

Nurturing Innovation Abroad

By Janet Bandows Koster

(AWIS Member since 2006)

There are many reasons why entrepreneurship is becoming the word of the day, not only in the press, but also in college curriculum meetings across the United States and around the globe. Entrepreneurship comes with a promise of opportunity, which is particularly desirable in times of economic uncertainty, and the entrepreneurial spirit breathes fresh life into meetings, bringing solutions and creativity to the forefront.

2015 Global Entrepreneurship Summit

The sixth-annual Global Entrepreneurship Summit (GES) took place on July 25-26, 2015 in Kenya with a particular focus on women and youth. The selection of Nairobi as host city for the 2015 GES underscores how Africa -- notably Kenya -- has become a center for innovation and entrepreneurship. In fact, Maria Contreras-Sweet, Administrator of the U.S. Small Business Administration noted in her closing remarks at GES: "Today, Nairobi is the site of major African headquarters for Google, Microsoft and IBM and has earned itself the nickname "Silicone Savannah" for the innovative ecosystem that has taken root."

As a lead-in to the Summit, the U.S. government made some major commitments to support Africa's women and youth entrepreneurs. They include:

- Up to \$100 million in financing for women entrepreneurs through a U.S. government partnership with Goldman Sachs
- A two-year, \$50 million dollar program to help early-stage social entrepreneurs scale up
- A \$25 million dollar loan guarantee program from USAID focused on the energy, health, and financial services sectors
- A State Department program to train and mentor 10,000 young Africans, especially women, in STEM entrepreneurship
- A new Women's Entrepreneurship Center in Mali that will certify hundreds of mentors and help create thousands of jobs
- And a new e-mentoring program from the Mara Foundation to teach business and finance fundamentals to as many as 1 million African women and youth

Co-hosted by President Barack Obama and Kenyan President Uhuru Kenyatta, mentors and finalists of the Global Innovation



Tech-I Mentors from left to right: Maroun Chammas, Anwar Aridi, Michael Cheetham, Kellye Eversole, Pat Dinneen, Janet Bandows Koster, Shirlanyne Quale, David Ireland, Annette Olson, Chuck Eesley, Celia Merzbacher.

through Science and Technology (GIST) Tech-I Competition received an exclusive invitation to participate in the Summit. In the opening session, President Obama addressed the over 1,000 innovators and entrepreneurs noting, "It's hard to access capital. It's hard sometimes to get the training and the skills to run a business as professionally as it needs to be in this competitive world. It's hard to tap into the networks and mentors that can mean the difference between a venture taking off and one that falls flat... And it's even harder for women and young people and communities that have often been marginalized and denied access to opportunities."

Global Innovation through Science and Technology (GIST) Tech-I

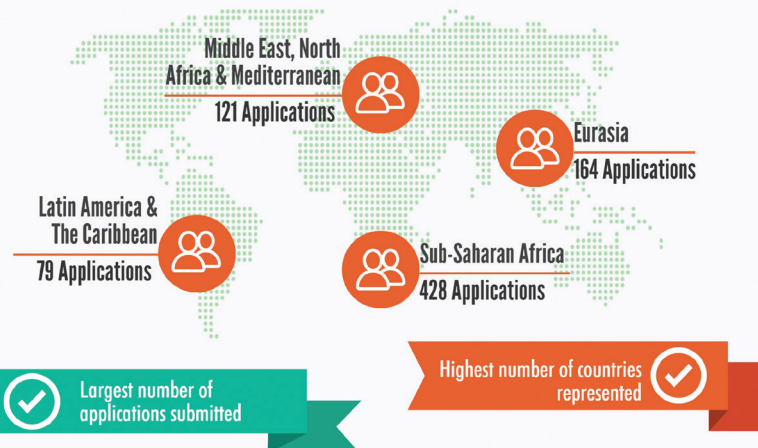
Led by the U.S. Department of State and implemented by the American Association for the Advancement of Science (AAAS), the GIST Tech-I Competition is an annual competition for young science and technology entrepreneurs from emerging economies worldwide. Aspiring innovators submit their ideas and startups online in an application consisting of an executive summary and promotional video. Their applications are then reviewed by experts and voted on by the global voting public in order to determine the finalists. Thirty finalists receive an all-expenses paid trip to the Global Entrepreneurship Summit (GES) to showcase their ventures and to receive intensive training. Tech-I winners, selected by experts at the GES, win mini-grants and receive one-on-one mentorship and training.

This year the Tech-I competition received a record 792 applications from 74 countries in the sectors of agriculture, energy, healthcare, and information communication technology. Following initial review at AAAS, applications went to the formal review stage conducted by the expert panels. Over

2015 TECH-I COMPETITION APPLICATION STATISTICS

Total Applications: 792

Countries Represented: 74



gistnetwork.org/tech-i

110 regional, scientific, technical, innovation, and entrepreneurship experts from around the world participated in the review process assessing: the feasibility of the idea/start-up; and the potential societal impact and target market of the idea/startup including a consideration as to what problems the idea solves, what the benefits of such an idea are, and how this product compares to others. Each application was reviewed by a minimum of three experts within a specific panel focused on their region and application sector.

Following full review, 76 semi-finalists from 37 countries were announced on May 8. From May 11 through June 11, semi-finalists embarked on a huge promotion campaign to advertise themselves, their product, and not forgetting to get people to vote on the Tech-I website for their idea. In total, Tech-I semi-finalists received an amazing 407,697 votes hugely surpassing the 1,000,000th Tech-I competition vote since 2011. Their efforts promoted entrepreneurship around the world in addition to highlighting how amazing ideas and hard work can not only benefit an individual but a community, a country, a region, and the world as a whole.

The 2015 Tech-I Competition had two tracks: the Idea Stage and the Startup Stage. The Idea Stage targeted entrepreneurs who have an idea or prototype but who have not launched their company. The Startup Stage was designed for new companies that are further along the growth process—for example, companies that have completed some market analysis, have a launch timeline or have recently launched a product/

service for distribution, or have a realistic strategy to sell a product/service.

The 30 Tech-I finalists (15 Idea stage and 15 Start-up stage) flew to Nairobi prior to the Global Entrepreneurship Summit for two days of intensive entrepreneurial skills training, mentorship, and pitching practice. Innovations included everything from solar powered hearing aids for deaf people in Botswana and greenhouses for sharecroppers in Kenya to apps that help beekeepers in Bosnia & Herzegovina and farmers in the Ukraine.

After intensive hands-on training, finalists were invited to make their pitch at the GES. The format included a five-minute pitch, five minutes of questions & answers, computer-based presentations were limited to seven slides, and all presentations had to be in English. Of the 30 finalists, five were women although the applicant pool was much higher in the 2015 competition than in 2014. Nigerian scientist Mojisola Ojebode, took second place in the Idea category, won Best In Agriculture, as well as Best Female Entrepreneur for her innovation which aims to develop and commercialize eco-friendly and health-friendly biopesticide alternatives.

In Their Own Voices

I had the great honor of participating as a mentor in this program for the second year in a row and spent time with Mojisola and the other finalists. They were an amazing group of talented innovators and we asked a few to share their stories with the *AWIS Magazine*. ✪



Bioresources: Developing Crop Protection Agents The Eco-Friendly Way

By **Mojisola Ester Ojebode**

While growing up, I had always loved anything to do with science. As an inquisitive child, I wondered how an item that looked like chalk could be called a drug and could cure ailments, and how expiration dates of products were determined. I studied biochemistry with the hope of proffering solutions to the problems in my community and beyond, especially the problems caused by non-selective synthetic pesticides. I went further for a Masters degree in Nutritional and Industrial Biochemistry, to gain more knowledge and further my research. On becoming an African Women in Agricultural Research and Development (AWARD) Fellow, I saw the need for my research in solving a problem encountered by farmers, traders, and households in Nigeria caused by insect pest attack on food crops in storage, especially on cowpea. I also saw the need to proffer an eco-friendly and health-friendly solution to this problem that will help solve the additional problems created by synthetic chemicals used for this purpose.

In Nigeria, cowpea (*Vigna unguiculata*) is the most affordable source of plant protein, with approximately 25-percent protein content. Aside from being food for humans, cowpea is also a component of animal feed. About 50 percent of this crop is lost as a result of cowpea weevil attack in storage. Within two to three weeks after cowpea is purchased, these weevils emerge in large numbers, lay eggs on the seeds, incubate them, and reduce them to powder. This reduces the income of cowpea traders and farmers in Nigeria (the world's largest producer of cowpea). The synthetic chemicals currently in use to get rid of cowpea weevils include Dichlorvos, Actellic etc., which are toxic insecticides. Regulations have been put in place on the use of these chemicals, because of the tendency for accumulated damage to health and to the environment. It is, however, unfortunate that stakeholders do not maintain these regulations, hence, endangering the health of the numerous consumers of food crops treated with these insecticides.

Based on my interactions with some rural communities, I observed that people plant lemon grass (*Cymbopogon citratus*)



around their homes to ward off reptiles. They also boil the grass for drinking to cure some ailments. The health benefits of lemon grass include relief from fever, stomach disorder, aches, and infections. I also observed that dried orange (*Citrus sinensis*) peels were used to repel mosquitoes. These observations were the basis for my investigation into these two botanicals (lemon grass and orange peel) for the control of insect pest attack in storage, in comparison with the insecticidal plant Neem (Ojebode Mojisola Ester, 2015). Efficacy of some plant extracts as storage protectants against *Callosobruchus maculatus*. *Journal of Biotechnology and Biomaterials*). The possible components of the extracts of these plants that confer insecticidal activi-

ties were also investigated. After a number of trials and analysis of these plant materials to test for the efficacy against cowpea weevils (*Callosobruchus maculatus*), and determining whether there were any risks to consuming treated food items protected using this means, I came up with the idea of turning them into a product that could be commercialized as a biopesticide. Hence, the birth of Bioxin! Bioxin is an eco- and health-friendly product that will get rid of insect pests in storage within one to three hours of exposure. It doesn't affect the taste of the food crop; instead, it evaporates, but the sweet smell of lemon and orange remains (depending on the variety of Bioxin used), which will prevent future reinfestation. Cowpea treated with Bioxin can be protected for more than six months after the first treatment. Moreover, weevil eggs present in treated cowpeas will not be able to hatch into adults. In addition, users of Bioxin do not have to wait for forty-eight hours after treatment, which is the case for presently used synthetic chemicals. It is affordable with a competitive price. Bioxin will not only get rid of cowpea weevils and improve farmers' and traders' income, it will additionally increase the consumption of this affordable source of plant protein, which will help improve the nutritional status of both urban and rural dwellers in Nigeria and beyond. Further research and development will be done, as the need arises, in conjunction with feedback from our customers.

"BioResources" continues on page 26 >

CITGREEN – A Biorefinery in Pakistan

By Almas Taj Awan, PhD

I belong to a traditional Pakistani family, and jumping into a science career was my passion since childhood. While working on, and after earning my master's degree in chemistry, I was associated with radio and with a national television channel in Pakistan as an anchorperson. Broadcasting was my hobby and I just loved being heard by huge audiences at the national level. But my love for science was still there, and in fact, was something never ending in my imagination. To pursue an international scientific career, I made a big decision to choose science over the media. After getting selected by TWAS (The World Academy of Science) and CNPq (National Council of Technological and Scientific Development of Brazil) for their PhD fellowship programs, I travelled to the country of football, Brazil. Leaving my family, friends, food, country, and, most of all, a well-known radio and TV career behind was not easy. However, I started enjoying my new life and decision, knowing that I was blessed to be among the very few women from my home country who get a chance to show their potential, especially in science, which is absolutely rare. With this goal in mind, I started working on my PhD and later on my postdoctoral studies.

My research projects were linked to the areas of biotechnology, microbiology, chemistry, and environmental sciences. I really felt privileged to work with some of the great Brazilian scientists. They included Professor Marcos Eberlin, a great name in the world of mass spectrometry; Professor Ljubica Tasic, who is known for her research in biotechnology, especially in biofuels, and Professor Antonio Mozeto and Professor Pedro Fadini, whose work relates to environmental sustainability projects in specific regions of Brazil.

I had great success in my PhD project, with many good results and achievements at the national and international levels. This gave me confidence and encouraged me a lot. My next goal was to turn my laboratory research into a pilot project that can benefit people. Brazil is the world's largest orange juice producer, and to get that juice the industry squeezes millions of tons of oranges every year. That means the Brazilian orange juice industry also deals with mountains of peels, seeds and



membranes that get left behind. The orange waste typically gets turned into food for farm animals so I used my PhD fellowship project at the University of Campinas in Brazil to explore orange waste and its potential to be turned into something more beneficial to the regional economy: a source of bioethanol.

This led to the launch of CitGreen, an innovative start-up based on my doctoral research. It utilizes biomass waste from the orange juice industry to produce value-added products such as bioethanol, hesperidin, essential oils, pectin, nano-cellulose, etc.

The world is shifting toward using alternative and renewable resources for energy production. As we are running short on our resources, we really need to think about alternatives. Petroleum is the major fuel from the past, but we know our petroleum resources are being depleted, day by day. So, my advisor Dr. Ljubica Tasic and I worked on the idea of turning the so-called waste into something new that can be an alternative to fossil fuels. We tested different species of yeast on the orange waste and found that two of them can be commercially useful for turning waste into bioethanol. Those two yeast species cut the fermentation time of the waste in half and double the bioethanol yield.

In Brazil, 60 - 70 percent of cars run on biofuels produced by sugars and vegetable oils extracted from food crops such as sugar cane, corn, wheat, soya beans, and sugar beets. But these crops can also be used to make food. That makes orange waste an especially compelling bioethanol source, because it would free up those other crops for feeding people instead. My research was published in RSC Advances, and, along with that, I registered in 2013.

I believe that doing scientific work has transformed my life. I have had remarkable experiences working with scientists from Serbia, Chile, India, and Japan. Recently, I was selected as a finalist for the GIST technology idea competition based on CitGreen, and I had an amazing experience working with mentors

"CITGREEN" continues on page 26 >

The STEM Ecosystem: Gender Differences in STEM Entrepreneurship

By Amanda Kimball

Research Specialist, University of California, Davis

In a recent episode of the *Odd Couple* (the 2015 television series remake), Oscar Madison, played by Matthew Perry, fumbled for words in the presence of an attractive woman, calling her a “lady doctor.” She very gracefully corrected him by replying “Actually, it’s just ‘doctor’—the ‘lady’ is silent.” No doubt that joke is derived from the original version of the show, and yet it still gets laughs today. While we live in a country where all occupations appear to be open to men and women alike, that doesn’t mean they are without hurdles. Gender issues in the workplace are alive and well, and both subtle and overt forms of gender bias challenge all of us to a continued vigilance and mindfulness around how we treat others and ourselves.

In science and technology fields, which are dominated by men and often regarded as male-gendered occupations, gender bias in the workplace starts even before getting the degree. Several Yale professors published an experimental study in which science faculty rated applications for a laboratory manager position (Moss-Racusin et al., 2012). Both the men and women faculty members rated female applicants as significantly less competent and hireable than the male applicants, despite identical application materials; they also gave the women a lower starting salary and offered less career mentoring. The study also found that there was a preexisting subtle bias against women that both moderated the results and was independent of faculty members’ gender, scientific discipline, age, and tenure status.

A common argument in response to the dearth of women in leadership positions, especially in technical companies, is that women simply opt out of the work force, choosing not to aspire to leadership positions. However, the findings of a recent paper

in the *Journal of Management* suggest that women’s lower managerial aspirations are the unconscious result of an environment where work opportunities, training and development, and career encouragement are doled out non-randomly by managers with subtle gender biases (Hoobler et al., 2014).

Another article by professors at Harvard and other universities describes four experiments in which husbands with stay-at-home wives tended to view women in the workplace less favorably (Desai et al., 2012). Relative to husbands with wives who work outside the home, these men in traditional marriages were more likely to deny qualified female employees opportunities for promotion, perceive female-run organizations as operating less smoothly, and be less attracted to organizations with female leaders.

In addition to these subtle biases around gender, blatant missteps by Chief Executive Officers in Silicon Valley remind us that even very overt misogyny still exists in the workplace. Story after story in the mainstream media describes the “brogrammer” culture where, for instance, networking events are held in strip clubs, and employees present apps that help users “stare at tits.” The CEO and founder of Snapchat, Evan Spiegel, sent disturbingly misogynistic emails to his fraternity brothers in



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and both subtle and overt forms of gender bias challenge
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around how we treat others and ourselves.

We have long way to go, but there is progress. When we started the UC Davis study back in 2005, just five companies in California could claim leadership teams that were at least 30% women.

college five years ago, describing women as “bitches,” “frigid,” and “sorori-sluts.” The CEO of Uber, Travis Kalanick, refers to his company as “Boob-er” because its success makes women attracted to him.

Given these examples, it is no surprise that Silicon Valley has a lack of gender diversity. According to voluntary self-disclosures by many of the most prominent high-technology companies in 2014, technical jobs in Silicon Valley are only 10-24% female. Across the U.S., 41% of highly qualified scientists, engineers, and technologists on the lower rungs of corporate career ladders are female (Hewlett et al., 2008). The attrition rate for women in technology is 56%, and these highly qualified women tend to move into other jobs, other industries, or self-employment. Only 20% of women who leave the technology sector leave the workforce altogether.

These outcomes trickle down the pipeline as well. While women have earned more bachelor’s degrees than men in science and engineering fields overall for at least a decade (NASEM, 2012), fewer women are choosing technology as a career path. The percentage of computer science degrees earned by women was 37% in 1985 and fell to 18% in 2012, and similarly, the percentage of computing jobs held by women was 37% in 1991 and fell to 26% in 2014 (Williams 2014). In the technology sector, it’s clear that the trend is getting worse over time.

At the UC Davis Graduate School of Management, we strive to address the issue of leadership gender diversity in our annual study with curiosity and objectivity. Now in its 11th year, the UC Davis Study of California Women Business Leaders, continues to find that women hold only a very small percentage of the top leadership positions in the largest 400 California corporations. And the improvement over time is almost negligible.

The study examines board directors and top-compensated executives. To avoid any self-disclosure bias, we use information that all publicly traded companies are required to report annually to the Securities and Exchange Commission. This

includes the names and biographies of corporate leaders. While the companies are not required to report on gender diversity, we identify the gender of these corporate leaders from their biographies, and package the information and analysis in an easily digestible format.

The 400 largest publicly traded companies with headquarters in California are located across eighteen different counties, but one county alone, Santa Clara, home to Silicon Valley, accounts for 107 (26.8%) of the 400 companies in the study. These 107 companies represent nearly \$2 trillion in market capitalization, almost half of the \$4.5 trillion in shareholder wealth represented by all 400 companies. These high performers have some of the lowest percentages of women in leadership. For example, the semiconductor sector continues to fill only 6% of board and top executive positions with women.

It’s not clear that numbers like this will change any time soon. A 2005 study in the *Journal of Corporate Finance* found that companies are significantly less likely to add a woman to the board when they already have a woman on the board (Farrell & Hersch, 2005). The study also finds that the process by which companies bring in new directors is not gender neutral. Companies are more likely to fill a board seat vacated by a female with another female (relative to no prior departure) and a board seat vacated by a male with another male. This trend contributes to the highly disproportionate representation of women.

Indeed, more than 100 (25.3%) companies in our study have zero women on the board or in the top-compensated executive positions. A common defensive argument is that companies engage in hiring the “best” people without respect to gender. However, what many companies actually do is choose from the pool of candidates who are most readily available. If you truly believe that men and women in our workforce have equal potential for corporate leadership roles, then you have to admit that an executive team of the “best” people would inherently

“Entrepreneurship in STEM” continues on page 27 >

↩ "BioResources" continued from page 22

As an Idea stage category finalist of the Global Innovation through Science and Technology (GIST) Tech-I competition, I received three awards to start up the production and distribution of Bioxin on large scale. I have a team of professionals in the required areas to start up this business. We are currently at the point of registering this product so we can go ahead with large-scale production in collaboration with stakeholders, such as agricultural institutes, farmers' and traders' associations, and agrochemical distribution agents. I am excited to use my findings as a young female scientist to solve real life problems that

require urgent attention, like the problem of insect pest attack in storage and the use of synthetic chemicals. ✪

Mojisola Esther Ojebode is a 2014 fellow of African Women in Agricultural Research and Development (AWARD). She completed her BSc at the Federal University of Technology Akure, Nigeria and is undergoing a research MSc program at the department of biochemistry (Nutritional and Industrial), University of Ibadan, Nigeria. She is the director of Moepelorse resources for women empowerment and is dedicated to using her scientific research findings to improve the livelihood of rural farmers.

↩ "CITGREEN" continued from page 23

from the American Association for the Advancement of Science (AAAS). I believe that working with people from varied and dynamic backgrounds is very encouraging, and learning from their life experiences and sharing ideas helps in professional growth.

As a former television and radio host in Pakistan, I am also interested in improving the public dialogue between science and society. In developing nations, there is often a huge gap between the science community and everyone else, and people don't realize what scientists do or why their work is important. Science should not just be in laboratories, between scientists. I feel progress and breakthroughs in society depend on visionary leaders as well as on individuals. Today, I see myself in a place where I can do research that benefits my society. The Cit-Green start-up plan seems to me to be a perfect match for my past skills and experiences and my current scientific work. I am quite enthusiastic about contributing my efforts to something beneficial in the area of applied research and its applications. My work not only will generate environmental friendly biofuels along with other value-added products, but it will also help to reduce the waste generation from huge fruit-juice industries.

This is just the beginning of my journey as a passionate female scientist and entrepreneur. Author Diane Mariechild once said, "A woman is the full circle. Within her is the power to create, nurture, and transform." That's absolutely true, but there are few women who realize their real powers. Being a strong woman is not about behaving just like a man. Indeed, it is about nurturing, celebrating femininity, and exemplifying the leadership qualities that bring huge benefits to communities. As President Obama said recently at the Global Entrepreneurship Summit in Kenya, if half of your team is not playing, you've got a problem. And in too many countries, half of the team consists of women

and girls who are not participating enough in community development. Many of my own female friends and colleagues, despite their strengths and capabilities, don't understand that there is no one better than themselves. There is a great need for emotionally strong women to motivate the rest of us to push on and to move forward. I have a strong desire to emerge and prove myself to be one of those voices of change. ✪

Dr. Almas T. Awan received her Masters degree (Chemistry) from University of Peshawar, Pakistan and PhD (Organic chemistry) degree from the Campinas State University, Sao Paulo, Brazil. She conducted her Post doctorate research at ThoMSON Mass Spectrometry Laboratory under a project affiliated with CPQBA of Campinas State University, Brazil. Dr. Almas has three major focuses for her research projects; 1) Mass spectrometry for the kinetic study of drugs for treatment of infectious diseases; 2) Biomass pre-treatments, hydrolyses, fermentation biochemistry and ethanol production; 3) Water and wastewater treatments and sediment analyses. Dr. Almas has authored peer-reviewed publications and has presented numerous lectures to national and international audiences. She was the president of Urdu literary Society during her Graduation, Media secretary during her Masters and SOLC member of British Council in Pakistan. Apart from academia, she served as Anchor person and Producer Radio programs on FM and AM for four years and also on PTV for one year. She was awarded TWAS-CNPq fellowship for her Ph.D. in Brazil under student exchange program by The World Academy of Science, Italy. Dr. Almas has reviewed numerous scientific articles for different Journals. She is a member of the American Association for the advancement of Sciences, The American Society for Mass spectrometry and Brazilian Society of Mass spectrometry, as well.