

Fostering Institutional Change for the Past 20 Years

# 20 YEAR HISTORY OF PR-LSAMP

## History of the PR-LSAMP Program



Dr. A. Hicks with PR-LSAMP and BD Fellows in Puerto Rico

PR-LSAMP is one of the six "Grand AMPs". It was created in 1991 as a collaborative venture of the main higher education institutions in Puerto Rico to increase the quantity and quality of minority and low-income college students who successfully complete a baccalaureate degree in science, technology, engineering, or mathematics (STEM), and continue on to complete a graduate degree in a STEM-related field. The alliance is composed of eleven major institutions of higher education that are well known for their strong commitment to academic excellence and for providing a learning environment conducive to retaining and graduating a significant number of undergraduate students in STEM careers.

PR-LSAMP has been the main generator of institutional change among

all members of the alliance in creating a genuine culture of undergraduate research and mentoring, therefore improving undergraduate STEM education.

### CHANGE IN INSTITUTIONAL CULTURE

Since its inception the PR-LSAMP program has worked in the curriculum revision and faculty development establishing during Phase I the Curriculum Development and Assessment Center, that together with faculty from all Alliance institutions, spearheaded by shifting the focus from breadth of content to depth of understanding and by integrating knowledge within and between disciplines. In its initial phase, curricular revision concentrated on the redesign of five "gatekeeper" courses, the entry-level courses that tend to push students away from STEM disciplines. Active strategies



Faculty members strengthening undergraduate Curriculum

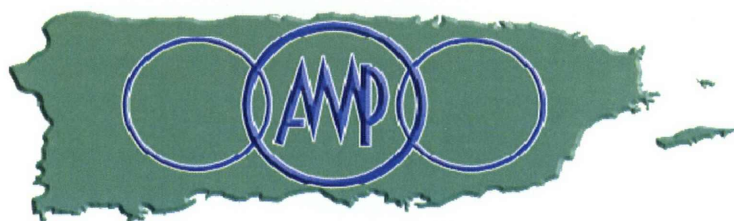
such as Cooperative Learning and Study/Learning Skills within the context of the course were successfully implemented.

PR-LSAMP has fostered the improvement of teaching and learning in the STEM fields by sponsoring activities and providing training where successful strategies in enhancing undergraduate academic performance in STEM fields are shared, such as the **Annual Best Practices Conference on Teaching and Learning**. Members of this community have the opportunity to adapt and implement these strategies in the classroom and laboratories at the undergraduate level, such as student-based and technology-based learning, thus improving the teaching-learning process for students.

### STUDENT ACTIVITIES

PR-LSAMP student activities were conceptualized since Phase I, to optimize their effectiveness in addressing the needs of three "tiers" of students: The **first tier** comprised students who are academically successful in STEM, but who needed mentoring, role models and

PUERTO RICO LOUIS STOKES



ALLIANCE FOR MINORITY PARTICIPATION



## Cont. HISTORY OF PR-LSAMP

research experiences to direct them toward graduate studies. **Second tier** students were likely to complete their undergraduate degrees, but had difficulties in completing courses and meeting requirements on time. **Third tier** students lacked effective study/learning skills, and many never completed their STEM degrees. Among the activities developed to help deal with all these issues since Year 1 were: Undergraduate Research, PRISM, TaDDEI (Study/Learning



Mentoring Workshops

Skills), Cooperative Learning, Peer Mentoring, and Stipends for Low Income/First Generation Students.

A strong emphasis has always been placed in promoting mentored undergraduate research activities that have developed at different rates in all PR-LSAMP institutions. Prior to 1991 undergraduate research was limited, especially in areas such as mathematics and four-year institutions. PR-LSAMP became the building block for creating an undergraduate research scholarship and developed a culture of mentoring at different levels. At the present moment it is a common practice to include undergraduate research components in proposals and it has become a requirement in the STEM curriculum. PR-LSAMP implemented

summer internships and research programs outside PR by establishing a network of partnerships with several programs such as NIST-SURF, DOE-SULI, and FaST\*. The mentored undergraduate research activity has proven to be the most



PR-LSAMP Student from Puerto Rico in NIST SURF 2010 Presenting Her Work

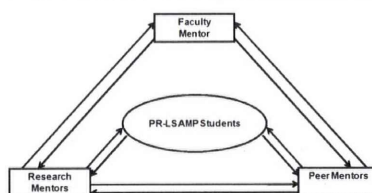
effective strategy to improve retention, increase the number of students who complete a BS degree in STEM fields and continue to pursue a PhD in these areas.



UPR Arecibo faculty Mentor and his undergraduate PR-LSAMP students

This initiative has been instrumental, especially in four-year colleges, as it has provided the opportunity and infrastructure for faculty members to develop and define their research work, develop new research areas and become active in obtaining external funds to further develop an active research activity at their institution. Over the past 20 years, PR-LSAMP institutions have increased the amount of additional

Figure 1  
Components of the Mentored Undergraduate Research Program



funding to enhance, strengthen, and sustain STEM programs from \$4.5M to \$105.7M, a 23-fold increase.

PR-LSAMP has catalyzed research education activities among all members of the alliance and has fostered a community of learners and researchers.



1996-Teacher Preparation Activity

During the last 20 years, PR-LSAMP has been dedicated resources to impact students at all the critical junctures of the pipeline, providing for seamless transitions in the K-16+ continuum. PR-LSAMP has offered Teacher Preparation Workshops in STEM disciplines, impacting 363 teachers;

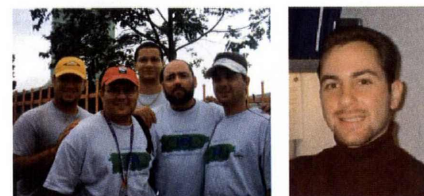
Precollege to College Bridging Program, impacting 1795 high school students; and Role Model Seminars, impacting more than 2000 high school and undergraduate students. In 2003 the Bridge to the Doctorate Program was incorporated among the PR-LSAMP initiatives and has been continuously funded for eight cohorts, impacting 94 first year graduate students. All these efforts have provided mentoring, role modeling and motivation for our students to strive for and maintain a standard of excellence in terms of their education and skills development. PR-LSAMP has been a major contributor in improving the quality of the new generation of well prepared Hispanic undergraduate and graduate students in STEM fields.



Azlin Biaggi, Ex-BD Fellow from Cohort I, obtained her PhD in 2008 and is currently a researcher at NASA Glenn Research Center



Ruth Hidalgo, Ex-BD Fellow from Cohort V and currently a researcher at the US Army Corps of Engineer, serving as Role Model to High School Students



Dr. Angel Marti, former PR-LSAMP student, now Assistant Professor at Rice University



# Cont. HISTORY OF PR-LSAMP



BD Fellows from Cohorts VII and VIII



Overview of PR-LSAMP and BD Activities



## Is PR-LSAMP Working?

### Certification of Science and Mathematics Teachers



273 STEM students were certified as science and mathematics teachers



You Bet!

### Mentoring Program



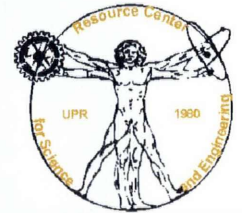
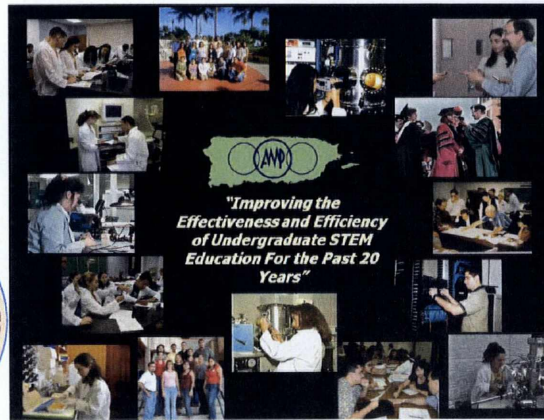
- Research Experiences
- Time Management and Study Skills
- Cooperative Learning
- Transition to Graduate School – A Series of Workshops

1,556 junior and senior STEM students have served as mentors in the PR-LSAMP Program and over 12,000 students have benefited from the mentoring activities



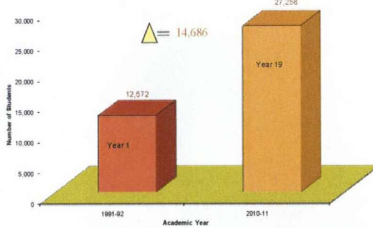
# 20 YEARS OF HIGHLIGHTS AND IMPACTS ACROSS THE PR-LSAMP ALLIANCE

## THE PR-LSAMP ALLIANCE



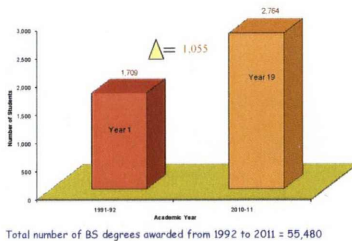
PR-LSAMP's success and institutionalization of activities are predicated on a systemic, integrative approach that builds not only on the successes of the past twenty years, but also on the participating institutions' on-

Increment in Undergraduate STEM Enrollment 1991 to 2011



going efforts to improve STEM education to ensure sustainability of efforts. As a result of these sustained efforts, PR-LSAMP institutions have: 1) increased the undergraduate STEM enrollment from

Increment in BS Degrees Awarded Annually

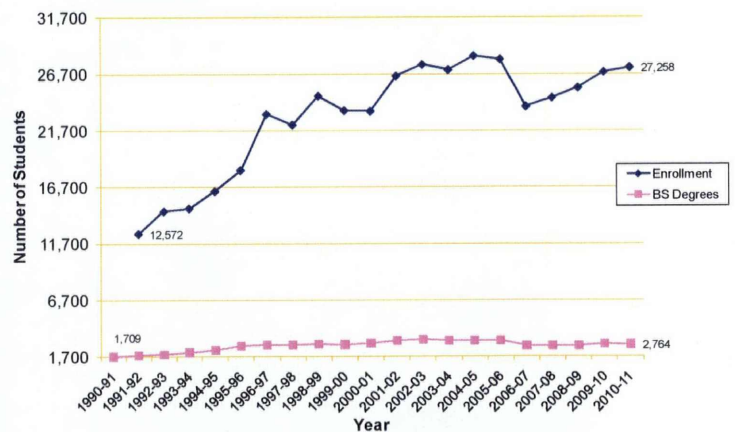


12,572 in 1991-92 to 27,258 in 2010-11, more than a twofold increase; 2) increased the annual BS degree production from

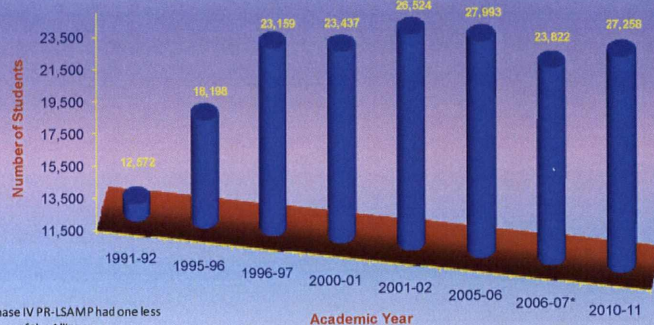
1,709 in 1991 to 2,784 in 2011 a significant contribution to the NSF goal of a diversified STEM workforce; 3) contributed to the national pool of Hispanic PhD's in Natural Sciences, from 12.5% to 17%, and Engineering, from 18% to 21%; and 4) increased the number of PhD degrees awarded in STEM fields in the UPR System from 9 in 1991 to 49 in 2010, more than a five-fold increase.



Comparison of SMET Enrollment and BS Degrees in PR-LSAMP Institutions



STEM Undergraduate Enrollment at PR-LSAMP Institutions 1990-91/1995-96 (Phase I), 1996-97/2000-01 (Phase II), 2001-02/2005-06 (Phase III), 2006-07/2010-11 (Phase IV)





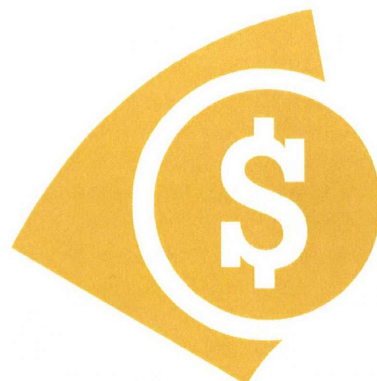
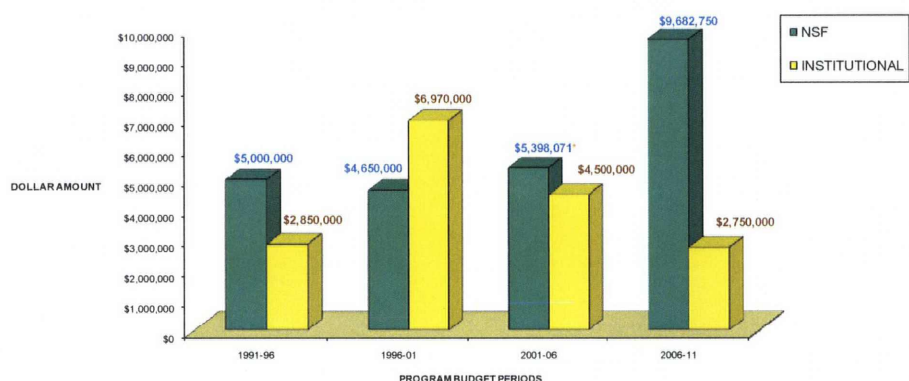
# 20 YEARS OF HIGHLIGHTS AND IMPACTS ACROSS THE PR-LSAMP ALLIANCE: ECONOMIC IMPACT

## PR-LSAMP AND BD FUNDING HISTORY

For the first two phases of PR-LSAMP received \$5M per phase to carry out program activities. Phases III and IV was reduced to \$2.5M per year with additional funding to implement the Bridge to the Doctorate program and also sponsor participants in the summer DOE FaST and SULI internships. PR-LSAMP institutions have contributed in each Phase with institutional funds in order to institutionalize program activities. Also institutions actively seek other external funds to strengthen their STEM programs. In summary, during the past 20 years of program implementation, PR-LSAMP has received \$20M in federal funds, institutions have contributed with \$17.5M and have received \$234M in external funding to strengthen STEM Programs.

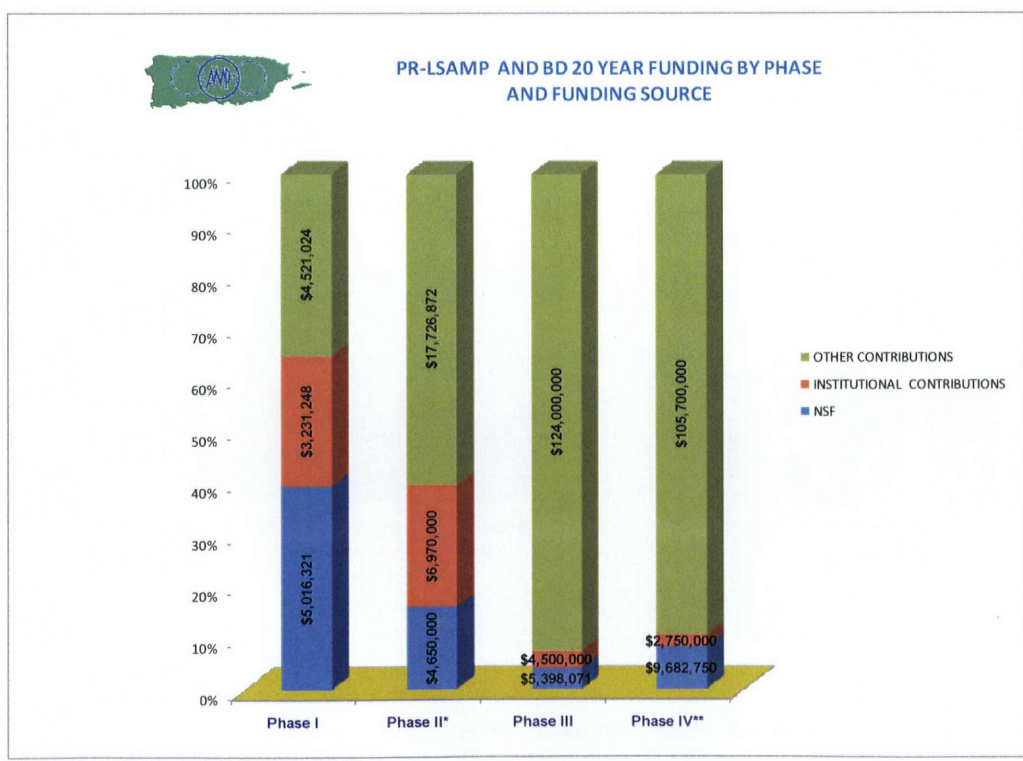


## PR-LSAMP AND BD FUNDING HISTORY



\*Starting in 2003 NSF has approved a total of \$7,679,000 to sponsor 94 Bridge to the Doctorate Fellows

\*\*During Phase II institutional funding was substantially greater than that of Phase I, Phase III and Phase IV. This is because we had an additional member of the Alliance, the Ana G Mendez University System, which had funds allocated to our program. Also, the institutional contribution of the other Alliance members was greater due to the activities that were being carried out during this phase.



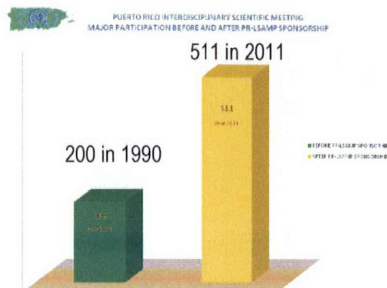


# THE IMPORTANCE OF UNDERGRADUATE RESEARCH

PR-LSAMP has emphasized the importance of undergraduate STEM students getting involved in research as soon as they enter in their first year. This has proven to be a catalyst for students academic performance, completion of their BS degree and their decision to continue graduate studies towards a PhD. In a recent survey taken among PR-LSAMP participants, 94% confirmed that participating in Undergraduate Research contributed greatly with their student performance and academic development. 91% of those who had already obtained a BS are currently in Grad School.

PR-LSAMP student participation in this activity has incremented over the years as has the participation in our annual research symposium called "The Puerto Rico Interdisciplinary Scientific Meeting". PRISM is the annual islandwide forum for undergraduate and graduate STEM students to present their research projects to their peers and STEM faculty members. For the past 19 years PR-LSAMP has co-sponsored this activity with the local chapter of the American Chemical Society and the AGEP Program.

The 2011 PRISM was held at the Inter-American University, Bayamon Campus. A total of 505 STEM students, 372 undergraduate and 133 graduate students

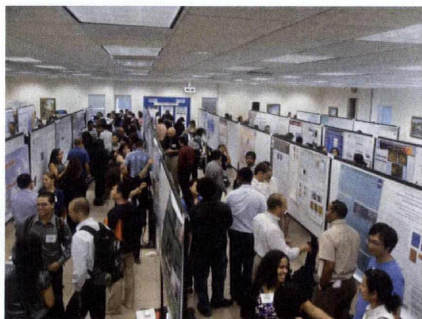


This year the invited speaker was Dr. Tyrone Hayes, professor at the Department of Integrative Biology at UC-Berkely who talked about "From Silent Spring to Silent Night: A Tale of Toads and Men". Dr. Hayes obtained his PhD from the Department of Integrative Biology at the University of California, Berkeley in 1993 and his current projects focuses on developmental endocrinology with an emphasis on evolution and environmental regulation of growth and development.



Dr. Tyrone Hayes, Invited Speaker

(407 in the sciences, 89 in engineering, and 9 in mathematics) from the different PR-LSAMP institutions presented their research projects to an audience of students and faculty members. Also, and for the first time, a total of 12 students from the US Mainland came to Puerto Rico and presented their work at this event. A total of 990 people participated of this meeting this year.



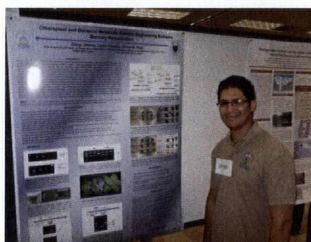
PRISM GRADUATE POSTER SESSION



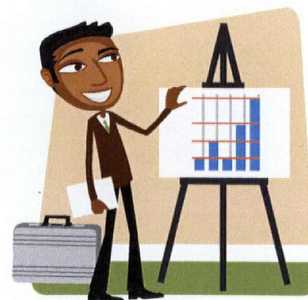
Undergraduate student presenting his research work at PRISM 2011 in IAU-Bayamon



PRISM PLENARY SESSION



Grad student participating of the PRISM 2011 Poster Session in IAU-Bayamon

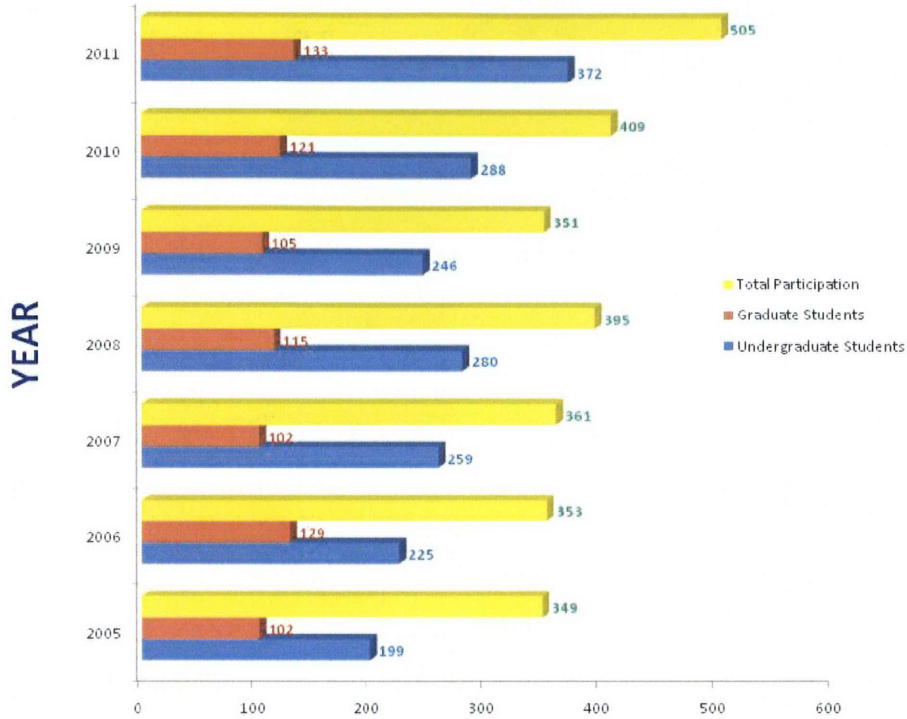




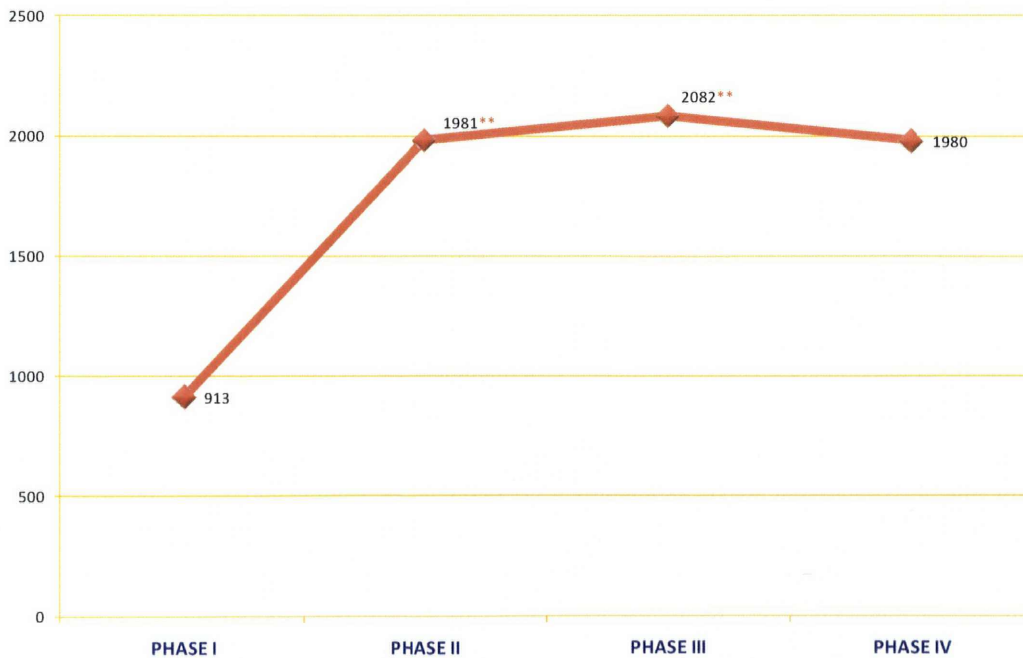
# THE IMPORTANCE OF UNDERGRADUATE RESEARCH



PUERTO RICO INTERDISCIPLINARY SCIENTIFIC MEETING  
STUDENT PARTICIPATION SINCE THE INCEPTION OF BRIDGE TO THE DOCTORATE



PR-LSAMP  
NUMBER OF PARTICIPATING STUDENTS IN UNDERGRADUATE RESEARCH BY PHASE



\*\*During Phase II and III the Alliance had an additional members, Polytechnic University and AGMendez System, which incremented the number



# 10 YEARS OF THE ANNUAL BEST PRACTICES CONFERENCE ON TEACHING AND LEARNING



In 2001, coinciding with the 10<sup>th</sup> anniversary of the Puerto Rico LSAMP Program, we offered for the first time a conference for STEM faculty members to become familiar with local, national and international best practices on teaching and learning. The activity was so successful that PR-LSAMP named it “Best Practices Conference on Teaching and Learning” and since then has offered it annually at the end of October with the purpose of bringing together the STEM community to promote strategies that have proven to be successful in improving undergraduate academic performance in STEM fields. Local experts and distinguished world known experts in the field present their

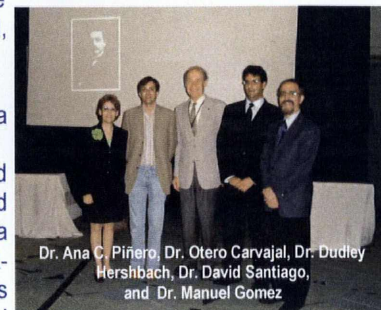
findings and best practice practitioners provide guidance on who to adapt, and adopt their methods in the class room and laboratory. Through this activity, PR-LSAMP brings together approximately 200 STEM faculty members from the different higher education institutions in Puerto Rico, becoming an excellent means for networking among participants. Among the subjects presented are: Misconceptions in the Classroom, Creating Excitement About Science, Dynamic Modeling, Just in Time Teaching, Cognitive Research and Active Learning.

*“Teaching should be such that what is offered is perceived as a valuable gift and not as a hard duty”*

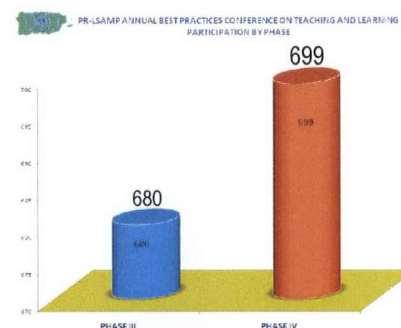
*A. Einstein*

In 2005, PR-LSAMP joined the international scientific community in the celebration of Einstein’s Miracle Year. Einstein and his work were the topics of the conferences presented by the three invited speakers. Dr. Dudley Hershbach, the 1986 Nobel Prize in Chemistry and a Harvard professor, talked about Einstein’s educational years and what

we can learn from it for today’s students. Dr. Luis Otero Carvajal, from the Universidad Complutense of Madrid, presented Einstein’s work in a historical context, and Dr. David Santiago, a former UPR-Rio Piedras graduate and now at Stanford University, addressed the impact of Einstein’s work in the development of technologies.



Dr. Ana C. Piñero, Dr. Otero Carvajal, Dr. Dudley Hershbach, Dr. David Santiago, and Dr. Manuel Gomez



## 2010 Annual Best Practices Conference on Teaching and Learning

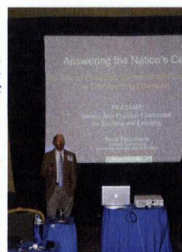
Held on October 29, 2010, the most recent Annual Best Practices Conference on Teaching and Learning featured four main speakers focusing on different aspects of science education:

Dr. Geraldine Richmond, Chemistry Professor at the University of Oregon, is recognized for her fundamental studies in contemporary surface science using state-of-the-art laser techniques. Dr. Richmond presented a talk titled “Assembling a Scientific Career with a Full Tool Box” which focused on the training that every educator should have on how to effectively communicate ideas in a

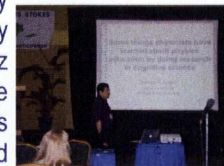


group setting or with individuals in the workplace.

Dr. Noah Finkelstein, Physics Professor at the University of Colorado, is increasingly involved in education policy and serves on five national boards in physics education. Dr. Finkelstein presented a talk titled “Answering the Nation’s Call: the Role of Scientists in Transforming Education” in which he provided an overview of the field of Physics Education Research (PER) and survey of some of the Colorado’s efforts in PER that have been shown to dramatically improve learning, increase access, and recruit and better prepare more math and science teachers.

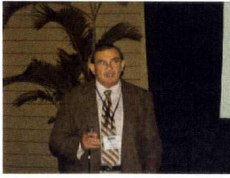


Dr. Ramon Lopez, Physics Professor at the University of Texas in Arlington, is a well renown researcher and educator and has served as consultant for a number of school districts around the country. He is the Co-Director for Diversity for the Center for Integrated Space Weather Modeling, a science technology center funded by NSF. Dr. Lopez talked about “Some Things Physicists Have Learned About Physics Education by Doing Research in Cognitive Science” where he touched several findings from cognitive science that have huge implications for how physics is taught, as well as some results from PER that are leading the way in university science education across all fields.





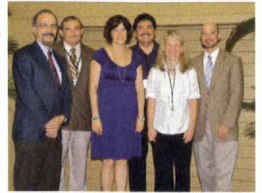
## (Cont.) 2010 Annual Best Practices Conference on Teaching and Learning



Dr. Hector Joel Alvarez, Faculty Education Professor at the University Puerto Rico, Rio Piedras, has been very involved in science education in Puerto Rico (and Latin America) since 1984, mainly in K—16 students both the public and the private

system. His major interest involves promoting and integrating the scientific way of thinking as an active and structured model through the inquiry method to the science classroom, including undergraduate science programs at the university level. His talk, titled “The Prevalence of Misconceptions in Secondary Science Teachers Candidates: Implications for the Development of Science Concepts”

focused on presenting the results of their research on misconceptions in Secondary Science Teachers Candidates using the Science Teacher Certification Test administered by the College Board.



Dr. Manuel Gomez, PI, Dr. Ana Rita Mayol, Co-PI, along with invited speakers of the 2010 Annual Best Practices Conference

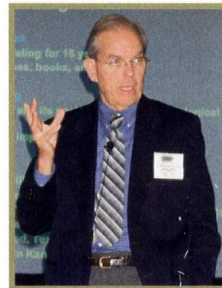
## Main Speakers of the Annual Best Practices Conferences on Teaching and Learning



2001



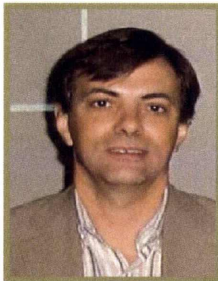
2002



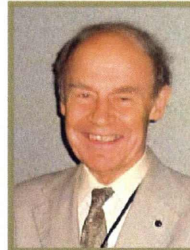
2003



2004



2005



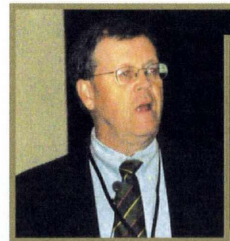
2005



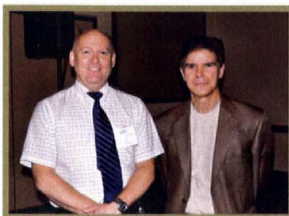
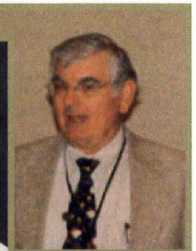
2005



2006



2007



2008



2009

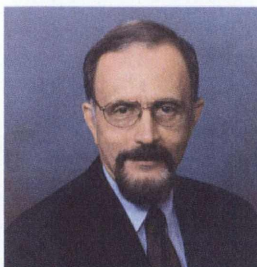


2010

2001: Dr. Neil Comins, Univ. of Maine 2002: Dr. Michael Zey, The Expansionary Institute 2003: Dr. Bruce Hannon, Univ of Illinois at Urbana 2004: Dr. Gregor Novak, US Air Force Academy & Dr. Jeanne Narum, Project Kaleidoscope 2005: Dr. Dudley Hershbach, Harvard Univ; Dr. Luis Otero Carvajal, Univ. Complutense de Madrid; Drd. David Santiago, Stanford Univ. 2006: Dr. Robert Chang, Northwestern Univ; Dr. John Jungck, Beloit College; Dr. Howard Adams, HG Adams & Associates 2007: Dr. Ronald Miller, Colorado School of Mines; Dr. Arlene Russell, Univ of California (UCLA); Dr. James Becvar, Univ of Texas-El Paso 2008: Dr. Jose Mestre, Univ of Illinois at Urbana; Dr. Robert Beichner, North Carolina State Univ 2009: Dr. Felice Frankel, Harvard Univ; Dr. Silvia Ronco, Research Corp; Dr. Ana Rita Mayol, Co-PI PRLSAMP and IFN Outreach Coordinator



## PR-LSAMP LEADERSHIP

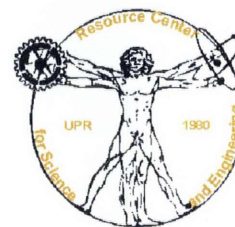


Dr. Manuel Gómez, Director of the Resource Center for Science and Engineering, has been the Principal Investigator (PI) of the program

since its inception in 1991. Under his leadership, PR-LSAMP has successfully implemented past initiatives and achieved its established goals. He is also the PI for Bridge to the Doctorate Program and the Co-PI for EPSCoR. The PR-LSAMP is managed by the **UPR Resource Center for Science and Engineering (RCSE)**, a consortium of main higher education institutions in Puerto Rico and manager of the large-scale systemic

initiatives on the Island. The high level of success of the RCSE is due to its development as a consortium -- a collaborative network among the major institutions of higher education on the Island, thus providing access to a broad pool of resources and promoting the optimization of efforts. Because of the multi-institutional nature of its structure and the island-wide scope and complexity of its goals and programs, which range from grades K-12 to the establishment of a strong R&D capability on the Island, the RCSE was established as an administrative unit of the UPR's Central Administration and as such responds directly to the President of the UPR System through the Vice President for Research and Technology (VPRT). The RCSE is not identified with any particular academic programs, levels or units, and it has effectively

promoted the maximum collaboration of all institutions, thus facilitating a synergistic effect leading to the improvement of STEM education and facilitates the integration of research and education in a seamless continuum throughout the Island. Since 2007, RCSE has catalyzed multi jurisdictional efforts to ensure that the educational pipeline is sustained including but not limited to programs such as: NSF PR-EPSCoR, NASA EPSCoR, DOE EPSCoR, PR-LSAMP, PR-AGEP, PR-GK-12, and PR-NASA-SGC.



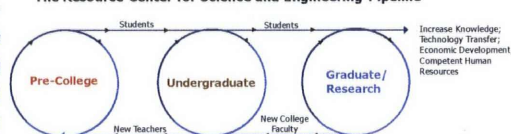
Dr. Ana C. Piñero, the was the PR-LSAMP Project Director and Co-PI until her retirement in 2009. Dr. Piñero was a former Undersecretary of Education for the Commonwealth of Puerto Rico, a former academic dean, and

was the PR-LSAMP Project Coordinator during Phase I. During Phase II, when she assumed the responsibilities of Associate Director of the Resource Center, she

supervised overall performance of PR-LSAMP. After her retirement from the University of Puerto Rico the program direction were delegated by Dr. Manuel Gomez to Dr. Ana Rita Mayol who has been the Education and Outreach Director of UPR-RCSE since 2009. She ensures that PR-LSAMP is closely articulated with the other systemic endeavors coordinated by the Resource Center. Dr. Mayol is also the Co-PI for the PR-LSAMP and the Bridge to the



The Resource Center for Science and Engineering Pipeline



Doctorate Programs. She is a researcher in Chemical Education, Co-PI for GK-12 and BD, Project Director for PR-AGEP, and is a former Assistant Dean for Student Affairs of the UPR-Rio Piedras College of Natural Sciences.

## PR-LSAMP STAFF

An Academic Coordinator, and a Management Coordinator, together with the Project Director, are responsible for the coordination and implementation of the project activities, the collection of project and participants' data, project evaluation and dissemination of PR-LSAMP successful strategies to improve STEM education, programmatic and fiscal reports, and allocation and administration of NSF and institutional funds.

For the past 12 years, Prof. Javier Figueroa has been the Academic Coordinator for the PR-LSAMP Program, as well as the Assistant Director. Prof. Figueroa is a Biologist with a



vast knowledge in many other areas of science and education, and has been in the academia for more than 20 years. He began in the PR-LSAMP program during Phase II as the coordinator of the Teacher Preparation Component. In 2003, when the first Bridge to the Doctorate supplement was approved, Prof. Figueroa became the program coordinator for this new activity and has been ever since. Students look for him for guidance and mentorship.



Ms. Ana Feliciano began as the Management Coordinator for the PR-LSAMP program in 1997. Ms. Feliciano has worked at the Resource Center for Science and Engineering for the past 24 years and her years of experience in working in different departments of the RCSE such as human resources, purchasing, and finance, and her preparation in Business Administration made her the ideal person to manage all the administrative aspects of the program.





## PR-LSAMP: ALLIANCES OF SUCCESS: UPR-AGUADILLA

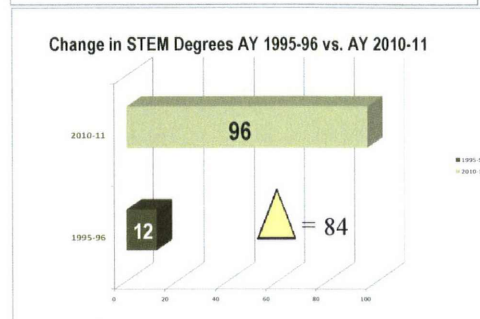
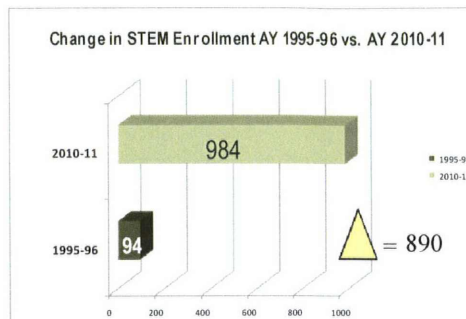
UPR-Aguadilla became a part of PR-LSAMP in Phase II. For students at UPR-Aguadilla the PR-LSAMP Undergraduate Research Program has been a motivation for research. The financial assistance offered by the program allows students not to have to go to work off campus for extra money to help them cover their expenses. This, in turn lets them devote more time to his/her research project. The experience also helps them improve their chances of admission to summer internship programs that require prior research experience. The research experiences opens opportunity for students to make relationships which open doors and raise the real possibility of the student continuing his graduate studies outside of Puerto Rico.

PR-LSAMP also benefits faculty members as it offers training in strategies that improve the teaching-learning process in the use of

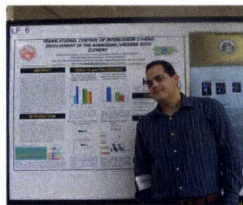
relevant and useful techniques for teaching and research and the opportunity to network with their peers in a friendly environment where sharing information and ideas is very important. On the other hand, the Undergraduate Research Program attracts excellent students to their laboratories.

PR-LSAMP has helped our institution evolve from only being dedicated to teaching, to now including more and more research initiative efforts. To increase the interest in research UPR-Aguadilla has enriched its science courses especially those under the BS curriculum in Biology which now requires that students have research experience.

Prof. Migdalia Sotomayor, Liaison Officer

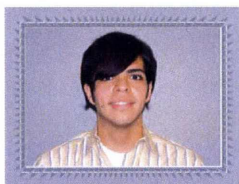


## UPR-AGUADILLA: Student Success Stories



**Jose Gonzalez** obtained his BS degree in Biology from UPR Aguadilla in May 2005. He was accepted at UPR Rio Piedras to

continue graduate studies in Molecular Biology in August of that same year and obtained the Bridge to the Doctorate-Cohort V Fellowship which funded his first two year in graduate school. He continued to be sponsored by the Research Initiative for Scientific Enhancement (RISE) fellowships. He has also received the RNA Society Poster Prize Award in 2008. Through his graduate studies he learned the following laboratory skills: cell culture, DNA/RNA transfection, gene cloning, site directed mutagenesis, siRNA knockdown and real time PCR. His research focuses on understanding the translational control of the Human IL-3 transcript by its Adenine/Uridine rich element in Jurkat leukemic T cells. Since IL-3 is over-expressed in several cancers, Jose findings may help in the development of effective therapies against leukemia and other diseases and a manuscript has been submitted for publication. Jose will obtain his PhD in December 2011.



**Edgardo Colon** obtained his BS degree in Biology in May 2010. During his undergraduate years Edgardo was

very active in undergraduate research and he was the founder of the Tribeta Club in UPR Aguadilla. He was accepted at UPR Rio Piedras to continue graduate studies in Molecular Biology under the mentorship of Dr. Carlos Gonzalez and received the BD Fellowship as part of Cohort VIII which will fund his first two years of graduate school. As a graduate student he has excelled in his academic achievements obtaining a 3.8 GPA in his first year. He participated of the Experimental Biology 2011 conference in Washington, DC. Edgardo aspires to obtain his PhD and continue a post-doc in Europe. He would like to become a faculty member able to offer courses in diverse science fields and also create his own business related with his science field.



**Enida C. Villanueva** was sponsored at the University of Puerto Rico Aguadilla Campus by PR-LSAMP in 1999. She recently obtained her PhD from the University of Michigan in the area of Immunology and is currently working in her Post

Doctorate in Mariana Kaplans M.D. research laboratory at the University of Michigan Medical School. Her research description is as follows: Define the role of neutrophils and low density granulocytes (LDGs) in Systemic Lupus Erythematosus (SLE) pathogenesis by assessing their capacity to form extracellular traps under different conditions, and the role of this phenomenon in the generation of autoimmune responses. Also, we aim to characterize the proliferative capacity, plasticity and pharmacologic sensitivity of LDGs. She has numerous publications in journals such as Endocrinology, Journal of Neuroscience, International Journal of Obesity, among others. She has been recognized with the following honors and awards for her excellence in academics; Pat Simons Travel Award (research excellence by young investigators), The Obesity Society. Rackham Travel Award, University of Michigan. John A. Williams Award for Outstanding Graduate Student Service, University of Michigan.



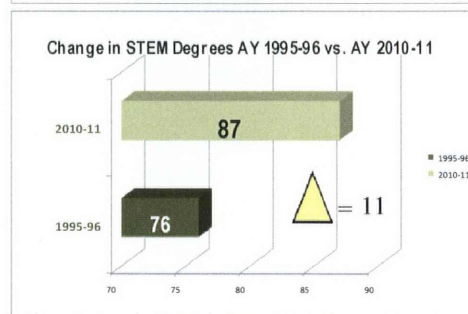
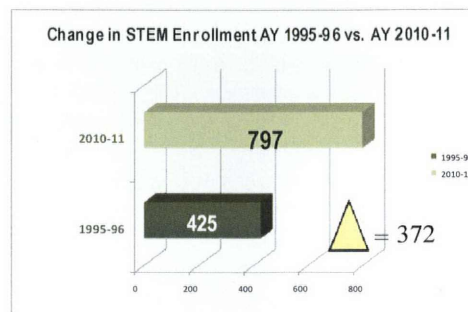


## PR-LSAMP: ALLIANCES OF SUCCESS: UPR- ARECIBO

The Physics/Chemistry, Biology and Computer Science Departments from the University of Puerto Rico at Arecibo (UPRA) have been impacted by PR-LSAMP through mentored undergraduate research experiences and a series of peer-mentored workshops to enhance students' academic success in STEM courses and to motivate them to continue graduate studies. Emphasis on research skills is significantly enhanced increasing the opportunities for students to engage in undergraduate research activities through a variety of strategies with the expectation of increasing the number of students that follow graduate studies in science and engineering related fields. UPRA has committed a space as the *PR-LSAMP Room* where students are exposed every semester to mentored workshops in scientific writing, scientific literature search, statistics, leadership, teamwork among others. A COOP Program was established at UPRA to provide STEM students with the opportunity to enroll as a formal credit course their summer or semester research internships in labs at US

research centers or universities. An undergraduate research *Posterfest* is annually offered at UPRA where students present their projects to the university community. The presence of PR-LSAMP has significantly contributed to increase the number of students engaged in undergraduate research. PR-LSAMP has provided our students with a learning environment that have enriched their science training. These accomplishments have strengthen our BS degree programs of Technology in Industrial Chemical Processes and Computer Science in their individual accreditation by the *Accreditation Board for Engineering and Technology (ABET)* - Computer Accrediting Commission (CAC) and - Technology Accrediting Commission (TAC), respectively. PR-LSAMP at UPRA has established the necessary synergy to engage STEM students in research endeavors starting at the undergraduate level and eventually feeding them into graduate programs. It has greatly contributed towards the enhancement of a quality science

education for our STEM students. Maiella Ramos, Liaison Officer



## UPR-ARECIBO: Student Success Stories



In May 2010, **Dr. Dalynés Reyes-Colón** completed a PhD in Anatomy at the University of Puerto Rico, Medical Sciences

Campus. For her research as a graduate student, she studied the neural basis of aggressive behavior, using as a model-system the freshwater prawn *Macrobrachium rosenbergii*, since this model may develop through three different morphotypes, each one more dominant than the previous one (small, yellow, and blue morphotypes). She focused on the role played by the biogenic amines serotonin and octopamine in modulating aggression. Previous studies with other invertebrates suggest serotonin to be involved in aggression, while octopamine is related with submission. Her research demonstrated that there are differences in the expression of a putative octopamine/tyramine receptor at the mRNA level in the central nervous system of three different morphotypes of the prawn. At present, Dr. Reyes-Colón works at the University of Puerto Rico at Arecibo as an Auxiliary Professor for the Anatomy, Physiology, Histology, and

Biology courses for undergraduate students; and, during summer, she collaborates with the Gross Anatomy course for first year medical students at the San Juan Bautista School of Medicine at Caguas, Puerto Rico. For the near future, she plans to develop a research project which will allow her to train undergraduate students in basic molecular biology techniques, in order to contribute to basic sciences, as well as to encourage these students to reach their highest scientific and academic goals.



As an undergraduate student of Microbiology Technology at The University of Puerto Rico at Arecibo (UPRA), **Alba Katria González Rivera** has participated in three summer research internship

programs and one year internship program at different universities of the country. Her earlier experience in research started at UPRA by studying the tolerance of lead and copper by bacteria isolated from the plant *Ceratophyllum demersum*. The results of these experiments were presented at the Puerto Rico-Luis Stokes Alliance for Minority

Participation (PRLSAMP) meeting of 2009 and at the American Chemical Society (ACS) annual meeting of 2010. On 2009, Katria did a summer internship in cancer and oncology at the University of Wisconsin-Madison under the Integrated Biological Sciences Summer Research Program (IBS-SRP). However, was on the summer of 2010 when she realizes her motivation in understanding biological process with a biophysical approach. That summer she studied the effects of membrane curvature during fusion pore opening in the exocytosis process. She presented the results of this research at the Advancing Hispanics/Chicanos & Native Americans in Science (SACNAS) conference of 2010 where she was recognized for her outstanding poster presentation in the area of biophysics. Her experience opened doors to Bridge a Ph.D in Neuroscience Program (BNP) at Michigan State University where she completed one year of internship from Fall 2010 to Spring 2011. This summer of 2011 she is participating of the Biophysical Society Summer Course: Case Studies in the Physics of Life sponsored by the Biophysical Society at the University of North Carolina- Chapel Hill. She is looking forward to complete a PhD program in Biophysics or Neuroscience.





## PR-LSAMP: ALLIANCES OF SUCCESS: UPR– BAYAMON

The UPR-Bayamón is a 4 year undergraduate institution. Only three of our 7 science, engineering and technology departments offer degree programs. The principal focus of our institution is teaching and while research should be an integral part of the teaching process it is often treated as an extracurricular activity, particularly by those who do not conduct research. The Puerto Rico Alliance for Minority Participation offers a venue for our students and those professors enthusiastic about research from science, engineering, technology, and mathematics to interact with each other stay abreast of research in other areas of science, and the opportunity to showcase their own research. Research at our campus would not halt if PRLSAMP funds were suddenly unavailable; however, fewer professors and students would be active in research if these opportunities did not exist. PRLSAMP provides motivation for our students to strive

for and maintain a standard of excellence in terms of their grade point average, attention to detail and overall organizational skills. The annual PRISM, among other venues, permits students to showcase their research projects. Participating new students reluctantly submit an abstract and nervously practice their seminars but upon returning from such an event they are recharged and invigorated by seeing so many other students excited about research. LSAMP students form a support community of sorts that orient students interested in research toward professors and their areas of expertise. A genuine research culture is slowly developing among students at our institution. Once PRLSAMP students gain confidence in their specific areas of research, many have participated in summer research programs off island. These students go on to mentor other students and promote research at our

campus. This, in turn, gives professors the opportunity to further evaluate students so their letters of recommendation, for research opportunities or graduate school, carry more weight.

Since 2006, funding from the Puerto Rico Louis Stokes Alliance for Minority Participation has permitted 19 students from the University of Puerto Rico, Bayamón to participate in research. Our university does not offer students financial rewards for participating in research. The only way students can receive financial restitution for conducting research is from external research funds/ grants like, PRLSAMP.

Dr. Alex Sloan, Liaison Officer

## UPR-BAYAMON: Student Success Stories



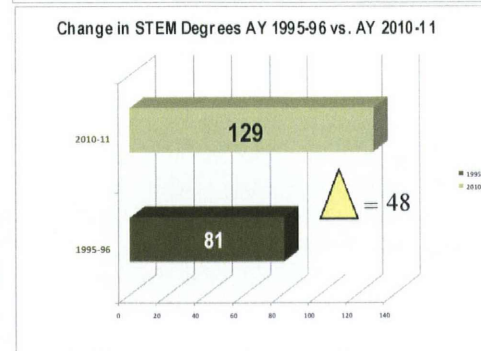
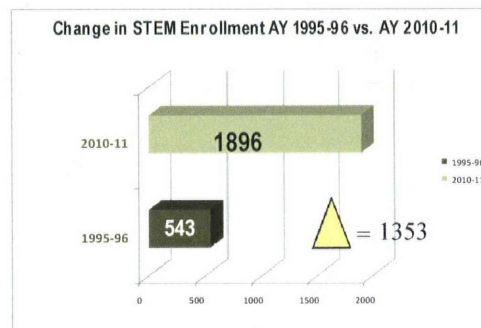
**Stephanie Cruz Maysonet** is a senior undergraduate student at the University of Puerto Rico in Bayamón (UPRB),

pursuing a Bachelors Degree in General Biology. She is involved in various extracurricular activities, including the UPRB's ESA SEEDS Chapter and a literary workshop. Stephanie has participated in two REU programs and is currently studying abroad in Costa Rica as part of an OTS semester program on tropical biology. Her research work has been presented at the last two ESA Annual Meetings as she has been awarded the SEEDS Undergraduate ESA Annual Meeting Travel Award on 2010 and 2011.



**Juan J Nieves Álvarez** earned a B.S. degree in General Biology in 2010 from the University of Puerto Rico Bayamón campus. While at UPR-Bayamón, Juan was mentored by Dr.

Alex Sloan, professor of Ecology, he was in the first group of students that received a PRLSAMP grant to carry research in science with Dr. Sloan. During 2007, Juan received a \$5,000 grant from Ecological Society of America's SEEDS program to research on Hermit Crab population dynamics. Afterwards, Juan served as the president of the student association of ecology L.I.F.E. for two years representing UPR-Bayamón twice at the ESA Annual Meeting. In 2009, he received a grant from the Organization for Tropical Studies and went to Costa Rica on a student abroad program for undergraduate students. Today he's working as a science and math teacher at the Fountain Christian Bilingual School while he explores the area of education as a way to integrate research in science to school levels.







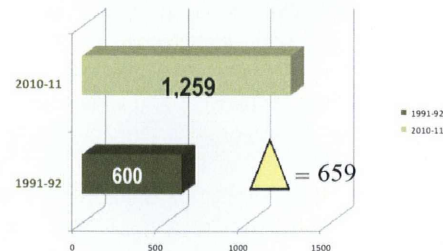
## PR-LSAMP: ALLIANCES OF SUCCESS: UPR– CAYEY

The teaching/research situation in an academic environment is a subunit of the larger view of educational institutions. Curriculum is inevitably molded to the dictates of this view, and indeed the system itself is an important feature of the 'hidden curriculum'. Research is, generally speaking, positively valued by students. From personal communications with students who participate in STEM program, these think that research activities make their university life more enthusiastic and motivated, increase their credibility, and ensures their knowledge is up to date. In an undergraduate institution like UPR-Cayey most of the research activity that takes place at the science departments is influenced by the student's long term goals. Students learn to think critically, and enhance interactions between faculty and fellow students. Moreover, students learn to work as

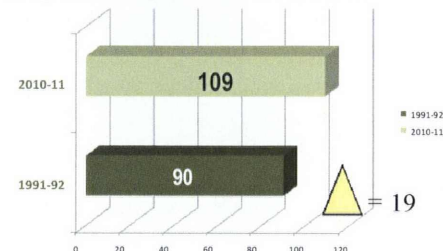
a group and broaden their minds to new opportunities in science and/or research. PR-LSAMP students value the summer research opportunities oversea and inside the Island. It gives them an opportunity to expand their knowledge and improve reading and language skills. PR-LSAMP is of great impact to the Institution because it helps achieve the goals and objectives of the University where research should be promoted within faculty and students. Furthermore, undergraduates are required to have a research experience as part of their undergraduate curriculum, and PR-LSAMP strengthens the requirement by offering seminars, workshops and symposiums where the students can present their work and learn from the experiences of other peers.

Belinda Roman, Liaison Officer

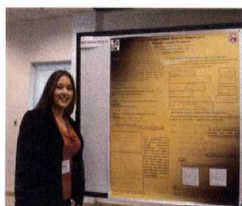
Change in STEM Enrollment AY 1991-92 vs. AY 2010-11



Change in STEM Degrees AY 1991-92 vs. AY 2010-11



## UPR-CAYEY: Student Success Stories



**Mariely Hernandez**

obtained her BS degree in Math in 2006 from UPR Cayey and was accepted to

continue graduate studies at UPR-Rio Piedras majoring in Applied Mathematics with Emphasis in Bayesian Statistics. Because of her good academic performance, Mariely received the Bridge to the Doctorate Fellowship, Cohort IV which funded her first two years in graduate school. She served as mentor to undergraduate students and visited high schools to serve as a role model to pre-college students interested in STEM fields. She continued to be funded by other programs such as AGEP, CREST-CATECH and PEAFF throughout her following years in graduate school until she finished her masters degree in Population Biology using Bayesian Statistics Analysis on May 2011.



**Gloriell Cardona**

obtained her BS degree in Math also from UPR Cayey in 2009. As an

undergrad she participated of PR-LSAMP activities at her institution and presented her research work at PRISM. She entered graduate school at UPR Rio Piedras in August of 2009 and was awarded a BD Cohort VII fellowship which funded her first two years of grad school. Gloriell served as role model, not only to undergraduate students in her lab, but also to high school students as she participated in talks to students interested in entering a STEM field. She was invited to speak in the "University Women" Puerto Rico Chapter conference. She presented her research work in various congress and already has one publication. She will obtain her MS degree in December 2011 and has been accepted to continue graduate studies towards her Ph.D. in Applied Mathematics at the University of Texas in Arlington.



**Roberto Martinez**

is a 2010 BS graduate from the Chemistry Department. As an

undergrad, Roberto did undergraduate research and presented his work at PRISM. In August he entered graduate school at UPR Rio Piedras to major in Analytical Chemistry and obtained a BD Cohort VIII fellowship. He currently is mentored by Dr. Carlos Cabrera and is working on water oxidation and fuel cells. He serves as role model to an undergraduate student under his supervision in the research lab and has offered talks to high school students that are in their junior and senior years who have interest in entering a STEM field in college. Roberto obtained a GPA of 3.66 in his first graduate year and his goal is to obtain a PhD and become a researcher in the industry focusing in developing technologies that contributes to environment conservation and obtaining ways to maximize the efficiency of this technology.



## PR-LSAMP: ALLIANCES OF SUCCESS: UPR-HUMACAO

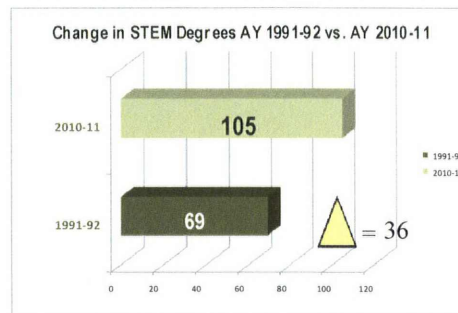
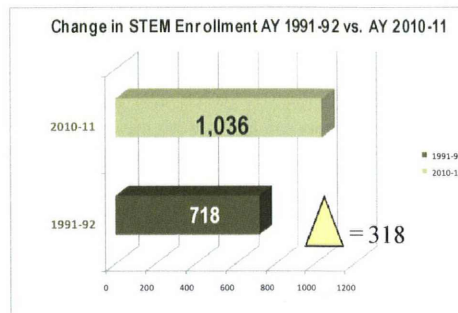
In the last 20 years, the University of Puerto Rico at Humacao transitioned from a two-years college to a full baccalaureate campus, with all the basic science and math programs producing well formed students that have been able to continue graduate studies, and became professionals, researchers and professors, throughout the nation.

PRLSAMP have been fundamental in the consolidation of this process since the beginning of the program, helping our faculty promoting undergraduate scientific research and facilitating the dissemination of the research products in Puerto Rico through the Puerto Rico Interdisciplinary Scientific Meeting (PRISM) and nationwide. Parallel to the research component, PRLSAMP promotes and supported academic mentoring

and peer mentoring. A tangible successful result of this support is the institutionalized program known as TaDDEI, that continues today helping students, especially in their chemistry courses.

The institutionalization of undergraduate research in UPR-Humacao is one of our flagship distinctiveness among other four-year colleges of Puerto Rico, and has been fundamental for the continuous or new funding for programs in UPR-Humacao, that are based on the development of a new generation of scientist, like MBRS, MARC, RISE, McNair, etc.

Dr. Denny S. Fernandez, former Program Coordinator and Liaison Officer



## UPR-HUMACAO: Student Success Stories



**Damaris Suazo** obtained her BS degree in Industrial Chemistry from UPR Humacao in May 2005. She was accepted to continue her graduate studies in Analytical Chemistry at UPR Rio Piedras on August 2005. During

her bachelor she had the opportunity to participate in undergraduate research in biochemistry area under the mentoring of Dr. Gabriel Barletta at the UPR-Humacao Campus. This previous participation encouraged Damaris to be apply to become a part of the PR-LSAMP BD program. Due to her excellent academic record she received the Bridge to the Doctorate Fellowship-Cohort III which funded her first two years in graduate school.

PR-LSAMP empowered students like Damaris Suazo Davila to complete a master degree and pursue a PhD degree in a strong collaboration with NASA Ames Research Center. Damaris Suazo-Davila is working under the mentoring of Dr. Carlos Cabrera,

director of the Center of Advanced Nanoscale Material, at the University of Puerto Rico Rio Piedras Campus. All that she learned as a PR-LSAMP fellow gave her the experience, the knowledge and most importantly the character to become part of her new step, becoming a Harriet Jenkins Pre-doctoral Fellowship Program. As a Jenkins Fellow, she is developing her Ph.D. research, Carbon Nanofiber Development for Cholesterol Oxidase Immobilization for Biosensor Application. She is not only part of a NASA Fellowship but also of a collaboration with Dr. Meyya Meyyappan at NASA Ames Research Center. Her research is a progression of a previous template created by NASA.



**Maria Ocasio** obtained her BS Degree in Coastal Marine Biology in 2007 at UPR-Humacao. Here, during her undergraduate studies, she participated of undergraduate research sponsored by PR-LSAMP under the supervision of her mentor Dr. Iris Velazquez. She entered graduate

school at UPR-Rio Piedras pursuing a PhD in Marine Ecology and received the Bridge to the Doctorate Fellowship-Cohort VI. Her graduate studies are focused on the effect of natural barriers and the presence of predatory fishes on the behavior, morphology, survival and abundance of the amphidromous shrimp *Xiphocaris elongata*. This species of shrimp is native to the Caribbean basin area and exhibits a long rostrum in streams where predatory fishes are present and a short rostrum in fishless streams.

Last year Maria applied for the highly competitive National Science Foundation's Graduate Research Fellowship Program (GRFP). The GRFP awarded her with a three year fellowship. This fellowship is given to the most competitive graduate student researchers that have the knowledge and skills to become excellent researchers in STEM fields. The Graduate Research Fellowship Program will help Maria to complete her Ph.D. research on a five year period. The annual stipend will help her to focus entirely on her research and her outreach activities.





## PR-LSAMP: ALLIANCES OF SUCCESS: UPR– RIO PIEDRAS

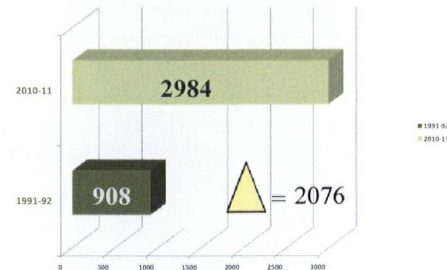
The PR-LSAMP program has been instrumental in the developing of a research culture in the University of Puerto Rico, especially at the undergraduate level. Prior to 1991 undergraduate research was practically non-existent, especially in areas such as mathematics and physics. The undergraduate research scholarships offered by PR-LSAMP promoted undergraduate research and mentorship. This activity has increased over the years and it is now common practice to include undergraduate research components in research proposals. Participation in summer internship and research programs outside Puerto Rico has also been promoted by PR-LSAMP by establishment of partnerships with several programs and the promotion of opportunities.

Another important initiative of the PR-LSAMP was the organization of the joint conference of the ACS-Junior Technical Meeting and the Puerto Rico Interdisciplinary Scientific Meeting, which allowed students from all scientific and engineering disciplines to have a local forum to present their research and learn about the research of students in other institutions in the Island.

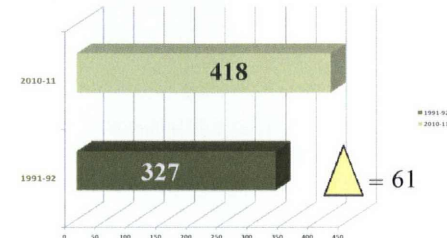
All these activities were the building blocks of the rich undergraduate research activity at the University of Puerto Rico and hence of the success of the UPR in promoting students to graduate studies in the sciences.

Dr. Ivelisse Rubio, Liaison Officer

Change in STEM Enrollment AY 1991-92 vs 2010-11



Change in STEM Degrees AY 1991-92 vs 2010-11



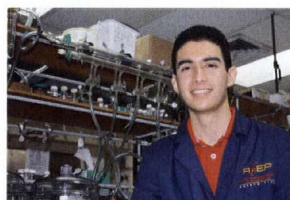
## UPR-RIO PIEDRAS: Student Success Stories



**Dr. Francisco Solá-López** obtained her BS degree in Physics from UPR-Rio Piedras in May 2005. Francisco was accepted to graduate school to obtain a PhD in Chemical Physics and received the Bridge to

the Doctorate Fellowship-Cohort III which funded his first two years of graduate studies. Dr. Solá did his research on in-situ microscopy of carbon and silica based nanostructures. He conducted great part of his thesis work at The National Center for Electron Microscopy (NCEM) at Berkeley (CA), and finish his doctoral work in 4 years. He produced seven journal articles and one patent during his doctoral work. Inspired by the challenges posted by Richard Feynman on "There's Plenty of Room at the Bottom", Dr. Solá-López's work was focused on real time fabrication and modification of nanostructures by electron beam irradiation, characterization and quantum electron field emission properties of individual nanostructures using microscopes as nanolaboratories, guided by the laws of physics. In addition,

he was recipient of the ORAU award to participate in the 58th Meeting of Nobel Laureates in Lindau; 19th Forum dedicated to Physics (2008), where only 60 graduate students (from USA) were selected. Since September 2009, Dr. Solá-López has been working in the Structures and Materials Division at NASA Glenn Research Center in Cleveland, OH, where he works on the structure-property relationships of a variety of aerospace materials. Recently, he demonstrated a new approach to image aerogels at the nanoscale by scanning electron microscopy in collaboration with Carl Zeiss Company (Nanotechnology 22, 175704, 2011).



**Kennett Rivero** obtained his BS degree in Chemistry in 2007 and was accepted to graduate school to major in Analytical Chemistry, both in UPR-Rio Piedras. He was awarded the Bridge to the Doctorate Fellowship-Cohort VI which provided economic support for his first two years in graduate school. In 2008 Mr. Rivero

participated of the Lindau Nobel Laureate Annual Meeting which took place in Lake Constance. There he met Dr. Richard Ernst, a Chemist who obtained the title of Nobel Laureate in 1991 for his lifetime work in this discipline. This meeting gave Kennett the opportunity to invite Dr. Ernst to Puerto Rico to give a talk to PR-LSAMP and BD students. In August 5, PR-LSAMP/BD was honored to receive the visit of Dr. Ernst and Kennett was in charge of his introduction to the public.

In July 2010, Kennett I. Rivero was a visiting student at the Department of Chemistry of the University of Oxford (UK) with the purpose of taking a course titled "Computational Methods in Inorganic Chemistry". This course was part of an international collaboration. The synergy between an experimental and a theoretical group was a great opportunity to exchange ideas and expertise with other young researchers in order to get new scientific insights. This experience allowed him to understand how important it is to establish scientific collaborations if you want to excel as a researcher and to contribute to the advancement of science.



## PR-LSAMP: ALLIANCES OF SUCCESS: UPR– MAYAGUEZ

UPR-Mayaguez has been a part of the PR-LSAMP Program since Phase I in 1991 and students from this institution have received great benefits from this program. Among the main activities of which UPR-Mayaguez has been a part of are:

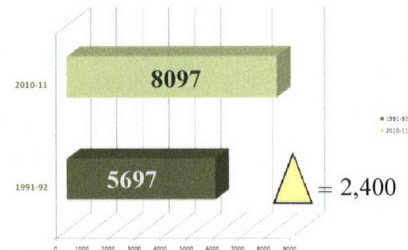
- Cooperative Learning- to develop students' ability to work collaboratively in groups
- Peer Mentoring- Upper level students serve as mentors to freshmen and sophomores to motivate and assist them in their STEM courses and research
- TaDDEI- Spanish language acronym for Study/Learning Skills
- Curricular Reform- that includes the integration of lecture and laboratory into a single course
- Teacher Preparation- to increase the number of STEM students that obtain the

certification to teach physics and mathematics

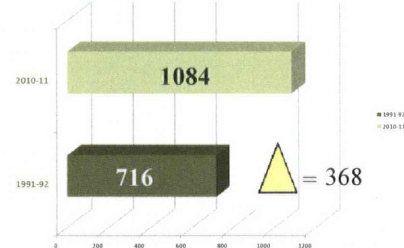
- Bridging Undergraduate to Graduate- to motivate and guide the students to continue graduate school and pursue a PhD.
- Mentored Undergraduate Research Experiences- to enhance students' academic success in STEM courses enforce the importance of integrating into research since their freshmen year

These activities have been a trigger to change the teaching and learning culture in our institution especially the mentored undergraduate research experience which develops in our students the necessary skills to succeed in graduate school such as team work communication skills, theoretical and experimental techniques, learning to analyze data, scientific reading and writing and how to publish a scientific paper.

Change in STEM Enrollment AY 1991-92 vs 2010-11



Change in STEM Degrees AY 1991-92 vs 2010-11



## UPR-MAYAGUEZ: Student Success Stories



**Dr. Azlin Biaggi-Labiosa** obtained her BS degree in Chemistry from UPR-Mayaguez. She applied to continue her graduate studies at UPR-Rio

Piedras in 2003 where she obtained one of the first fellowships ever offered under the Bridge to the Doctorate Program. As a Ph.D. candidate in Chemical Physics, Dr. Biaggi did her research on the light emission from nanocrystalline silicon when it is irradiated with electrons (cathodoluminescence). Her work in this area led her to demonstrate for the first time that the cathodoluminescence of nanocrystalline silicon can be tuned by decreasing the nanoparticles size. This work was published in an article entitled "Nanocrystalline silicon as the light emitting material of a field emission display device" (Nanotechnology 19, 225202, 2008) and was one of the top 10% downloaded articles in the Institute of Physics (IOP) for that year. She graduated in June 2008 and started a postdoctoral position at the University of Puerto Rico in July 2008 funded by the Institute of Functional Nanomaterials (IFN). During that time she continued her research

work and developed an upper undergraduate laboratory for Physics and Chemistry titled Wave Guides at the Nanoscale. Since September 2009, Dr. Biaggi-Labiosa has been working in the Sensors and Electronics Branch at NASA Glenn Research Center in Cleveland, OH, where she works on the design and fabrication of chemical sensors for various aerospace applications, including engine emissions, environmental applications and breath analysis. In August 2010, she was selected to be part of Cleveland's 40/40 club which recognizes 40 influential Hispanic Americans under the age of 40 in Cleveland. She actively participates in outreach activities by giving talk to schools with underrepresented minorities and tutoring to high school students.



**Ruth Hidalgo-Hernández** is a former PR-LSAMP student and Bridge to the Doctorate Fellow-Cohort V from UPR Mayaguez. Her BS and MS degrees are both in Mechanical Engineering under the supervision of Dr. O. Marcelo Suárez. Her research focused on the tribological characterization Al-B-X composites subject to mechanical wear as the need of lightweight

materials (composite aluminum) for efficient aerospace applications. The fellowship has not only provided her for financial support, but allowed spending her time focused only on the research and obtaining a degree. For Hidalgo is a privilege being part of the program and been able to open doors for more opportunities. After concluding her degree as Master of Science in Mechanical Engineering, she began working as Research Mechanical Engineer with the U.S. Army Corps of Engineers, specifically with the Engineer Research and Development Center (ERDC) - Geotechnical and Structures Laboratory (GSL) under the Concrete and Materials Branch, in Vicksburg, Mississippi. The ERDC is one of the most diverse engineering and scientific research organizations in the world, providing high quality, responsive engineering and environmental research for our nation needs and demands. With the support of the U.S. Army Corps-ERDC, Ruth is currently enrolled in the PhD program at the University of Mississippi. Miss Hidalgo acknowledged that being part of the BD fellowship has had a big impact on her career, giving her more confident and value to trace goals regardless the obstacles encountered in the path.



# PR-LSAMP: ALLIANCES OF SUCCESS: INTERAMERICAN UNIVERSITY SYSTEM



The Inter American University of Puerto Rico-Bayamón Campus

has been part of the PR-LSAMP Alliance for the past fifteen years. This collaboration has offered our Campus the opportunity to better develop undergraduate research among our students. It has offered our STEM students the experience of participating of extracurricular activities, which enrich their academic knowledge. During the past five years we have increased the number of students participating in undergraduate research to an average of 16 Also, PR-LSAMP has helped us double, in these past five years, the number of students that now participate in summer research experiences abroad (from 6 in the summer of 2005 to 12 in the summer of 2010) including the NIST SURF program where in the past three years, five students from out institution have been accepted, one of the for the 3rd year in a row.

PR-LSAMP has offered our faculty members an opportunity to develop their creative research ideas providing them of the tools that they need, such as materials and equipment. Faculty members have embraced this opportunity and have worked with our students to further their research work, obtaining preliminary data in the different teaching/learning areas becoming more competitive when applying for new grants. The PR-LSAMP mentoring program has also proven to be of great benefit to the development of research when upper level students pass the knowledge they have gained to the new students who enter their lab and, in this way, maintain continuity of the work being performed. Researchers who collaborate with the PR-LSAMP program have increased the number of grants received during the last five years from 7 to 84.

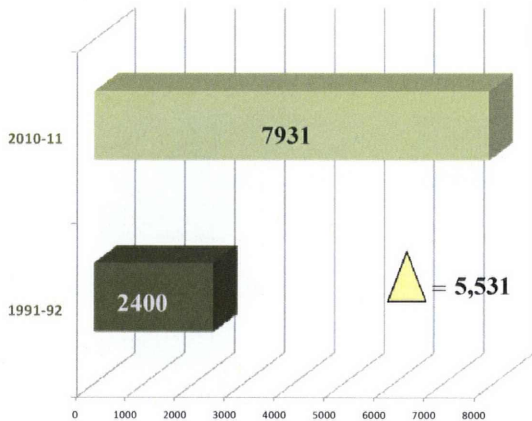
Prof. Rafael Canales, Liaison Officer



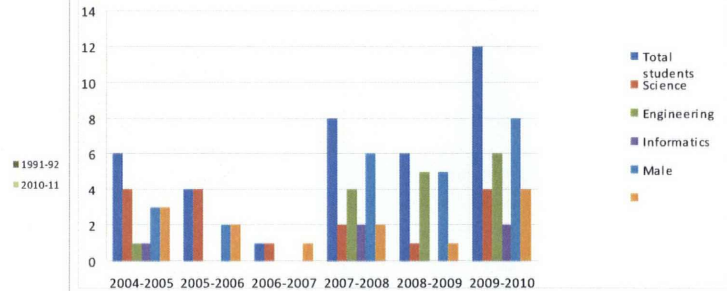
The Inter American University of Puerto Rico-Metro Campus has been a active collaborator of the PR-LSAMP Program. Emphasis has been given to research and mentoring activities to enhance students skills to prepare them for graduate school. During these past five years data shows that IAU-Metro has increased the number of students participating in undergraduate research from 7 to 24. A total of 56 students have benefited directly from PR-LSAMP activities in this institution. Students are guided in research by ten faculty members. Students are actively participating in PRISM and the Annual Best Practices Conference.

Dr. Rosa Brito, Liaison Officer

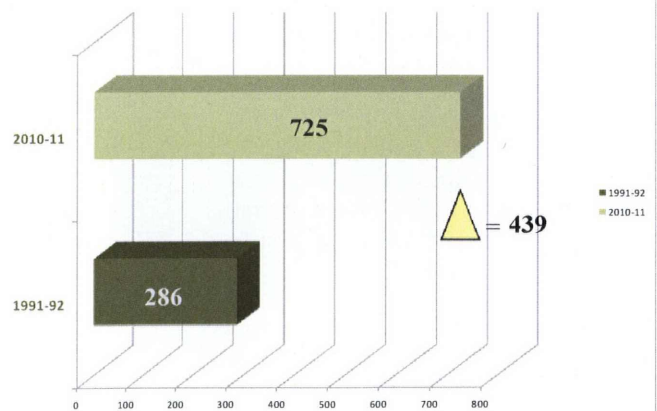
Change in STEM Enrollment AY 1991-92 vs 2010-11



IAU-Bayamón/PR-LSAMP Student Participation in Summer Internships 2005-2010



Change in STEM Degrees AY 1991-92 vs 2010-11





## INTER-AMERICAN UNIVERSITY SYSTEM: Student Success Stories



PR-LSAMP provides students as **Eliezer Otero Ferrá**, a bachelor student in Computer

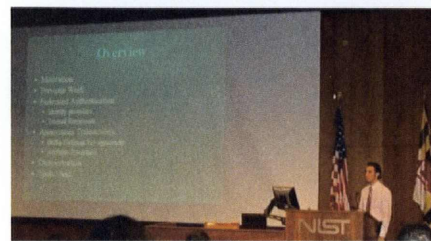
Science from the Inter American University of Puerto Rico-Bayamon Campus, the opportunity to complete summer internships in mainland US in order to further develop their research skills.

During the summer of 2009, Eliezer Otero Ferrá participated in the Fellowship Summer Undergraduate Research (SURF) program of the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland, under the supervision of Dr. William MacGregor. During the internship Eliezer had to implement a security protocol on a smartcard. The project consisted of two parts; first Eliezer had to familiarize with the

operation of the smartcard by developing test programs by completing simple information transactions between a smartcard and a simulated terminal. The second part was to implement the protocol following the security specifications.

In the summer of 2010 Eliezer was selected to participate again in the SURF program, again under the supervision of Dr. William MacGregor. Eliezer was expected to perform a demonstration of an attribute assurance in an anonymous transaction using Diffie-Hellman key exchange. This project was divided in three parts; first Eliezer had to create an application using Visual Basic that could interact with a smartcard; second, he implemented a Diffie-Hellman key exchange in the application on test it sending encrypted messages from the card to the application and vice versa; the last part was to implement the attribute assurance using the Diffie-Hellman key exchange.

Eliezer has taken advantage of the summer internship programs made available at his institution through PR-LSAMP even though he is not a participant of the PR-LSAMP during the academic year. For three consecutive years he has participated in the SURF program and this has given him the opportunity to see what is expected from him outside school and have given him the tools, skills, knowledge and networking to pursue an advanced degree in Computer Science



NIST SURF PARTICIPANTS 2010



**Melissa E. Dávila Morris** earned a B.S. in General Studies in 2003 from Cornell

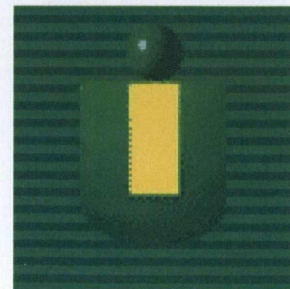
University, a MBA in Technology Management in 2007 from University of Phoenix-Puerto Rico, and a B.S. in Chemistry in 2011 from Inter American University of Puerto Rico-Metropolitan Campus. While Melissa studied her B.S. in Chemistry, she conducted research in Biochemistry based Fluorescence Quenching of BSA, under the mentoring of Dr. Antonio Colom. On the other hand, Melissa had the opportunity to participate in summer internships for two years. In 2009 she was accepted in the SURF program at the National Institute of Standards and Technology in Gaithersburg, MD, under the Chemical Science and Technology Laboratory, Analytical Microscopy

Team in the Project: Trace Explosives and Narcotics Detection. In 2010 she was once again accepted in this summer internship program and now under the Material Sciences and Engineering Laboratory, Ceramics Division in the Project: Nanomechanical Properties of Gold Nanoparticles. Melissa has presented her research work in the modality of oral and poster presentations, at local and national forums.

Currently, Melissa is studying at University of Maryland Baltimore County (UMBC) with a view to a PhD in Chemistry. She is part of Meyehoff Scholars Program and is being evaluated for scholarship under the UMBC LSAMP-Bridge to the Doctorate Program.



NIST SURF PARTICIPANTS 2009







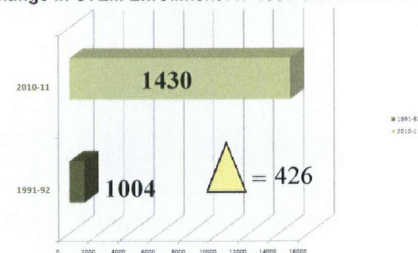
## PR-LSAMP: ALLIANCES OF SUCCESS: PCUPR

The PCUPR has been a member of the Puerto Rico Louis Stokes Alliance for Minority Participation Program since its inception in 1991. PR-LSAMP has impacted more than 1,000 students in our institution, especially through the TaDDEI workshops carried out during the first two phases of the program and the Undergraduate Research component. All PR-LSAMP activities helped the University to develop a research culture among the College Science faculty and students. STEM student enrollment has increased and there is also more interest in our students to perform undergraduate research. Each year more students apply to Summer Undergraduate Internships since workshops and other activities are

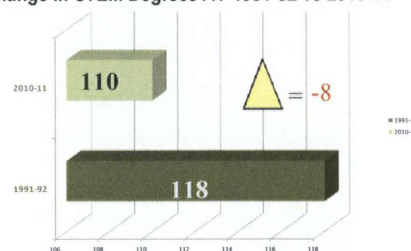
carried out at the PCUPR. Results of the research obtained during semesters and/or summer internships are presented in many student scientific forums in Puerto Rico and abroad, such as PRISM, ABRCMS, College of Science's Scientific Symposium and others. Undergraduate research activities and development skills workshops have helped students to be more efficient in their courses and to be more successful as graduate students.

Carmen Asencio, Liaison Officer

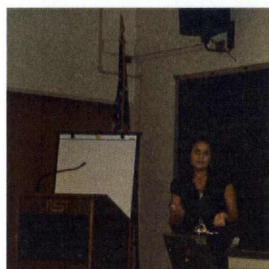
Change in STEM Enrollment AY 1991-92 vs 2010-11



Change in STEM Degrees AY 1991-92 vs 2010-11



## PCUPR: Student Success Stories



**Janice Sotomayor** obtained her BS degree in General Sciences with a minor in Biology from the Pontifical Catholic

University of Puerto Rico in May 2010. She was accepted to continue her graduate studies in Medicine in the Ponce School of Medicine and Health Sciences on August 2010. As an undergraduate, she was an active honor student in the Institutional Honor Program. Janice had four opportunities to participate in undergraduate research. One of them was during her first summer as freshman student (2007) with the NIST SURF Program in the Biochemical area and under the mentoring of Dr. Nancy Lin at the National Institute of Standards and Technology at Gaithersburg, Maryland. She was also one of five freshman students of the PCUPR participating in PR-LSAMP's workshops for developing research skills. Later, as PR-LSAMP scholar, she worked in undergraduate research with Dr. Lizzette Santos-Santori at the Biochemical area at the Pontifical Catholic University of Puerto Rico. On the summer 2009, she participated in a research program at Rutgers/UMDNJ SURP Program in the Molecular Biosciences field with Dr. Terri Kinzy.

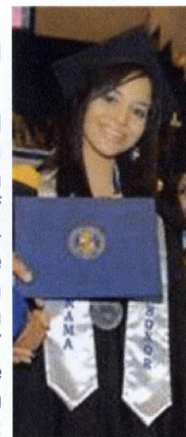
Finally, her last undergraduate research project was at the Organic Chemistry area with Dr. Adalgisa Batista. Results of her research were presented in various scientific forums, such as PRISM/JTM and ABRCMS. This previous participation encouraged Janice to develop a passion for Medical Sciences related field which made her apply to an MD program in which she is working with an Anesthesiology research project with Dr. Santiago Cummings at the Hospital Damas in Ponce.

PR-LSAMP encourages students like Janice Sotomayor to keep on the track of the Research field. As a doctor she will look forward in working with the NIH program in Medical/Biomedical Research for the development of new treatments and best technologies for the patients.

**Rosa Jaimán** graduated in 2010 from PCUPR obtaining a BS in General Science with a Minor in Psychology. During her undergraduate studies she was member of the Institutional Honor Program. She also was scholar of the PR-LSAMP Program participating in Undergraduate Research and Bridging from Undergraduate to Graduate Components. In 2007, Rosa began doing research with Prof. Carmen working in various ongoing research projects and her results were presented in the meetings such as Undergrad Research Conference at the Univ of Maryland, McNair Annual Conference, PRISM 2008, 2009 and

2010; SERMACS 2009; ABRCMS 2009; and NCUR 2010.

In 2008, Rosa participated in the Summer Research Opportunities Program (SROP) in the University of Illinois at Urbana-Champaign where she worked with Dr. Susan Schatz, in the research project "Using the FI/EXT task to evaluate response inhibition seen in rats with PCB and PBDE exposure: Parallels with ADHD". She received the award for outstanding scholarship this institution at Illinois Summer Research Opportunities Program (SROP), in the science area. She also had the opportunity to present this work at the CIC/SROP 2008 Conference at Michigan State University.



In 2011, Rosa was selected to be part of the program Bridge to Neuroscience in Michigan State University. She took courses in Neurosciences and Toxicology and worked in Dr. William D. Atchison's laboratory in a research related to the effects of methylmercury on presynaptic vesicles and postsynaptic endplates in mice. Recently, Rosa was accepted by the Michigan State University under the Neuroscience Doctoral Program.



## PR-LSAMP: ALLIANCES OF SUCCESS: LIAISON OFFICERS

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### UPR-Mayagüez

Prof. Jeannette Santos  
(787)832-4040 x-2398  
jsantos@ece.uprm.edu



### UPR-Río Piedras

Dr. Ivelisse Rubio  
(787)764-0000 x-7243  
iverubio@uprrp.edu

### UPR-Aguadilla

Prof. Migdalia Sotomayor  
(787)890-2681 x-226  
migsotomayor@yahoo.com

## University of Puerto Rico

### UPR-Humacao

Dr. Ileana Rodriguez  
(787)850-9387  
ilecoral@hotmail.com

### UPR-Arecibo

Dr. Maiella Ramos  
(787)878-2830

### UPR-Cayey

Dr. Belinda Roman  
(787)738-2161 x-3205  
Wild\_germplasm@yahoo.com



## Pontifical Catholic University

Prof. Carmen Asencio  
(787)841-2000  
casencio@pucpr.edu



## Inter American University

**UIA-Bayamón**  
Prof. Rafael Canales  
(787)279-1912 x-2115

**UIA-Metro**  
Dr. Rosa Brito  
(787)250-1912 x-2603



# THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY

The Bridge-to-the-Doctorate Program, an initiative within the LSAMP Program, began in August of 2003, with ten former undergraduate PR-LSAMP students being awarded fellowships for their first two years of graduate studies at UPR-Rio Piedras. Since then, 96 additional fellowships have been awarded, for a total of **106** Fellows.

The two institutional sites that have participated in the BD Program are UPR-Rio Piedras and UPR-Mayaguez., the island's two major higher education institutions with graduate programs in STEM fields. The breakdown of Fellows by STEM discipline is:

STEM Disciplines	Fellows
Chemistry	42
Biology	28
Engineering	12
Physics	12
Marine Science	4
Mathematics	5
Environmental Sc.	1
Computer Science	1
Agricultural Science	1
Total	106

Each Fellow receives a \$30,000 fellowship per year, for their first two years of graduate studies. The BD Program also covers the Fellows' tuition and institutional fees; the health plan, and provides funds for travel and educational materials.

A Support Program includes a series of workshops, seminars, and field trips, and the Annual Transdisciplinary Research Conference to enhance the Fellows' academic preparation. At least five of these activities are joint activities with Fellows from the following Cohort, to exchange experiences and establish networking, including presenting their research projects at the annual Puerto Rico Interdisciplinary Scientific Meeting and the annual Puerto Rico EPSCoR Meeting. All Fellows must serve as mentors to an undergraduate PR-LSAMP student, and must visit at least one high school each year to serve as role models to high school students, and share with them their academic experience and career plans. Former Fellows now serve as resources in PR-LSAMP workshops.

During the summer of 2008 a group of nine Fellows is attending the International Conference on Global Warming to be held in Istanbul, Turkey. Other 12 Fellows have elected to

participate in the 4th International Conference on Bio-Engineering and Nanotechnology, to take place in Dublin, Ireland.

## Major Accomplishments of the BD Program

Track record of BD fellows of the first eight cohorts has been collected up to December 2010, obtaining a 100% response rate. Data was collected for all BD Fellows that are still in the PhD pipeline, 69 students. Analysis of the data demonstrates substantial impact and the value-added of the BD Program that is summarized by the following statements:

- Sixty nine BD Fellows (73%) are in the PhD pipeline and should contribute significantly to the diversifying the National STEM workforce.
- A total of sixteen BD fellows (17%) have entered the workforce in academia, industry, or government research centers. Of these, six fellows (6.4%) have obtained their PhD and fifteen (16%) their MS degrees, of these five have continued to complete their PhD.
- Three BD graduates, two of these female, have a promising future in leadership position in mainland agencies; two of these are Research Scientists at NASA Glenn Research Center and one recently joined the ARMY Corps of Engineering. One former fellow is completing a Postdoctoral Fellowship at Texas A&M University, and was awarded the 2011 Ford Fellowship, the only one awarded that year.
- The PR-BD Initiative has been successful in recruiting first generation low-income students, which are mainly located at 4-year institutions. Forty three percent (43%) of all BD Fellows have at least one parent with only a high school diploma or less and 9.5% are first generation students.
- 167 papers have been published in peer review journals as a result of the Fellows' research work.
- BD Fellows presented their research work in 802 local, national and international scientific conferences.
- BD Support Program has offered 212 workshops, conferences and educational field trips since its creation; 21 of these during the academic year 2010-2011.
- 45 fellows have made presentations at international congresses held in Australia, Austria, Brazil, Canada, Denmark, France, Germany, Greece, Guadalupe, Guatemala, Holland, Hungary, India, Italy, Japan, Mexico, New Zealand, Poland, Spain, Switzerland, Turkey, and United Kingdom.

The BD Initiative has been very successful in disseminating the program island wide. An example of this is the fact that as the



Selected group of fellows representing each cohort at the PRLSAMP Advisory Board Meeting



# THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY

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# THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY

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Cohort I Fellows



Cohort I and II Fellows



Cohort II Fellows



Cohort III Fellows



Cohort III and IV Fellows



Cohort IV Fellows



Cohort V Fellows



Cohort IV and V Fellows



Cohort VI Fellows



Cohort VII Fellows



Cohort VI, VII and VIII Fellows

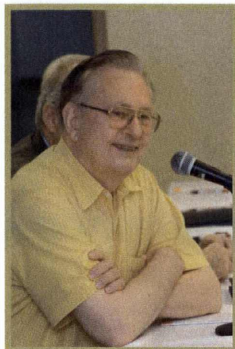


Cohort VIII Fellows



## BD Fellows Meet with Dr. Arden Bement, Director of NSF in 2006, During His Visit to Puerto Rico

*"Tell me about your educational and research experience, and where you foresee yourself in the year 2011"* asked Dr. Arden Bement, NSF Director, at the roundtable discussions with NSF fellows at UPR-Rio Piedras and UPR-Mayaguez.



LSAMP Bridge-to-the-Doctorate, AGEP, and EPSCoR Fellows shared their educational and research experience, and career plans with Dr. Bement during his visit to UPR-Rio Piedras and UPR-Mayaguez. Most fellows visualize themselves as professors and researchers at an academic setting, either in Puerto Rico or the US mainland. *"I have been very fortunate to be one of the recipients of a BD fellowship, and as a professor I want to help others achieve their academic goals"* said, Daniel Caballero, now a fifth year doctoral student in biochemistry at UPR-Rio Piedras.



BD Fellows Cohort II  
UPR - Mayaguez



NSF FELLOWS AT UPR RIO PIEDRAS

Giovanna Cartagena, a freshman student at UPR Rio Piedras, with lab mentor, Azlin Biaggi, Cohort I Fellow.



Front row: Dr. Weiner, Dean of Natural Sciences at UPR-Rio Piedras, Dr. Bement, Dr. Guadalupe, Dean of Graduate Studies at UPR-Rio Piedras, and Dr. Gomez, Director of the Resource Center for Science and Engineering

On January 27 and 28, 2006, Dr. Arden Bement, NSF Director visited Puerto Rico with Dr. Michael Turner, NSF Assistant Director for Mathematical and Physical Sciences. The two-day site visit included meetings with NSF fellows and researchers, at UPR-Mayaguez and UPR-Rio Piedras; a visit to the Arecibo's National Astronomy and Ionosphere Center, and participation in the Second National AGEP Evaluation Capacity Workshop, held at the Windham Condado Hotel in San Juan.

At both institutions, meetings were held first with NSF-EPSCoR Start-up Grantees and other NSF Grantees, where Dr. Bement saw first hand the impact that the Research Infrastructure Improvement EPSCoR Program has had in developing more than seventeen young competitive scientists. The visits to the laboratories were followed by lively roundtable discussions with NSF fellows, which included Bridge-to-the-Doctorate fellows and fellows from AGEP and EPSCoR programs – "The highlight of my trip", said Dr. Bement.



# THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY



Research in Population Biology in the Mangrove Forest



Mona Island, best known as the Puertorrican Galapagos:  
Studying Limestone Formations



Waterfalls in the Karst Zone Area of the  
Mountain Central Region



Studying Geological Faults  
and Landslides



Cohort VII during their visit to Cornell University also  
visit the Ithaca Science Center



Mariely Hernandez; Plant Sam-  
pling in the Tropical Forest



Studying Coral Reefs in Cayo Enriquez at  
La Parguera



## Workshops, Conferences, and Field Trips To Enhance the Academic Preparation of BD Fellows



Dr. Ana Guadalupe, Dean of Graduate Studies, on "How to Succeed in



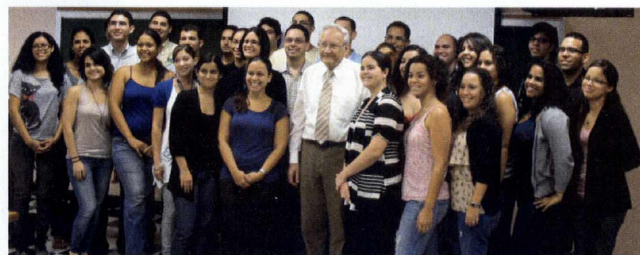
Cohort VIII Fellows participating of workshop titled "One Universe, Many Worlds"



Leadership Workshop



Dr. Richard Wilson, Caltech Institute, Dept of Mathematics



Dr. Richard Ernst, Chemistry Noble Laurette, visited PR-LSAMP and BD students and shared with them his life story and his career endeavours as a scientist and researcher.



Annette Casiano, a former PR-LSAMP Student and currently a PhD Chemistry candidate at Michigan State University, Ann Arbor



Magic, Science, and Education Workshop



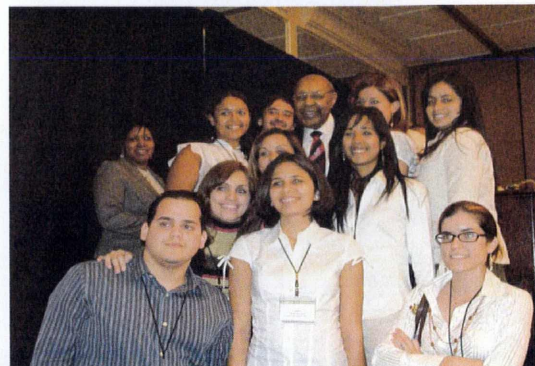
Cohort VII & VIII Fellows in Geology and Geomorphology Field Trip at the Puerorrican Southwest Province



# THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY : FELLOWS PARTICIPATE IN THE NSF JAM MEETINGS



Dr. A. Hicks, LSAMP Director,  
with Cohort III Fellows



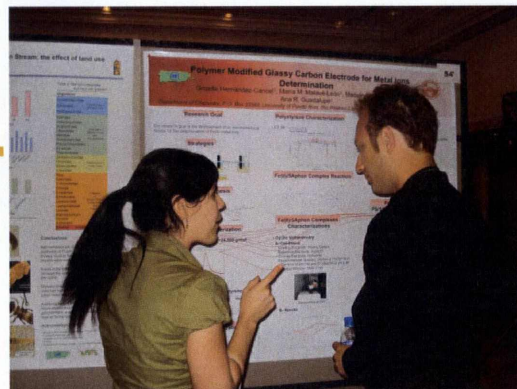
Congressman Stokes with  
Cohort III Fellows



Congressman Louis Stokes



Agustin Diaz, Cohort I Fellow, shares with new fellows the  
challenges and experiences encountered



Griselle Hernandez, Cohort IV Fellow, discusses her  
research project at the poster session



Cohort IV Fellows with Prof. Javier Figueroa, BD  
Coordinator



# THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY : FELLOWS PARTICIPATE IN THE NSF JAM MEETINGS



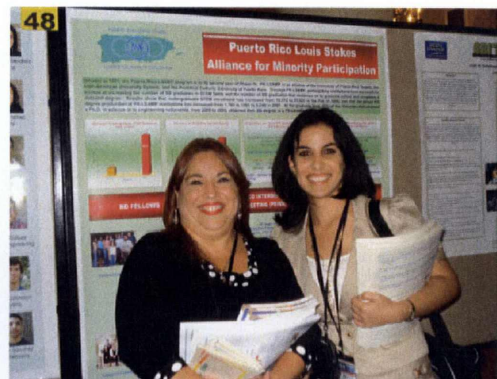
Fellows visit Hon. Luis Fortuño at Congress as he was States Comissioner for PR in 2008



Dr. Arthur Hicks with Cohort VI BD Fellows



Cohort VII Fellows at NSF JAM Meeting



Mrs. Ana Feliciano, Management Coordinator and Ms. Ida Pantoja, BD Cohort V Fellow at the BD Poster Session



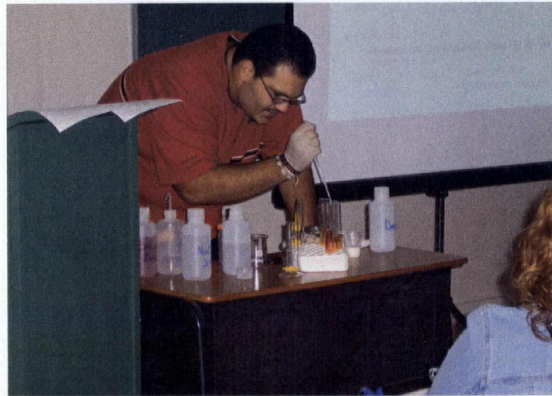
# THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY : FELLOWS SERVE AS RESOURCE PROFESSORS AND ROLE MODELS



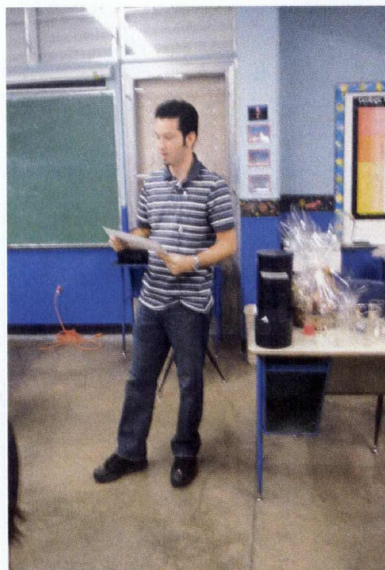
Ruth Hidalgo, Cohort V Fellow, at the Carlos Gonzalez High School, Aguada PR



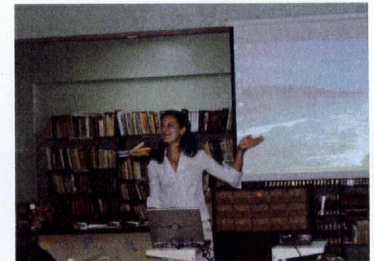
Physics Academy at Maunabo, PR  
Azlin Biaggi, Cohort I Fellow



Chemistry Academy at the Luis Muñoz Marin High School at Yabucoa, PR  
Agustin Diaz , Cohort I Fellow



Life Science Academy,  
Daniel Caballero,  
Cohort I Fellow



Luzed Diaz, Cohort I Fellow, at the Eloisa Pascual High School, Caguas PR



Geology Summer Academy at the Central Igneous Province of PR  
Agustin Diaz, Cohort I Fellow



Cindy Figueroa, Cohort VII BD Fellow participating in Nanodays 2011 at Plaza Las Americas



Angelica Erazo, Cohort VIII Fellow participates in the Miami Dade Nanodays Training



# THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY : FELLOWS PARTICIPATION IN INTERNATIONAL CONFERENCES, COURSES AND RESEARCH EXPERIENCES

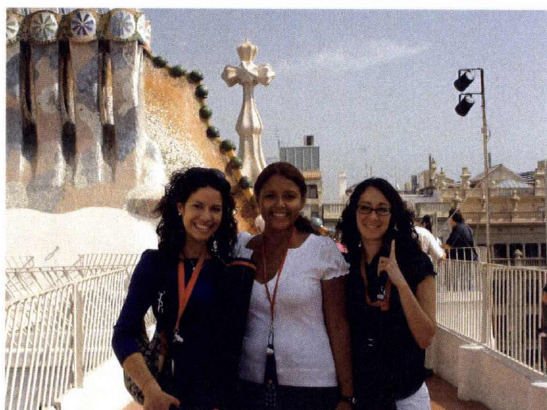
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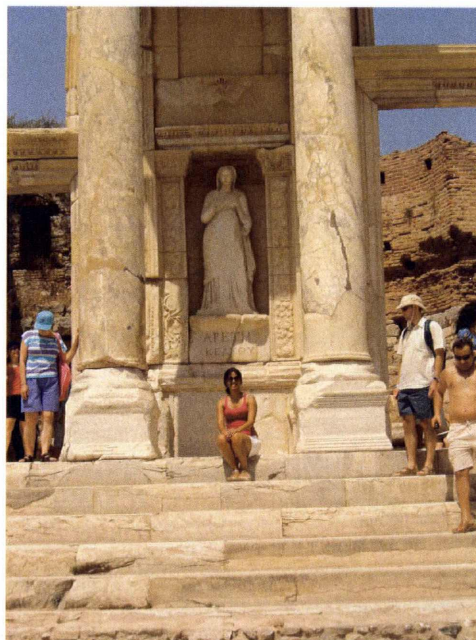
Azlin Biaggi, Cohort I Fellow and Francisco Sola, Cohort III Fellow, at the First International Workshop on Semiconductor Nanocrystals in Budapest, Hungary



Karilys Gonzalez, Cohort I Fellow, at the 36th International Conference on Coordination Chemistry in Merida, Mexico



Damaris Suazo and Giselle Flores, Cohort III Fellows at the "13th European Congress on Biotechnology" in Barcelona, Spain

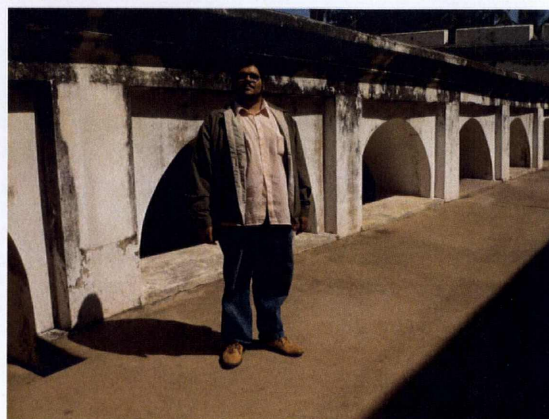


Enid Contes, Cohort III Fellow attended "The NATO Advanced Study Institute on Mini-Micro Fuel Cells as Electric Energy Generators"

In Izmir, Turkey

Fernando Piñero, Cohort IV Fellow, attended The International Conference on "Applicable Algebra and Error Correcting Codes" in Bangladesh, India. He also conducted research with Dr. Tom Hoeholdt in Denmark during the summer of 2007..

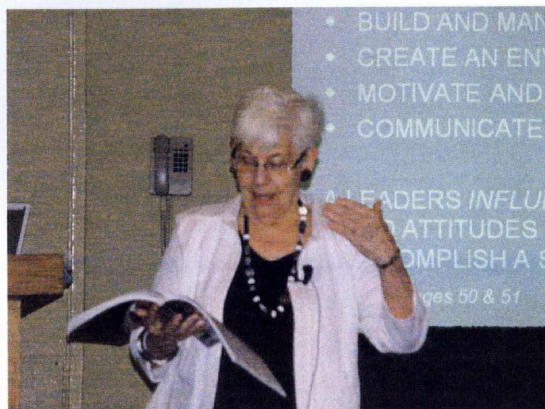
Dr. Hoeholdt is a world authority in Code Theory.





## THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY : Leadership Workshop: “Leaders and Leadership in Undergraduate Science (STEM)”

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On December 6, 2007, PR-LSAMP sponsored the workshop “Leadership in STEM Education” for the Bridge-to-the-Doctorate Fellows. The workshop was offered by Jeanne Narum. Narum is the founding Director of Project Kaleidoscope (PKAL), a national initiative to transform STEM undergraduate education. PKAL’s initiatives are well known for addressing solutions rather than problems and promoting “best practices” that have proven successful in strengthening the learning process and environment. Over 900 colleges and universities nationwide have participated in one or more PKAL activities.

Narum designed the workshop around three goals:

**Goal 1** – “To address leadership development from the professional perspective: Exploring how visions of student learning and of the future of STEM fields – as well as the broader national context- must be considered in developing a STEM leadership plan”.

**Goal II** – “To address leadership development from the political perspective: Exploring how the skills of leadership – imagining, connecting, creating, communicating, collaborating, negotiating, and reflecting – are translated into action by leaders within and beyond undergraduate STEM learning environments”

**Goal III** – “To address leadership from the personal perspective: Exploring how awareness of self and the ability to manage one’s self are critical characteristics of leaders, within and beyond undergraduate STEM”.

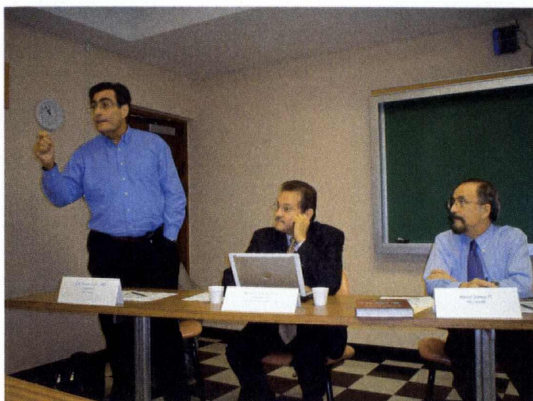
A total of 35 BD Fellows, representing all cohorts, attended the workshop. Participants received the following materials: 1) Project Kaleidoscope BD Fellows Seminar Manual – which included the strategies (what works) to achieve the goals stated above; 2) The 2006 Annual Report of the Research Corporation: A New Paradigm for Undergraduate Science Education, and 3) Making the Right Moves: A Practical Guide to Scientific Management for Postdocs and New Faculty by the Burroughs Wellcome Fund and the Howard Hughes Medical Institute.





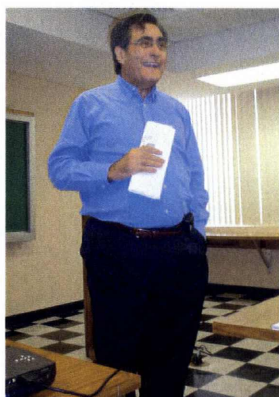
## THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY : Scientists as Entrepreneurs

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At the 2006 PR-LSAMP Advisory Board meeting, members had the opportunity to meet with a group of BD Fellows, and were surprised that not one of them expressed an interest in becoming an entrepreneur. Following the Advisory Board's recommendation, PR-LSAMP offered the workshop "Scientists as Entrepreneurs", to expose BD Fellows to successful entrepreneurs. Two local entrepreneurs were the main speakers: Dr. Manuel Figueroa, President, Virtual Educational Resources, Inc. (VERNET), a software development and ISP company located in Puerto Rico. Under his leadership the company grew from no revenues to \$3M in two years while maintaining profitability. It is now the leading

educational software development company in Latin America. The second speaker was Mr. Luis Romero, President of Optivon, Inc., a telecommunications company, that exports its systems to Europe, Middle East, Latin America, Asia, and Africa. They both explained the nature of entrepreneurship, the skills needed to be a successful entrepreneur, the challenges and opportunities of entrepreneurship in Puerto Rico, and how entrepreneurs contribute to the economic development of Puerto Rico. They described their life experiences as successful entrepreneurs and then interacted informally with the students.



Luis Romero,  
CEO Optivon



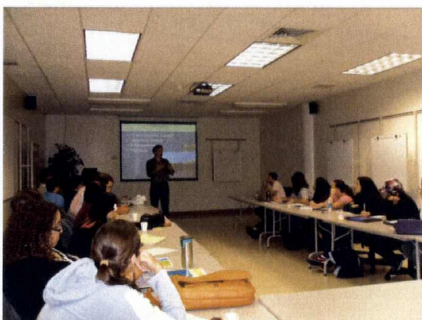
Audience



Manuel Figueroa,  
CEO VERNET

## THE BRIDGE TO THE DOCTORATE PROGRAM: EIGHT YEARS OF HISTORY : Scientists as Entrepreneurs

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On May, 2010 BD Fellows participated of a workshop offered by **Dr. Hugh Kearns**, a professional in the area of Education and Mental Health Science, titled "The 7 Secrets of Highly Successful PhD Students". This two day intensive workshop offered students strategies to master during their graduate school in order to succeed with both the academic requirements as well as the research requirements. Examples of the topics covered were: how to work more efficiently with time management, how to deal with distractions, how to boost your writing productivity, among others..





# 20 YEARS OF HIGHLIGHTS AND IMPACTS ACROSS THE PR-LSAMP ALLIANCE-Program Evaluation

PR-LSAMP has consulted an external evaluation firm, Leffingwell & Associates, to perform an evaluation of the PR-LSAMP program regarding the success of its activities and the impact it has had on students' academic achievements. This PR-LSAMP evaluation covered the following aspects of the program: retrospective longitudinal tracking of participating students, the Undergraduate Research Component and the results of the workshops offered as part of the Bridging from Undergraduate to Graduate Component. Here is a summary of the results of this evaluation:



"An extensive battery of questionnaires confirmed that the PRLSAMP program was dealing in an appropriate fashion with all LSAMP issues and was obtaining considerable success in every area. It also revealed ways in which the program can be improved, which program management welcomed and discussed with the evaluators, brainstorming on ways of acting on this information and developing even better techniques to measure outcomes. An on-line retrospective longitudinal questionnaire received 141 responses (a 15% response rate, higher on the three paper instruments) on the status of participants in relation to their studies, confirming that the program is meeting its goal of promoting graduate STEM studies among baccalaureate participants. For 42 individuals with a B.S., 37 (88%) were in graduate school (or had obtained a graduate degree), far surpassing the program's goal of 65%. An interesting finding was that the female respondents aspired

to a doctorate over a master's by a 6-1 ratio, while their male counterparts were more often satisfied to seek a master's. Most respondents had a clear and accurate idea of what an interdisciplinary research community is: a of scientists from different fields who collaborate to solve a problem or problems. Overall, 76% of the respondents believed that an interdisciplinary research community was created by PRLSAMP. It appears that all program activities are having a positive impact and are perceived as such by the participants for creating an interdisciplinary research community. The most common mechanism mentioned for creating an interdisciplinary research community was the set of activities (symposia, conferences, workshops, etc.) sponsored by PRLSAMP, with the symposia receiving especially favorable recognition. The extent to which the program has communicated the importance of an interdisciplinary approach and the value of not only collaborating but of creating a community of researchers is to be applauded. Mentoring for undergraduate research was scored favorably, from 3.2 to 3.6 for different aspects (on a 0-4 scale). Responses giving self assessment on prior experience and prior skill/knowledge in each of the 11 areas treated by workshops confirmed that program management had conducted an accurate needs assessment and all topics were highly appropriate. Multiple metrics (three different mathematical models) were employed to assess the impact of the workshops (extent of improvement, self-assessed). There was substantial self-assessed improvement in every area, and the workshops were judged to have been a major factor in that improvement. Although there is a substantial subjective component in this assessment, respondents judged (using a multiple metric approach) the workshops on Technical Research Skills, Writing for Science (general), Science Content Topics, and Science as an Interdisciplinary Field as the most successful. Aside from providing participants with specific knowledge and skills essential for success in STEM fields, the responses indicated that the program is promoting a substantial change in the institutional cultures of the participating institutions (especially in regard to creating interdisciplinary research communities)." by Joseph Lipowski, Leffingwell & Associates.

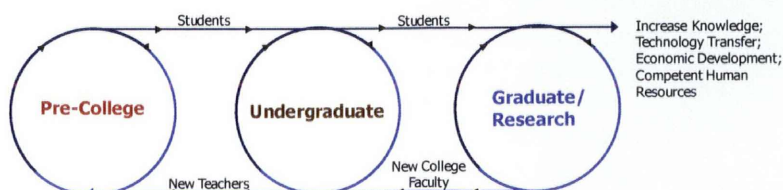
## PR-LSAMP: The Next Five Years

PR-LSAMP is ready to submit a new proposal in October 2011 to continue the support of undergraduate and graduate students in STEM fields giving emphasis to underrepresented minority, especially first generation college students. Among the expected outcomes we have for this new venture are:

1. The percent of students that obtains a BS degree from PR-LSAMP institutions and enters a graduate degree program in a STEM field will be sustained at 65%.
2. For the alliance, the number of students who complete a STEM Ph.D. will increase from 514 to 620, a 20% increment of the five-year running average; UPR-AG will contribute to this goal
3. Annually, PR-LSAMP institutions will sustain a minimum of 3,100 students that obtain a BS degree in a STEM field.
4. PR-LSAMP institutions will provide resources and infrastructure to sustain the PR-LSAMP activities that improve student success in STEM fields, and help make a successful transition from undergraduate to graduate studies.

PR-LSAMP program has been designed to impact students at all the critical junctures of the pipeline and will expand it's scope by creating a Supra Alliance than will impact student beyond the Puerto Rico Jurisdiction. These outcomes are significant and will have a regional and national impact because they will contribute to prepare the next generation of scientists in Puerto Rico and US Mainland and increase the Nation's pool of well-prepared, competent scientists from underrepresented groups.

**The Resource Center for Science and Engineering Pipeline**





# EVIDENCE OF PR-LSAMP CONTRIBUTION TO STEM PhD's FOR UNDERREPRESENTED MINORITIES

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## BS Graduates of PR-LSAMP Institutions that Obtain a PhD Degree in the Natural Sciences

PR-LSAMP institutions contribution to the national pool of Hispanic PhDs in Natural Sciences has maintained an average of **17%**  
NORC 5-year running average data:

<b>2000-05</b>	<b>2001-06</b>	<b>2003-08</b>	<b>2004-09</b>
<b>17%</b>	<b>18.4%</b>	<b>17.0%</b>	<b>17.0%</b>
<b>(302/1784)</b>	<b>(340/1845)</b>	<b>(367/2187)</b>	<b>(413/2481)</b>

**NORC = National Opinion Research Center - University of Chicago**  
(Number of PhD Graduates from PR-LSAMP Institutions/Total Number of National Pool of Hispanics PhDs)

## BS Graduates from PR-LSAMP Institutions that Obtain a PhD in Engineering

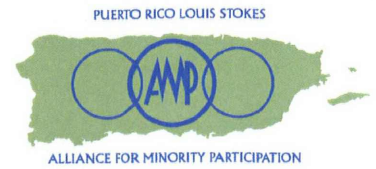
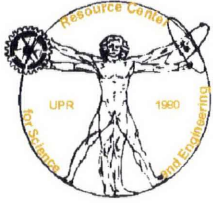
PR-LSAMP institutions contribution to the national pool of Hispanic PhDs in Engineering has increased from **12%** to **21%**

NORC 5-year running average data:

<b>2000-05</b>	<b>2001-06</b>	<b>2003-08</b>	<b>2004-09</b>
<b>17%</b>	<b>19.2%</b>	<b>21.0%</b>	<b>21.0%</b>
<b>(71/425)</b>	<b>(80/416)</b>	<b>(105/511)</b>	<b>(119/579)</b>

**NORC = National Opinion Research Center - University of Chicago**  
(Number of PhD Graduates from PR-LSAMP Institutions/Total Number of National Pool of Hispanics PhDs)





## Contact Us!!

**PR-LSAMP CENTRAL STAFF: 787-765-5170**

<b>Dr. Manuel Gomez</b>	<b>Principal Investigator</b>	<b>mgomez@upr.edu</b>	<b>x2001</b>
<b>Dr. Ana Rita Mayol</b>	<b>Co-Principal Investigator And Project Director</b>	<b>anaritamayol@gmail.com</b>	<b>x2062</b>
<b>Prof. Javier Figueroa</b>	<b>Assistant Coordinator</b>	<b>jfigueroa.prlsamp@gmail.com</b>	<b>x2012</b>
<b>Mrs. Ana M. Feliciano</b>	<b>Management Coordinator</b>	<b>afeliciano.prlsamp@gmail.com</b>	<b>x2016</b>
<b>Ms. Krisia Melendez</b>	<b>Secretary</b>	<b>kmelendez.prlsamp@gmail.com</b>	<b>x2013</b>
<b>Ms. Valerie Crespo</b>	<b>Student</b>	<b>vcrespo.prlsamp@gmail.com</b>	<b>x2118</b>



**Dr. Arthur Hicks, LSAMP Program Director, Visits PR-LSAMP and BD Students in December 2010**