about new and different subjects. Now I am learning about my own history, since my Native American background wasn't really recognized because "it didn't belong" when I grew up. My grandfather took the name of DeSoto because he wanted to appear more Spanish than Native American. It was really sad, because the forces of society succeeded in destroying his interest in his own culture. But the reverse is true for me. Since I was denied that part of my background, my interest in my heritage has been rekindled. I want to learn more about it, and help young Native Americans interested in science.

One of my colleagues, a member of SACNAS, invited me to give a talk at a SACNAS conference. Science is such a common language. It is about thinking, learning, and using something that everyone has, no matter what your race, class or gender is: your mind.

Dr. Elba Serrano – Biophysicist

World culture has shaped much of who I am. I was born in Old San Juan, Puerto Rico. My father was a career sergeant and Vietnam veteran in the US military, and we were posted to new assignments on a regular basis. By the age of 11, I had lived in Puerto Rico, Central America, and Taiwan. Layered over my nomadic military lifestyle is my family's strong Hispanic culture. Being Puerto Rican has always been important to them. This respect and honor for my culture clashed deeply with how I was treated at school. I was a native Spanish speaker. Due to my accent, I was made fun of and, at times, even physically abused by other children. I also received insulting comments about the color of my family's skin. These experiences created a lot of sadness and low self-esteem in me.

In later years, I lived in England, France, and Germany, and I have spent shorter periods of time in Mexico, Japan, Italy, and Brazil. I have always lived within multiple cultures surrounded by different languages, giving me a deep appreciation for the varied lifestyles and viewpoints of other nationalities. What I found by living in many diverse cultures is that there is a common human experience that transcends ethnicity.

Because we all share a common human experience, I recognize the importance of science in an international context. All knowledge is human; that's what makes us all unified. Students read about a molecule or about the ocean whether they are in the Middle East or in South America. Humans from every nation have contributed to scientific knowledge. There are issues that affect the whole planet that need to be addressed by the international community. Some of the most important issues today pertain to health, energy, and water. The first issue, health, includes global epidemics like malaria, tuberculosis, HIV, and SARS. Contagious diseases are going to affect all of us whether they are in our country yet or not. The second issue, energy, is important in preserving our resources and environment. We need to look at clean energy like solar power versus polluting energy like gasoline. The third issue, clean water, is something we take for granted in this country, but many people die around the world because they don't have access to clean water and sanitation. I believe every country has something to offer to help tackle these problems. Together we can create change.

Right now, I'm involved in international efforts/activities on the status of women in the world and the participation of women in science. Half of the human race is female, and we have a contribution to make in every area of scientific investigation. I have always worked in male dominated fields, and only a few of my colleagues have shared my Hispanic heritage. As a physics undergraduate at the University of Rochester, I was one of eighty students; only two were women, and I was the only minority. When I was at Stanford University for my Ph.D., I was the only woman out of eight to continue in science. Today, in the biology department at New Mexico State University, only four out of 19 tenure-track faculty are women. I am one of only two permanent women faculty members there. This is just an example from my workplace. However, around the world, women are not represented equally. In some cases, the inequality can be devastating. Women are poorer than men in our own country and around the world. Training women in the sciences ensures that women's ideas about the direction of science are included in the questions we ask, but it also gives women a better life—you can make a good living as a scientist.

Through international dialogue on the status of women, I have learned that communication between countries and listening to the voices of the underprivileged are important. My research presently lies in the area of communication. I study the nervous system. The nervous system itself is about communication: its function is to give information to the brain about internal or external happenings. In particular, I am interested in the neural regeneration that can help restore hearing loss. Many people are born without hearing, and many lose it progressively through life due to a variety of causes. In my lab, we examine the sensory cells that are responsible for hearing. We hope to stop specific types of hearing loss through the repair and restoration of cells in the nervous system.

Science is a universal language that the whole world can use to communicate, from one nation or culture to the next. Science created a way for me to connect with others in the world, people of all different ethnicities. In this way, all of us from different nations and cultures can learn from and respect one another. For me, learning this universal language of science has helped me heal from the discrimination I faced as a child, and it holds tremendous potential to continue to break down barriers of oppression and hatred—to create a world without borders.

