

Assemblyman Patrick O'Donnell
Chair, Assembly Select Committee
on Aerospace



Senator Jean Fuller
Chair, Senate Select Committee
on Defense and Aerospace

Agenda

February 29, 2016

3:00 – 4:30 PM Room 4203

Women in Aerospace and Engineering: Exploring Challenges and Opportunities for Women in STEM Fields

1. Call to Order
2. Women in Industry
 - a. Julie Van Kleeck, Aerojet Rocketdyne
 - b. Lt. Col. Kelly Latimer, Virgin Galactic
 - c. Madeline Salazar, Boeing Satellite Systems
 - d. Kelly Jill Tornquist Hennig, Northrop Grumman
3. Women in National Laboratories and Research Centers
 - a. Dr. Malina Hills, Aerospace Corporation
 - b. Dr. Tamara Jernigan, Lawrence Livermore National Laboratory
4. Women in Academia
 - a. Dr. Debra Larson, California Polytechnic State University – San Luis Obispo
5. Women in Professional Societies
 - a. Dr. Sandra Magnus, American Institute of Aeronautics and Astronautics
6. Questions and Comments from the Members
7. Adjournment



WOMEN IN AEROSPACE AND ENGINEERING: EXPLORING CHALLENGES AND OPPORTUNITIES FOR WOMEN IN STEM FIELDS

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TABLE OF CONTENTS

| | |
|--|----|
| Participant Biographies..... | 3 |
| Government Efforts to Expand STEM Education..... | 11 |
| Discrepancies in STEM Employment by Gender..... | 12 |
| Sources..... | 17 |

PARTICIPANT BIOGRAPHIES

JULIE VAN KLEECK

Vice President of Advanced Space & Launch
Aerojet Rocketdyne

Julie Van Kleeck is Aerojet Rocketdyne's Vice President of the Advanced Space and Launch Business Unit. She is responsible for space and launch propulsion and power, research, technology development and product development programs, including AR1. AR1 is a developmental booster engine that is being considered to replace Russian propulsion on the Atlas V and future launch vehicles.

Ms. Van Kleeck's program and technology responsibilities include: the booster propulsion for NASA's Space Launch System (SLS); the propulsion system for the Orion deep space capsule; Commercial Crew propulsion and power systems; advanced electric propulsion; International Space System (ISS) power system, as well as AFRL and DARPA programs. She also oversees the company's research activities for next-generation space technology, including additive manufacturing, advanced materials, non-toxic propellants, modular small satellites, and nuclear propulsion and power technology efforts.

Ms. Van Kleeck joined Aerojet in 1981 and was appointed to her present position in June 2013. Previously, she was the vice president of the Space and Launch Business Unit, where she managed all of the company's in-space and launch propulsion technology, development and production programs. She began her career in systems engineering and later moved to rocket system product development and has demonstrated experience in virtually all forms of rocket propulsion technology and their applications. She has been instrumental in the development of leading-edge rocket propulsion technology and products, including a number of missile defense, launch vehicle and spacecraft propulsion systems – many of which are in production today at Aerojet Rocketdyne.

Ms. Van Kleeck earned her Bachelor of Science degrees in Mechanical and Aeronautical Engineering from the University of California and has extensive "hands-on" experience. She has received numerous technical awards from Aerojet Rocketdyne and outside organizations. She is very active in Aerojet Rocketdyne's outreach and advocacy efforts for STEM and Women in Aerospace programs. She is currently the executive sponsor of the company's "Women in Network" (WIN) organization, an AIAA Associate Fellow, the co-chair of the AIAA Corporate Member Committee, and a Propulsion and Energy Executive Steering Committee member. She is also a past board member of the Aerospace Museum of California and a current member of the European Space Propulsion board.

Ms. Van Kleeck resides in Folsom, California with her husband and extended family. She is an avid skier and runner.

AEROJET ROCKETDYNE

Aerojet Rocketdyne, headquartered in Sacramento, is an innovative company delivering solutions that create value for its customers in the aerospace and defense markets. The company is a world-recognized aerospace and defense leader that provides propulsion and energetics to the space, missile defense and strategic systems, tactical systems and armaments areas, in support of domestic and international markets. In California, Aerojet Rocketdyne's facilities in Sacramento and Los Angeles employ approximately 2,700 of the company's nearly 5,000 employees across the country.

LIEUTENANT COLONEL KELLY LATIMER, US AIR FORCE, RET

Test Pilot

Virgin Galactic

Lieutenant Colonel Kelly Latimer is the newest pilot on the growing commercial flight team of Virgin Galactic, the world's first commercial space line.

Latimer, US Air Force, Ret. is a former combat veteran and retired US Air Force Lieutenant Colonel. Latimer joins Virgin Galactic with extensive experience with heavy aircraft and as an experimental test pilot for NASA, Boeing, and the US Air Force.

Latimer was the first female research test pilot hired by NASA's Dryden (now Armstrong) Flight Research Center, where she conducted experimental flight test and test support on the Stratospheric Observatory for Infrared Astronomy (SOFIA) 747SP, T-38, C-17, 747 Shuttle Carrier Aircraft, BE200 and T-34 for various NASA research projects.

Latimer's service with the US Air Force began with undergraduate pilot training at Reese Air Force Base, TX and as a T-38 instructor pilot. She graduated from the US Air Force Test Pilot School Edwards Air Force Base, where her roles included C-17 Instructor Aircraft Commander, C-141 experimental test pilot, and Senior USAF Advisor to the Iraqi Air Force and its reconnaissance squadron. Latimer personally flew 90+ combat sorties with members of IqAF Sq 70 and flew 130+ combat hours in support of Operation ENDURING FREEDOM and Operation IRAQI FREEDOM. As 418th Flight Test Squadron Commander and Global Reach Combined Test Force, she led more than 650 military, civilians and contractors to execute developmental and operational testing of airlift and special ops systems and commanded a flight test squadron of 280 personnel.

Before joining Virgin Galactic, Latimer held positions at Boeing where she was a key team member on system development, aircraft design, engineering and certification and conducted the very first flight tests of Boeing's KC-46/767 aerial tanker program. Latimer also served as Deputy Director for Airlift Operations and Chief Pilot for C-17 and was responsible for operations globally, managing test pilots and other aircrew to prepare for and conduct safe test flight operations and ensuring the application of crew resource management principles.

Latimer has logged more than 6,000 flight hours and more than 1,000 hours in test flight in over 30 aircraft. She is type rated in heavy aircraft and fighters including B767/B757, B737, B787, and T-38/F-5. Latimer graduated with honors and distinction with a bachelor's degree in aeronautical engineering from the United States Air Force Academy and a master's degree in astronautics from George Washington University.

VIRGIN GALACTIC

Virgin Galactic, a privately funded company headquartered in California, is on track to become the world's first commercial spaceline. Virgin Galactic is currently developing SpaceShipTwo, a reusable suborbital vehicle that will reach space altitudes on frequent, affordable, and safe suborbital voyages for humans and research payloads, and its LauncherOne vehicle system, a space transportation service to provide dedicated rides to orbit for small satellites.

MADELINE SALAZAR

Integration Manager, Satellite Systems
Boeing

As a 6th-grader Madeline Salazar wrote prophetically in an application for a STEM outreach event: *“Seven years from now I will probably be a student at a college or university. I will be a mini-engineer.”*

Today Madeline Salazar is a first-generation college graduate, an MIT alumnus, a mechanical engineer and a leader in the engineering field. She was born and raised in East Los Angeles by immigrant parents of Mexican descent.

At the young age of 22, Salazar has already experienced a variety of positions in various companies, as well as act as a contributor to the engineering research and development field. During one summer, Madeline served the U.S. Naval Sea Command as a civilian engineer developing a visual dashboard of data that would allow researchers to quickly see and analyze incoming data. At NASA’s Jet Propulsion Laboratory Madeline led the solar array layout on a satellite called SMAP and developed design solutions to mechanisms on Curiosity, the latest of the Mars Exploration Rovers. Back at MIT, Madeline managed the design, development and manufacturing of a transparent Infant warming blanket that would monitor and maintain the temperature of burn patients who were susceptible to hypothermia while allowing medical staff to monitor them and their injuries.

Salazar continues to build on her experiences at The Boeing Company where she has served as an integration manager at the world’s largest satellite development factory in El Segundo, Calif. As the youngest member of her team, she was responsible for and managed the integration of commercial satellites with multimillion dollar budgets. Today she serves as a Hydro-Mechanical System engineer in Commercial Aviation Services, working with the company’s national and international customers day-to-day.

Salazar always has her home in East L.A. in the back of her mind, “I feel there’s a need for you to go back and help your community, the people who have gone through the same things as you,” she says. Her passion lies in reaching out to parents who need guidance in supporting their children in getting to and through college, and to college students who face the same struggles she faced as a first generation student in college and in a STEM career. She exercises this passion as a co-founder of the non-profit organization, Latinas in STEM, as well as co-founder of Tech Camp LA, a summer technology camp for K-12 students. As a recent college graduate and a young professional, Salazar understands the needs for women in STEM and through motivational speeches for both students and parents; she is reaching out to her communities one by one. Salazar was recognized at the 2014 HENAAC Awards as ‘Most Promising Engineer with an Undergraduate Degree’ for both her technical and community contributions.

BOEING

Boeing, the world's largest aerospace company and leading manufacturer of commercial jetliners and defense, space and security systems, celebrates 100 years of aerospace leadership in 2016. A top U.S. exporter, the company supports airlines and U.S. and allied government customers in 150 countries. Boeing products and tailored services include commercial and military aircraft, satellites, weapons, electronic and defense systems, launch systems, advanced information and communication systems, and performance-based logistics and training.

KELLY JILL TORNQUIST HENNIG

Principle Investigator, Wideband Communications Products IR&D
Northrop Grumman Aerospace Systems

Kelly Jill Tornquist Hennig leads a team of engineers who are developing advanced microelectronics products and techniques for future communications products and systems. Her responsibilities include resource management, product vision, inter-organization coordination and insertion/capture targeting.

Previous assignments include Chief Engineer for the Galaxy Program, an effort to development disruptive solutions for customer driven Research & Development programs and Deputy Lead for developing a strategy for Complementary Metal Oxide Semiconductor research, qualification, technology insertion and program capture. She also served as Deputy Program Manager and Technical Lead for the Defense Advanced Research Projects Agency's Diverse Accessible Heterogeneous Integration Foundry Development Program and successfully co-ordinated a multi-technology, multi-project effort for a number of high profile customers, including the Air Force Research Laboratory, the Army Research Lab, and the National Institute of Standards and Technology.

Hennig holds eight patents and has coauthored more than 50 technical papers. She has been recognized by Northrop Grumman with an Innovation Award, a Good Engineering Award, the 2015 Champions Circle Award for Innovation Pipeline, the 2015 Patent of the Year Award for her patent on Wafer level packaging of Micro Plasma Limiters, the Northrop Grumman Technology Review Journal Best Paper award for Spring/Summer 2006, the 2007 Innovation Award, and the 2007 Distinguished Invention Award.

She earned a B.S. in Electrical Engineering from Rutgers University in 2000 and an M.S. in Electrical Engineering, Electromagnetics and Optics, from the University of Michigan in 2001.

NORTHROP GRUMMAN

Northrop Grumman is an American global security, aerospace, and defense technology company with facilities across California including San Diego, Long Beach, Palmdale, Manhattan Beach, Sunnyvale, and Sacramento. Northrop Grumman provides innovative systems, products and solutions in unmanned systems, cyber, C4ISR, and logistics and modernization to government and commercial customers worldwide. Their mission is to be at the forefront of technology and innovation, delivering superior capability in tandem with maximized cost efficiencies.

DR. MALINA M. HILLS

Vice President of Space Programs Operations
Aerospace Corporation

Dr. Malina M. Hills is the vice president of Space Program Operations (SPO). She assumed this position in July 2014. In this position, she works directly with the Air Force, government, and industry partners to develop military satellites and to advance national security space systems. She assists with the development of system requirements, provides schedule/cost risk assessments, and solves systems development problems. Hills oversees five major mission areas: communications, surveillance, weather, navigation, and space superiority. SPO is organized into five divisions: Space Based Surveillance Division, Environmental Satellite Systems Division, MILSATCOM Division, Navigation Division, and Space Support Division.

Hills was formerly general manager of the Military Satellite Communications (MILSATCOM) Division, and was responsible to the Air Force Space and Missile Systems Center for systems engineering and mission assurance in the architecture, acquisition, development, orbital operation, and sustainment of military satellite communication systems, including support for the Advanced Extremely High Frequency, Defense Satellite Communications System, Enhanced Polar System, Milstar, Wideband Global SATCOM, Command and Control System – Consolidated, and Advanced Concept programs.

Prior to that, Hills was general manager of the Systems Engineering Division, where she led the division's bicoastal efforts to support customers in space systems architecture and design, acquisition and planning, mission assurance, and system analysis and simulation.

Hills came to Aerospace in 1987 as a member of Laboratory Operations, and has held a number of increasingly responsible positions, including principal director of systems integration for the Space Based Infrared System program, principal director of the Business and Operations Analysis Subdivision, and principal director of the Research and Program Development Office.

Hills has a bachelor's degree in engineering and applied science from Yale University, and a doctorate in chemical engineering from the California Institute of Technology. Hills is an Associate Fellow of the American Institute of Aeronautics and Astronautics. She is a member of the International Council on Systems Engineering, the Armed Forces Communications and Electronics Association, and Women in Aerospace.

Hills has been honored with the 2001 NRO Director's Team Award, and the 2008 INCOSE L.A. Chapter President's Award.

AEROSPACE CORPORATION

The Aerospace Corporation, headquartered in El Segundo, provides independent technical and scientific research, development, and advisory services to national security space programs. The company operates a federally funded research and development center for the United States Air Force's Space and Missile Systems Center and the National Reconnaissance Office. The Aerospace Corporation also applies more than 55 years of space systems experience to projects in the national interest for civil agencies like NASA, the National Oceanic and Atmospheric Administration, commercial companies, universities, and international organizations.

DR. TAMARA E. JERNIGAN

Deputy Principal Associate Director for Weapons Complex Integration
Lawrence Livermore National Laboratory

Tammy Jernigan was born in Chattanooga, Tennessee and raised in Southern California. She completed her B.S. degree in physics (with honors) and M.S. degree in Engineering Science at Stanford University in 1981 and 1983, respectively. She then joined the Astronomy Department at UC Berkeley to pursue a Ph.D. degree in theoretical and computational astrophysics. Her research focused on the modeling of high-velocity outflows in regions of star formation, gamma-ray bursters, and the study of radiation produced by astrophysical shock waves. In 1985, she was selected as a NASA astronaut and subsequently completed her Ph.D. in Space Physics at Rice University while training for the Space Shuttle program.

Dr. Jernigan is a veteran of five Space Shuttle missions where she supervised the pre-flight planning and in-flight execution of critical activities aboard STS-40, 52, 67, 80, and 96. On STS-67, Dr. Jernigan served as Payload commander where the crew conducted continuous ultraviolet observations of a variety of stars, planets, and distant galaxies. During Dr. Jernigan's last flight, STS-96, the crew performed the first docking to the International Space Station and Dr. Jernigan executed a spacewalk of nearly eight hours to attach equipment to the exterior of the station.

In addition to her space flight experience, Dr. Jernigan held numerous management positions as an astronaut. She has served as Deputy Chief of the Astronaut Office, assisting with the management of both military and civilian astronauts and support personnel and as Deputy for the Space Station program where she developed and advocated Astronaut Office positions on the design and operation of the International Space Station. She is the recipient of numerous awards including Outstanding Woman of the Year in Science for Alameda County (2004), the NASA Distinguished Service Medal (2000), the Lowell Thomas Award, Explorer's Club (2000), the NASA Outstanding Leadership Medal (1996), the NASA Outstanding Performance Award (1993), the NASA Exceptional Service Medal (1993), and the Laurels Award, Aviation Week (1991).

In October of 2001, Dr. Jernigan joined Lawrence Livermore National Laboratory where she has served as the Principal Deputy Associate Director for the Physics and Advanced Technologies Directorate and as the Associate Director for Strategic Human Capital Management. Dr. Jernigan currently serves as Deputy Principal Associate Director for Weapons and Complex Integration (WCI). WCI is responsible for ensuring the safety, reliability, and security of the Nation's nuclear deterrent in the absence of nuclear testing. In addition, Dr. Jernigan has served on several National Academy Boards including the Space Studies Board and the NASA Technology Roadmap Steering Committee. She is currently a member of the Naval Studies Board.

Dr. Jernigan resides in Pleasanton, California with her husband and former astronaut, Dr. Jeff Wisoff, and their two children, Jeffrey and Michael.

LAWRENCE LIVERMORE NATIONAL LABORATORY

Lawrence Livermore National Laboratory, located in Livermore, is a federal research facility founded by the University of California in 1952. Lawrence Livermore is sponsored, and primarily funded, by the United States Department of Energy. Lawrence Livermore's defining responsibility is ensuring the safety, security and reliability of the nation's nuclear deterrent. The Laboratory's science and engineering are being applied to achieve breakthroughs for counterterrorism and nonproliferation, defense and intelligence, energy and environmental security.

DR. DEBRA S. LARSON

Dean, College of Engineering
California Polytechnic State University

Dr. Debra Larson, P.E. has been serving as the dean for the College of Engineering at California Polytechnic State University San Luis Obispo since August of 2011. The College is well known for its Learn-by-Doing approach to education and is a preferred provider of practice-ready baccalaureate engineers to industry; ranking tenth in the nation in terms of degrees awarded.

In the fall of 2013, the College enrolled 5,288 undergrads in fourteen programs and 358 master students in eleven programs. The College, under Dean Larson's direction, is successfully growing multidisciplinary initiatives that span the University including cybersecurity, autonomous flight, big data, advance manufacturing, and innovation and entrepreneurship.

Previously, Dr. Larson served as associate vice provost at Northern Arizona University (NAU) in Flagstaff, AZ. Prior to this appointment, she served as the associate dean for the College of Engineering, Forestry and Natural Sciences at NAU. This associate dean position followed an earlier, four-year appointment as chair for the Department of Civil and Environmental Engineering at NAU.

Dr. Larson holds the academic rank of professor; is a licensed professional engineer (inactive) in the states of Oregon and Arizona; is well-known for her activities in engineering education; and provides national service to ABET, ASEE, and Order of the Engineer.

Dr. Larson's academic career began in 1994, after an earlier career as a civil and structural engineer working in manufacturing, product development and sales, and consulting.

CALIFORNIA POLYTECHNIC STATE UNIVERSITY

Cal Poly, located in San Luis Obispo, is a nationally ranked, four-year, comprehensive public university on California's Central Coast. It is a distinctive learning community offering academically focused students a hands-on educational experience that prepares them for today's scientific and technical world. Founded in 1901 as a vocational high school Cal Poly is home to over 20,000 students and offers 64 bachelor's degrees, 31 master's degrees, and one doctoral of education degree.

DR. SANDRA H. MAGNUS

Executive Director

American Institute of Aeronautics and Astronautics

Dr. Sandra H. “Sandy” Magnus is the Executive Director of the American Institute of Aeronautics and Astronautics (AIAA), the world’s largest technical society dedicated to the global aerospace profession.

Born and raised in Belleville, Ill., Dr. Magnus attended the Missouri University of Science and Technology, graduating in 1986 with a degree in physics and in 1990 with a master’s degree in electrical engineering. She received a Ph.D. from the School of Materials Science and Engineering at Georgia Tech in 1996.

Selected to the NASA Astronaut Corps in April, 1996, Dr. Magnus flew in space on the STS- 112 shuttle mission in 2002, and on the final shuttle flight, STS-135, in 2011. In addition, she flew to the International Space Station on STS-126 in November 2008, served as flight engineer and science officer on Expedition 18, and returned home on STS-119 after four and a half months on board. Following her assignment on Station, she served at NASA Headquarters in the Exploration Systems Mission Directorate. Her last duty at NASA, after STS-135, was as the deputy chief of the Astronaut Office.

While at NASA, Dr. Magnus worked extensively with the international community, including the European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA), as well as with Brazil on facility-type payloads. She also spent time in Russia developing and integrating operational products and procedures for the International Space Station.

Before joining NASA, Dr. Magnus worked for McDonnell Douglas Aircraft Company from 1986 to 1991, as a stealth engineer. While at McDonnell Douglas, she worked on internal research and development and on the Navy’s A-12 Attack Aircraft program, studying the effectiveness of radar signature reduction techniques.

Dr. Magnus has received numerous awards, including the NASA Space Flight Medal, the NASA Distinguished Service Medal, the NASA Exceptional Service Medal, and the 40 at 40 Award (given to former collegiate women athletes to recognize the impact of Title IX).

AMERICAN INSTITUTE OF AERONAUTICS & ASTRONAUTICS

The American Institute of Aeronautics and Astronautics (AIAA) is more than 30,000 engineers and scientists from 88 countries dedicated to the global aerospace profession. AIAA convenes five yearly forums; publishes books, technical journals, and Aerospace America; hosts a collection of 150,000 technical papers; develops and maintains standards; honors and celebrates achievement; and advocates on policy issues. AIAA serves aerospace professionals around the world—who are shaping the future of aerospace—by providing the tools, insights, and collaborative exchanges to advance the state of the art in engineering and science for aviation, space, and defense.

GOVERNMENT EFFORTS TO EXPAND STEM EDUCATION

WHAT IS STEM?

Through Science, Technology, Engineering, and Mathematics (STEM) education, students learn to become problem solvers, innovators, creators, and collaborators and go on to fill the critical pipeline of engineers, scientists, and innovators so essential to the future of California and the nation

STEM workers are those employed in science, technology, engineering, and mathematics occupations. This includes computer and mathematical occupations, engineers, engineering technicians, life scientists, physical scientists, social scientists, and science technicians. STEM is subject-matter driven. As such, it includes managers, teachers, practitioners, researchers, and technicians. Although the majority of the STEM workforce has at least a bachelor's degree, the STEM workforce also includes those with associate's degrees and high school diplomas. The Census Bureau occupation code list contains 63 STEM occupations, accounting for 6 percent of the total civilian workforce aged 25 to 64.

DEMAND FOR STEM EDUCATION

Many of California's students lack consistent access to high-quality STEM education. Although the importance of STEM learning has been widely acknowledged, several factors have limited access to STEM education: the focus on English language arts and skill-based mathematics required by No Child Left Behind; insufficient focus on science as well as on STEM education in the classroom; lack of access to high-quality STEM materials and instruction; insufficient opportunities for students to engage in hands-on, inquiry based learning; and insufficient professional preparation by teachers at all levels.

One consequence of California's lack of access to STEM education for all students is that the state's workforce is not prepared or trained for STEM work nor does our STEM workforce reflect the demographics of the state.

In California in 2012, there were approximately five people searching for every available job. Meanwhile, there were 1.5 STEM jobs available for every job seeker. Workers with STEM skills are scarce across the entire economy.

It has been estimated that by 2018, 92 percent of traditional STEM jobs will require at least some postsecondary education and training. Close to two-thirds of STEM job openings will require bachelor's degrees or above and the remaining roughly 35 percent of the STEM workforce will consist of those with sub-baccalaureate training, including 1 million associate in arts degrees, 745,000 certificates in related fields, and 760,000 industry-based certifications.

FEDERAL RESPONSE

Industry, government, and academic leaders cite increasing the science, technology, engineering, and mathematics workforce as a top concern. The National Academy of Sciences, National Academy of Engineering, and the Institute of Medicine describe STEM as "high-quality, knowledge-intensive jobs... that lead to discovery and new technology," improving the U.S. economy and standard of living. In 2007, the US Congress passed the America COMPETES Act, and reauthorized it in 2010, to increase funding for STEM education and research.

The COMPETES Act contains numerous provisions relating to STEM education including:

- The enhancement of research capabilities and coordination and emphasizing the importance of undergraduate research experiences as tools that promote careers in STEM fields.
- Called for a National Science and Technology Summit and numerous reports on the state of innovation and competitiveness in the United States and assessments of the federal government's effective support of science, technology, engineering, and mathematics education in the US.
- Established a panel of experts to provide information on promising practices for strengthening teaching and learning in STEM at the elementary school and secondary school levels.
- Requires the development and implementation programs that will increase the production of professionals with both a baccalaureate degree in STEM and teaching certification and the development of 2-3 year part-time masters programs in teaching.
- Requires the National Science Foundation commission a report from the National Academies of Sciences about barriers to increasing the number of underrepresented minorities in STEM fields and to identify strategies for bringing more underrepresented minorities into the STEM workforce.

The America COMPETES Act also created the STEM Training Grant Program in order to recruit and prepare students pursuing a bachelor's degree in a STEM field to become certified as elementary and secondary teachers and sets aside \$2 million annually, per institution, that implement the program.

CALIFORNIA RESPONSE

In 2013 the State Board of Education adopted the Next Generation Science Standards (NGSS.) These new standards reflect how science is done in the real world through Scientific and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The NGSS integrate science, technology, and engineering throughout the K-12 curriculum and correlate with the Common Core State Standards in English language arts and mathematics that were adopted by California in 2010.

Implementation of the NGSS in California is scheduled in three phases: 1) Awareness (2013-2015); 2) Transition (2015-2016); and 3) Implementation (2016-2017). The NGSS will bring science instruction up-to-date by emphasizing a deeper focus on incorporating science and engineering practices, and applying crosscutting concepts within and across the scientific disciplines of Earth and Space, Life, and Physical Science. The NGSS also provides a coherent progression of learning from kindergarten through grade 12, so students learn step-by-step the knowledge and skills they need for college and careers.

In July 2014, the California Legislature passed and the Governor signed into law the California Career Pathways Trust. Funds in the amount of \$250 million were made available to school districts, county superintendents of schools, direct-funded charter schools, regional occupational centers or programs operated by a joint powers authority, and community college districts in the form of one-time competitive grants. The grants were made available for kindergarten through grade fourteen career pathways programs that established regional collaborative relationships and partnerships with business entities, community organizations, and local institutions of postsecondary education; develop and integrate standards-based academics with a career-relevant, sequenced curriculum following industry-themed pathways that are aligned to high-need, high-growth, or emerging regional economic sectors; and Provide articulated pathways to postsecondary education aligned with regional economies.

DISCREPANCIES IN STEM EMPLOYMENT BY GENDER

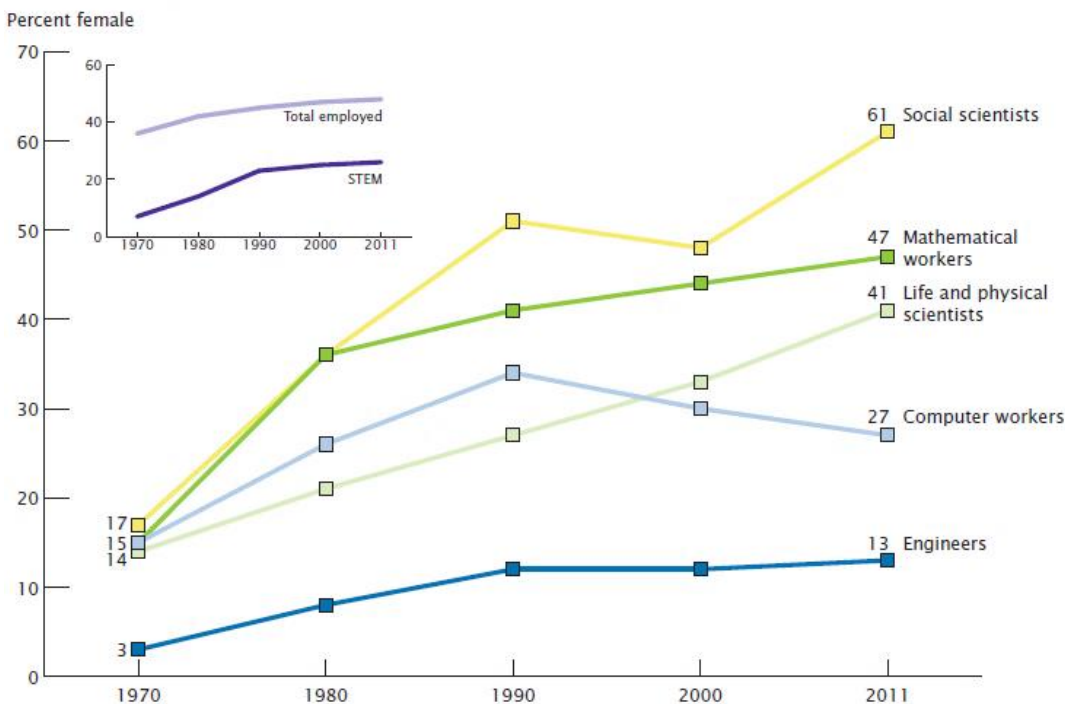
One focus area for increasing the STEM workforce has been to reduce disparities in STEM employment. Historically women have been underrepresented in STEM employment. Research has found that women are less likely to be in a science or engineering major at the start of their college experience, and less likely to remain in these majors by its conclusion. Because most STEM workers have a science or engineering college degree, underrepresentation among science and engineering majors could contribute to the underrepresentation of women in the STEM workforce.

According to a 2013 study, “The overall percent of females interested in STEM majors and occupations is a surprising 46 percent... Across all four STEM areas, however, males consistently outperformed females in math and science, with the exception of the females interested in Engineering and Technology. Females were more prevalent in the expressed and measured cohort, suggesting they have an inherent interest in STEM fields, which contradicts the low representation of women in the STEM fields.”

Despite more female high school test takers indicating an interest in STEM careers than their male counterparts this interest does not translate into STEM-related college degrees. Women are more likely to hold a college degree than men but, they are less likely to have studied in a field that would prepare them for a STEM career. In engineering, only 15 percent of degree holders are women. By graduation, men outnumber women in most science and engineering fields. In some STEM and STEM related fields women earn only 20 percent of the bachelor’s degrees.

Women’s Employment in STEM Occupations: 1970 to 2011

(Data based on sample. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see www.census.gov/acs/www/)



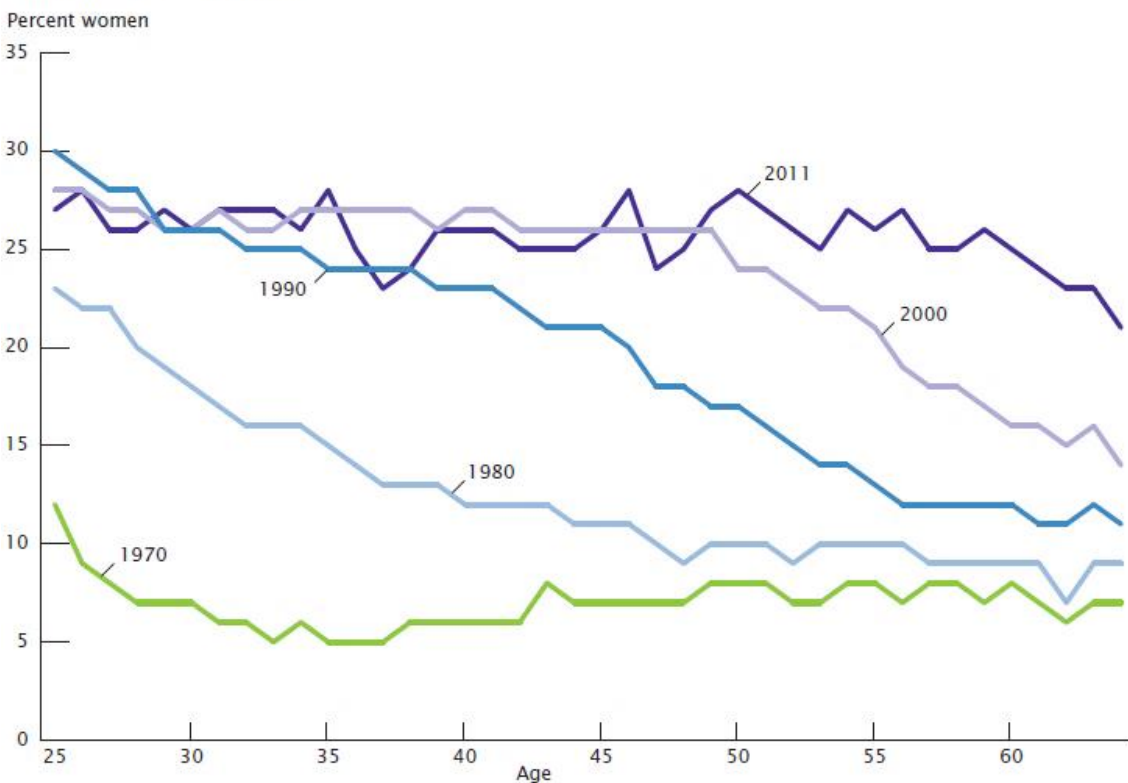
Sources: U.S. Census Bureau, 1970, 1980, 1990, and 2000 decennial censuses and 2011 American Community Survey.

Although women make up nearly half of the working population, they remain underrepresented in STEM occupations. In 2011, 26 percent of STEM workers were women and 74 percent were men. There has been uneven growth in women's representation in STEM occupations since the 1970s. In 1970, women were 3 percent of engineers, 14 percent of life and physical scientists, 15 percent of mathematical and computer workers, and 17 percent of social scientists.

By 2011, women's representation had grown in all STEM occupation groups. However, they remained significantly underrepresented in engineering and computer occupations, occupations that make up more than 80 percent of all STEM. In fact, women's representation in computer occupations has declined since the 1990s. This mirrors the decline in women's share of bachelor's degrees in computer science awarded since the 1980s. Women's underrepresentation in STEM is a result of their significant underrepresentation in engineering and computer occupations, rather than math and science occupations. While women's representation has continued to grow in math and science occupations since the 1970s, growth has tapered off in engineering since 1990. In 2011, women were 13 percent of engineers, 27 percent of computer professionals, 41 percent of life and physical scientists, 47 percent of mathematical workers, and 61 percent of social scientists.

Women's Share of the STEM Workforce by Age: 1970 to 2011

(Data based on sample. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see www.census.gov/acs/www/)



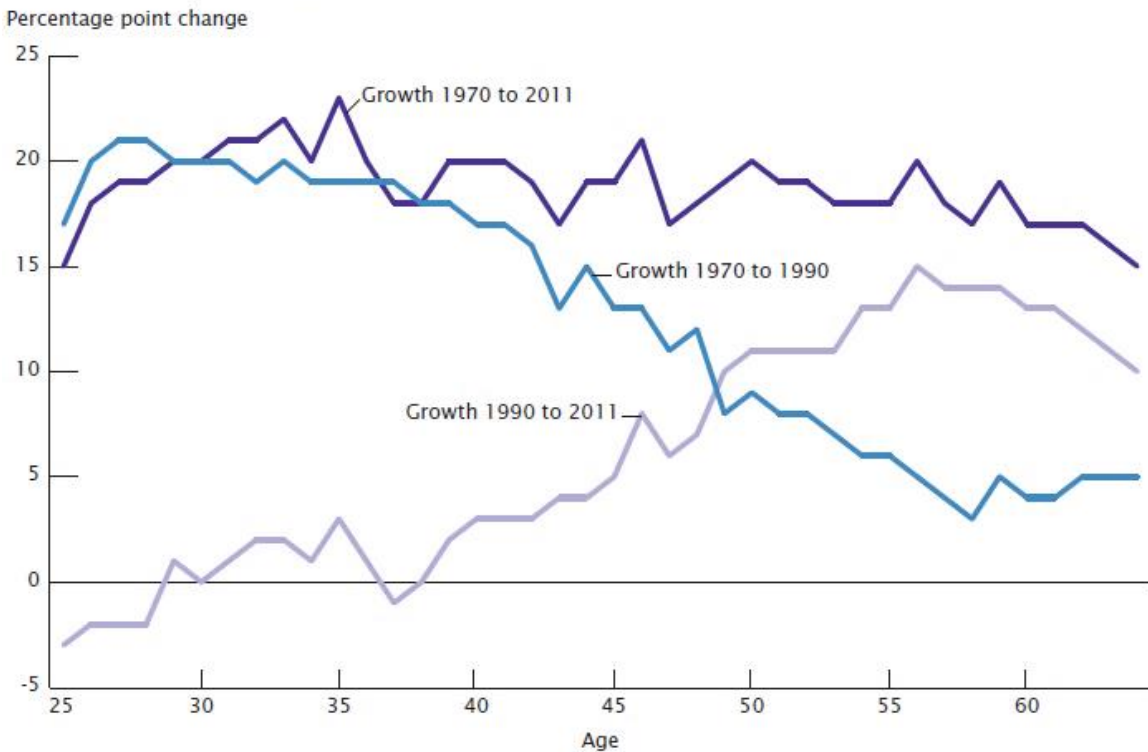
Sources: U.S. Census Bureau, 1970, 1980, 1990, and 2000 decennial censuses and 2011 American Community Survey.

In the 1970s, women's share of STEM occupations was 12 percent when they were 25 years old, sharply declined when women were in their late-twenties, and remained low until retirement. In 2011, women had higher shares of STEM employment than in the 1970s, starting out at 27 percent at the age of 25, and relative to earlier decades, showed more stability in STEM employment during peak employment ages and into retirement.

However, while women’s share of STEM employment is up since 1970, the most recent decades show much less growth in STEM among younger women compared with earlier decades. Most of the growth in women’s share of STEM employment among those under the age of 40 occurred between 1970 and 1990.

Percentage Point Change in Women’s Share of the STEM Workforce by Age: 1970 to 2011

(Data based on sample. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see www.census.gov/acs/www/)



Sources: U.S. Census Bureau, 1970 and 1990 decennial censuses and 2011 American Community Survey.

Women who have graduated with a degree in science or engineering experience a significant gap in pay in relation to their male counterparts. Full-time, year-round women earned \$58,800 per year compared to the \$85,000 per year that men make. The pay gender gap between women and men with a science or engineering degree who are working in a STEM occupation is not as severe as that experienced by their compatriots not working in STEM fields but it is still significant. Among science and engineering graduates that worked full-time, year-round in a STEM occupation, men earned \$91,000 per year compared with \$75,100 among women. The increased pay for women in STEM occupations indicates STEM employment boosts earning among women more than among men while also highlighting how wide the gap between women and men in the STEM workforce is.

SOURCES

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Contacts:

Jonathon Howard
Assembly Select Committee on Aerospace
Jonathon.Howard@asm.ca.gov 916.319.2478

Chris Burns
Senate Select Committee on Defense & Aerospace
chris.burns@sen.ca.gov 916.651.4743