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SOMAS-URM: The Evolution of a Mentoring and Summer Research Program

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The need to enhance recruitment and retention of students in the sciences to strengthen the economic and scientific foundation of the United States was recently underscored by the National Science Board. The SOMAS Program (Support Of Mentors And their Students) addresses this need using a two-pronged strategy: 1) Junior faculty receive mentoring and instruction in launching research programs that engage student collaborators; and 2) College students are introduced to discovery in the neurosciences by conducting original research with their professors. Junior faculty from predominantly undergraduate institutions are invited to submit applications to obtain summer research support for undergraduate students who will spend 10 weeks collaborating with the faculty member on projects of common interest. Awards cover a travel and a supply budget, summer student housing, as well as faculty and student stipends. The faculty mentors and their students

are to use the travel support to attend the joint Annual Meetings of the Society for Neuroscience (SfN) and the Faculty for Undergraduate Neuroscience (FUN). Faculty Awardees are required to participate in the Survival Skills and Ethics Workshop held at the SfN Meeting to prepare them to write grants aimed at supporting their research programs. Students are to present their summer research findings at the FUN Poster Session held jointly with the SfN Meeting. Students are also required to attend Survival Skills Workshop sessions that focus on ethics in research and that provide tips on applying to graduate school. The SOMAS-URM Program presently emphasizes recruitment and retention of underrepresented groups to enhance participation in scientific discovery by the full range of the American population.

Key words: funding program; mentorship; predominantly undergraduate institution; undergraduate student

In 2004, the National Science Foundation (NSF) funded a national grants program based at Davidson College known as the Support of Mentors and their Students Program (SOMAS; www.somasprogram.org). This Program is aimed at supporting junior faculty and their students at predominantly undergraduate institutions by providing them with funding to conduct summer research at their home institutions. This effort is in response to the recent report from the National Science Board (2003) recommending that the United States engage in activities to enhance the recruitment and retention of American undergraduates from all demographic groups.

Dwindling numbers of American students entering science, technology, engineering, and mathematics (STEM) fields and the decline of talented STEM students from foreign countries as they choose to return to their home countries after completing their studies in the United States may produce a disastrous shortfall in the scientific human resources of the Nation. A more vibrant scientific community is seen as necessary to energize the American economy, which is presently in dire need of just such an energy infusion.

The SOMAS Program seeks to address the shortfall looming on the horizon by taking a two-pronged approach: 1) Junior faculty receive summer research support as well as intensive mentoring and guidance in launching research programs that engage their undergraduate students during the summer months. 2) Undergraduate students are immersed in summer research to introduce them to the wonders of the nervous system and the excitement of discovery. Three features of the program make it a particularly unique way of effecting systemic change. First,

since the target of the program is the junior faculty member, the measures taken to enhance their ability to mentor undergraduates and to become more competitive in securing extramural funding for their research programs have a likelihood of producing a long-lasting impact. Second, since undergraduates are a focal point of the Program's support, introducing students to scientific research early in their careers within an environment they are already comfortable with (i.e. their home institutions) has the potential to ignite a passionate pursuit of science as a career path. Finally, because of the unique nature of neuroscience as an interdisciplinary science, the impact of the SOMAS Program may be wide-ranging, conceivably affecting programs in psychology, biology, chemistry, physics, and computer science, to name just a few areas of scientific overlap.

Between 2004 and 2008, six \$10,000 grants were awarded each year to junior faculty so they could conduct neuroscientific research at their home institutions – a total of 24 grants (see Table 1 for a list of the SOMAS Awardees). In 2005 the NSF named the SOMAS Program an NSF *Nugget* for being an exemplar in contributing to the infrastructure of the Nation in developing human resources. The Program provided the Awardees with support in creating welcoming laboratories for undergraduate students, in conducting research in accordance with ethical principles, in obtaining information useful to apply to graduate schools and fellowship programs, and, of course, in conducting scientific research at a PUI. The \$10,000 grant that was awarded to each winner was used for summer salary for the student and faculty member, for laboratory supplies, and for travel costs to attend the joint

Annual Meetings of the Society for Neuroscience (SfN) and the Faculty for Undergraduate Neuroscience where the students and their SOMAS faculty shared their summer research results with the scientific community. The students and faculty also attended a two-day Professional Skills Workshop (http://www.survival.pitt.edu/events/workshops_society.asp) just prior to the SfN meeting that focuses on grantspersonship, the responsible conduct of research, graduate school and fellowship application approaches, life in graduate school, careers in neuroscience, and how to attend the SfN meeting, which often has in excess of 25,000 participants. Ramirez co-organized this workshop with Drs. Beth A. Fischer and Michael J. Zigmond of the University of Pittsburgh. It should be noted that this workshop is open to undergraduate students, graduate students, post-docs and faculty – it is not limited to SOMAS Awardees in other words.

In 2008, the SOMAS Program (www.somasprogram.org) underwent an evolution. With the financial support of the Howard Hughes Medical Institute (HHMI) for the period between 2008 and 2012, the SOMAS-URM Program (Support of Mentors and their Students from Underrepresented Minority Groups in the Neurosciences) is focusing on promoting the recruitment and retention of underrepresented groups in the sciences by enhancing the mentoring abilities and research competitiveness of junior faculty from predominantly undergraduate institutions, as well as on enhancing the competitiveness of undergraduates for entry into graduate school. During this grant period, the HHMI is funding four \$8,000 awards per year. For those Awardees funded for the summer of 2009, Faculty for Undergraduate Neuroscience contributed an additional \$1,000 per award. Arguably our society has made progress in improving educational opportunities for members of underrepresented minorities and women (NSF Report, 2007). For example, whereas women comprised only 8% of all science and engineering doctorates in 1966, by 2004 they accounted for 44%. Unfortunately, when we examine the number of doctorates awarded in the life sciences an unsettling pattern unfolds for underrepresented minority groups. In 1997, the composition of the American population was 73% white, 12% black, 11% Hispanic, and less than 1% American Indian/Alaskan Native. That same year the number of doctorates in the life sciences awarded to these groups was: 84% white, 3% black, 3% Hispanic, and less than 1% American Indian/Alaskan Native (NSF Report, 2000). By 2005, the demographics of the American population changed such that American society is now 67% white, 13% black, 14% Hispanic, and 1% American Indian/Alaskan Native (retrieved from the U.S. Census Bureau at quickfacts.census.gov/qfd/states/00000.html). However, the number of life science doctorates awarded in 2006 indicates that the discrepancies are far from remedied. The number of doctorates in the life sciences awarded to these groups was: 81% white, 5% black, 4% Hispanic, and less than 1% American Indian/Alaskan Native (Hoffer et al., 2007; racial and ethnic terminology adopted from NSF Report, 2000). Within the

neurosciences, minority groups typically do not fare much better. According to a recent survey (2005) by the Association of Neuroscience Departments and Programs, racial and ethnic minorities (defined as African American, Hispanic-American, Native American, and Pacific Islander) constituted only 12% of the predoctoral trainee total who were also U. S. citizens (www.andp.org), a percentage far below their representation in the American population. Finally, examining the gender of faculty in American colleges and universities with doctoral degrees in science and engineering reveals that whereas 56% of male faculty have doctoral degrees, only 40% of female faculty members in science and engineering fields have the doctorate. The SOMAS-URM program is structured similarly to the original SOMAS Program, with the exception that the faculty member or the student must be a member of a URM group or a woman, or the hosting institution must be an institution characterized as a historically black college or university, an Hispanic serving institution, or a women's college, and there is now an emphasis in exploring approaches that may aid in the recruitment and retention of underrepresented groups in the neurosciences.

The SOMAS-URM Program addresses two important observations made in recent studies: 1) The Program provides a path for research experiences for underrepresented students working in collaboration with the faculty at their home institutions (Lopatto, 2004); 2) The Program aims to enhance the mentoring abilities of junior faculty, which has been reported to be the weakest aspect of the undergraduate research experience (Russell et al., 2007). The latter two recent large-scale surveys of undergraduate students and faculty (numbering over 15,000 respondents; Lopatto, 2004; Russell et al., 2007) have yielded particularly interesting findings relevant to the work described here. Engaging students in undergraduate research experiences increases their understanding, confidence, and awareness of conducting research. Of great significance, both sets of surveys revealed that research experiences serve as an affirmation of a scientific career and appear to sustain a scientific career trajectory. With respect to minority students, Lopatto observes that "The undergraduate research programs are providing a pathway to a scientific career for minority students, and the data indicate that most of these students intend to continue on this path" (Lopatto, 2004, p. 276). Interestingly, Russell et al. report that the *weakest* aspect of the undergraduate research experience reported by their respondents is in faculty mentoring; most of the suggestions for improving the undergraduate research experience centered on improving faculty guidance. Perhaps one of the more surprising findings that Russell et al. report is that neither mentor ethnicity nor gender were particularly strong factors influencing a student's expectation to seek a Ph.D. or to newly arouse a desire to pursue the Ph.D.; indeed, the mentor's enthusiasm combined with excellent interpersonal, management, and research skills were the most influential factors – precisely the factors that the SOMAS-URM Program targets to enhance.

The SOMAS and the SOMAS-URM Programs are

presently being evaluated as to their effectiveness in their preparation of faculty Awardees and their students. A cursory assessment of the first year of SOMAS Awardees is encouraging. In a two-year follow-up study, the first class of SOMAS Awardees reported publishing a total of 37 publications (though not all projects were directly supported by SOMAS) for an average of six papers per Awardee and at least two of the six papers on average had students as coauthors. Since completing the SOMAS program, all six Awardees have received funding to support their research. Three received separate funding from the National Institutes of Health totaling over \$500,000, two were awarded NSF grants of over \$600,000, and one received \$1.5 million from the National Institute on NIDA to support her research. Three of the SOMAS Awardees have received internal recognition from their university (e.g. Outstanding Young Investigator) and three have received tenure (a tenure decision had not been made for the other participants when these data were collected). The initial class of SOMAS participants has also assumed a number of leadership roles both within their university and nationally. Two SOMAS Awardees have assumed chair or director positions of their college or universities neuroscience program, a third Awardee was named to the executive council of the regional neuroscience organization, and another SOMAS participant, Dr. Chris Korey, is presently the President of Faculty for Undergraduate Neuroscience. The six students who were mentored by the first class of SOMAS faculty are all continuing to pursue a career in science. When the data were collected, three were enrolled in graduate studies in the sciences, two were engaged in the applications process for graduate school, and one was a research technician at a university.

The SOMAS-URM Program's goal is to strengthen the engagement of individuals from underrepresented groups in neuroscience. As reported in *Rising Above the Gathering Storm* (The National Academies, 2007), far too few members of underrepresented groups are participating in our knowledge economy. Our Nation has in essence squandered a precious human resource. It is incumbent upon our Nation to enhance the access of URM groups if we are to remain competitive scientifically and economically in the global marketplace – to say nothing of the fact that promoting their involvement is a morally correct goal to pursue (Crowley et al., 2004). It should be noted that the original iteration of the SOMAS Program, which supported 48 faculty and students from 2004 to 2008, had served 24 women (faculty: 9, students: 15) and 8 members of underrepresented minority groups (faculty: 5, students: 3). Although its emphasis is the promotion of retention and recruitment of members from underrepresented groups, the SOMAS-URM Program nonetheless invites members of the majority to participate in the Program. It is hoped that our efforts to engage the broadest swath of American citizens in our neuroscientific research efforts will ultimately yield a highly energized group of male and female scientists truly representative of America's cultural, ethnic, and racial texture to traverse the uncharted terrain in the nervous system. If scientific

exploration of the brain, the most complex object known to humanity, is to provide insights into the nature of our conscious experience and into the intricacies necessary to find cures for countless nervous system diseases, the exploration will require genius drawn from all quarters of the American landscape.

YEAR	SOMAS AWARDEE & INSTITUTION
2005	Dr. Ronald Bayline, Washington & Jefferson College, Washington, PA Dr. Katherine Cameron, Washington College, Chestertown, MD Dr. Christopher Korey, College of Charleston, Charleston, SC Dr. Laura O'Dell, University of Texas at El Paso, El Paso, TX Dr. Seth Ramus, Bowdoin College, Brunswick, ME Dr. Noah Sandstrom, Williams College, Williamstown, MA
2006	Dr. Michael Barresi, Smith College, Northampton, MA Dr. Anne Marie Brady, St. Mary's College of Maryland, St. Mary's City, MD Dr. Joshua Brumberg, Queens College, CUNY, Flushing, NY Dr. Kevin Crisp, St. Olaf College, Northfield, MN Dr. Maria Elena de Bellard, CA State University Northridge, Northridge, CA Dr. Mary Morrison, Lycoming College, Williamsport, PA
2007	Dr. Hadley Horch, Bowdoin College, Brunswick, ME Dr. Sarah Leupen, Ohio Wesleyan University, Delaware, OH Dr. Oné Pagan, West Chester University, West Chester, PA Dr. Maureen Peters, Oberlin College, Oberlin, OH Dr. Michael Smith, Western Kentucky University, Bowling Green, KY Dr. Kevin Wilson, Gettysburg College, Gettysburg, PA
2008	Dr. Joseph Burdo, Bridgewater State College, Bridgewater, MA Dr. Melissa Glenn, Colby College, Waterville, ME Dr. Karl Johnson, Pomona College, Claremont, CA Dr. Gary Muir, St. Olaf College, Northfield, MN Dr. Onarae Rice, Furman University, Greenville, SC Dr. Jeffrey Smith, The University of Portland, Portland, OR

Table 1. List of SOMAS Awardees.

REFERENCES

- Crowley S, Fuller D, Law W, McKeon D, Ramirez JJ, Trujillo KA, Widerman E (2004) Improving the climate in research and scientific training environments for members of underrepresented minorities. *Neuroscientist* 10:26-30.
- Hoffer TB, Hess M, Welch V Jr., et al. (2007) Doctorate recipients from United States universities: summary report 2006. Chicago: National Opinion Research Center.
- Lopatto D (2004) Survey of Undergraduate Research Experiences (SURE): first findings. *Cell Biol Educ* 3:270-277.
- National Science Board (2003) The science and engineering workforce: realizing America's potential. [NSB 03-69] Arlington, VA: National Science Foundation.
- National Science Foundation (2000) Women, minorities, and persons with disabilities in science and engineering, 2000. [Report No. NSF 00-327] Arlington, VA: National Science

Foundation.

National Science Foundation (2007) Women, minorities, and persons with disabilities in science and engineering: 2007. [Report No. NSF 07-315] Arlington, VA: National Science Foundation.

Russell SH, Hancock MP, McCullough J (2007) The pipeline. Benefits of undergraduate research experiences. *Science* 316:548-549.

The National Academies, Committee on Prospering in the Global Economy of the 21st century: An Agenda for American Science and Technology; Committee on Science, Engineering, and Public Policy (2007) Rising above the gathering storm: energizing and employing America for a brighter economic future. Washington, DC: The National Academies Press.

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