

DRAFT

“Keeping our Best and our Brightest in the Sciences”

The first step of a proposed training program sponsored by the State of South Carolina, South Carolina Alliance of Graduate and Professional Programs and the South Carolina Commission of Higher Education.

Background and Rationale:

The economic impact of graduate students in a knowledge-based economy.

One of the fundamental underpinnings of a knowledge-based economy is discovery of new information also known as intellectual property. Through research and graduate education we can achieve a vibrant and ever expanding economy. The state of South Carolina has recognized the need to develop a knowledge-based economy and has made a variety of investments including endowed chairs for centers of economic excellence, Life and Palmetto Scholarships for high achieving college students, but has yet to formulate any program that is targeted toward graduate students. This is problematic, as other states are moving aggressively to do so. Our CoEE chairs are distributed amongst the three research universities and are rapidly becoming part of the driving force behind the knowledge-based economy for this state. The holders of these endowed chairs have the responsibility to not only continue to conduct the highest quality research but also to train the next generation of scientific leaders. After all, the individuals who hold one of these endowed chairs have been chosen because of their outstanding research careers. Along with our other endowed chair recipients and outstanding faculty, we would expect them to provide a very fertile and exciting research training ground for graduate students. Therefore, we must provide them with the fiscal package that will allow them to have graduate students training in their laboratories. It is the graduate students who will not only conduct the research but will also be the future scientific leaders in research. They may become the next generation of scientific leaders for the research enterprise for the state of South Carolina.

The state of Virginia is a national leader in educational innovation and in a recent report entitled “The Spark for Virginia’s Knowledge-Based Economic Engine” listed the following 10 roles graduate education plays in their economic and social prosperity.

1. Research breakthroughs that spawn new industries
2. Production of faculty
3. Workforce training
4. Infusions of money into the market
5. Larger tax revenues
6. New and existing business development
7. Strategic growth of Virginia’s population
8. Alleviation of “brain drain”
9. Solutions to social problems and
10. A rich cultural life.

Thus, this program has the same potential as that outlined in the report by the state of Virginia. Indeed, this has an even higher likelihood of achieving these opportunities since we are targeting the program to the best and brightest students in our state.

Undergraduate candidates: Undergraduate students at the State's four year colleges would be eligible for the program. The potential students for this program would be identified by their faculty during their first year of college. They would be tracked from that point forward.

The students who are ideally suited to be chosen for this program are those who have been identified while still in high school and who are not only the brightest but also those who have identified themselves as having as their career goal a PhD degree in those areas wherein there is the potential for contributing to the knowledge-based economy. Ideally these would be students who are candidates for Life or Palmetto scholarships.

It has been our experience that some of the best and brightest undergraduate degree recipients are being attracted away from our Colleges to attend graduate institutions in other states. Clearly, there are many factors that are responsible for their choosing undergraduate and graduate schools in other states. However, we must find creative and competitive recruitment and training programs that will make our Colleges more attractive to our State's best and brightest undergraduate science majors.

One approach would be to develop a training program that is unique, comprehensive, high quality, and can save the students a year of time from the date that they enter undergraduate school to the time that they receive a PhD.

Plan: Phase 1. Those students identified as being ideal candidates for the program who are attending one of the State's undergraduate colleges or universities would be invited to participate in a summer undergraduate research experience for each of the summers between their sophomore and junior and junior and senior years at one of the 3 research universities or other universities within the state that participate in the program. This component of the program would allow us to track the students early on and identify the best students among those that one would consider to be some of the best in the state.

Phase 2. Students accepted into this program would enter the College of Graduate Studies in their senior year of college rather than attending their undergraduate institution. They would enroll in the College of Graduate Studies' first year curriculum. Upon successful completion of this curriculum, they would receive credit for their first year of graduate school in lieu of their senior courses at their undergraduate institution and graduate with their class. Thus, this program would reduce by one year the amount of time required for a student to obtain an advanced degree based on the time of entering undergraduate school compared to the classic pathway.

Clemson University: Clemson has 140 graduate programs including 40 doctoral programs that enroll nearly 4000 graduate students. Applications for graduate school have increased to record levels every term during the past five years; doctoral degrees awarded have nearly doubled; and the Clemson university graduate school is ranked #1 in Google within all of .edu for the search term 'graduate school.' Programs from Architecture through Automotive Engineering, Chemistry, Environmental Toxicology, Entomology, all engineering disciplines, Family and Community Studies, Genetics and Biochemistry, Parks and Recreation, Physics, and Education (to name a few) possess high and growing national reputations. The department of Bioengineering at Clemson was the first bioengineering program in the nation, and that tradition of innovation sees Clemson now proposing one of the nation's first PhD programs in Photonics. Clemson has a high and growing reputation as measured by virtually all national ranking methodologies. Clemson's faculty hold over \$140M in competitively obtained research awards from multiple agencies, a level which does not yet include a recently announced award of \$98M for wind energy research, or \$10M for bioengineering. The university typically has a dozen Fulbright Fellows in residence, and is becoming well known as one of our nation's preeminent student-centered research universities. Faculty reputation and scholarship as measured by publication and citation are doubling

every five years. Our primary challenge within the ultra-competitive national competition for the best and the brightest graduate students does not revolve around the excellence of our faculty and programs, but rather now, the ability to offer competitive assistantship and fellowship support-- as do our competitors around the nation and world—specifically for the best and the brightest undergraduate degree recipients who are residents of South Carolina.

Medical University of South Carolina: The Medical University of South Carolina has developed very strong PhD, MD/PhD and DMD/PhD training programs. The quality of the applicants to the College and its matriculants has increased significantly during this time. The high quality of the training programs has been acknowledged by multiple highly competitive extramural funding agencies (eg. National Heart, Lung and Blood Institute, National Institute of General Medical Sciences, National Institute of Dental and Craniofacial Research, National Institute of Diabetes, Digestive and Kidney Diseases, Department of Education, National Cancer Institute, American Heart Association and the National Science Foundation) and external advisors. The number of extramurally, competitive training programs in the College has increased from one in 2000 to a total of 15 training grants that fund ~60 pre-doctoral students in addition to approximately a dozen individual extramural competitive fellowships and scholarships. Our students are nationally competitive for NIH National Research Service Award fellowships with an ~80% success rate compared to the national average of ~30%. The research enterprise continues to grow with \$217 million in research grants, In the last year the University was awarded a ~\$20 million NIH Clinical and Translational Sciences Award, a ~\$20 million NSF grant for regenerative medicine and the Hollings Cancer Center received NCI designation. However, in spite of these significant accomplishments, the College has not significantly increased the number of applicants and matriculants from South Carolina.

University of South Carolina: Over 6,000 graduate students are enrolled in degree programs at the University of South Carolina, with 32% of those in 67 doctoral programs ranging from STEM disciplines (science, technology, engineering, and math) to education, health sciences, social sciences, humanities and arts, business, and mass communication. A recent USC study on the graduate student experience emphasized that recruiting the most qualified graduate students requires nationally competitive assistantship and fellowship support. The university maintains a strong commitment to undergraduate research extending from the scholarly inquiry focus of the South Carolina Honors College more broadly to the Magellan Scholars program featuring faculty mentoring and research fellowships open to all undergraduates. The Combined Bachelor's/Masters Accelerated Plan already provides facilitated transition to graduate degree programs for qualified USC undergraduates by applying credits earned in senior year courses to both degrees; this proposal would significantly extend this plan to students at other SC colleges and universities. The areas of research emphasis at the University of South Carolina most relevant to this proposal include Environmental Research, Future Fuels, Information and Knowledge Technologies, Nanotechnology, and Biomedical Research. USC faculty generated \$206 million in funding for research, outreach, and training programs in fiscal year 2008. Recently designated by the Carnegie Foundation with their highest classification of 'very high research activity,' the University of South Carolina, as exemplified by its Innovista urban research campus initiative to integrate public and private research and business, is committed to expanding knowledge-based economic enterprise within the state.

Application process:

Graduate School: During each of their summers, the students would be expected to pursue undergraduate research experiences at one of the three research intensive universities, or other participating colleges and universities in South Carolina. During their junior year of school, they would apply officially to the program. The application packet should include; 1) three letters of recommendation from faculty and individuals that are familiar with their research potential, 2) STEM discipline GPA of 3.5 or greater, 3) GRE score and 4) a personal statement addressing their career plans (College of Graduate Studies application packet). The applicants would be initially screened by the student’s undergraduate home institution. Those who pass the first stage would then be invited for a formal interview and evaluation by the College of their choice admissions committee. Those students who are accepted into the program will be designated “South Carolina Student Research Scholars.”

Advantages to the State: This program has the potential to enhance enrollment of the best and brightest high school students into our State colleges and universities since this unique program would probably not be available to them in other states. For example, this program might be extremely attractive to students in the Governor’s School for Math and Science. This unique program would also enhance the enrollment of the best and brightest undergraduate majors in one of the three participating Universities’ Colleges of Graduate Studies. It is well established that graduate students play an important role in research and generation of intellectual property. Thus, the State has the opportunity to benefit from some of our best minds to contribute to our State’s knowledge-based economic development.

Cost of the program: Students in this program would be entitled to all the rights and privileges of a graduate student at the respective university. They would receive a stipend of \$30,000 per year, paid health insurance and tuition upon matriculation into the College of Graduate Studies. The students would still be responsible for payment of tuition at their undergraduate institution.

Budget

Category/year	01	02	03	04	05
Summer undergrad Program Stipends	\$90,000	\$180,000	\$180,000	\$180,000	\$180,000
Summer research Supplies	\$15,000	\$30,000	\$30,000	\$30,000	\$30,000
Graduate students stipends	\$900,000	\$1,800,000	\$2,700,000	\$3,600,000	\$3,600,000
Supplies	\$60,000	\$120,000	\$180,000	\$240,000	\$240,000
Travel	\$30,000	\$60,000	\$90,000	\$120,000	\$120,000
Annual research Symposium	<u>\$10,000</u>	<u>\$10,000</u>	<u>\$10,000</u>	<u>\$10,000</u>	<u>\$10,000</u>
Totals	\$1,105,000	\$2,200,000	\$3,190,000	\$4,180,000	\$4,180,000*

* The recurring cost for the continuation of the program.

Budget justification

Summer undergraduate students: It is projected that there would be 30 students participating in the program for each summer. In the second year of the program and beyond, there would be steady state of 60 students in the program during the summer. The stipend for these students for the summer is \$3,000 X 30 students. The cost of supplies for the summer is \$500 X30 in the first year. This will increase to 60 students in the second year and then be at steady state.

Graduate students: Graduate student stipends will be \$30,000 which is the current NSF rate. We project 30 new students will enter the program per year and receive funding for up to four years. Steady state will be reached in 4 years so that funding for year 5 and beyond is the same as for year 4. The participating universities will participate in a 4 to 1 match. Such that for each 4 students funded by the program, the university will pay for an additional student in the program.

Graduate student supplies: Each student will have an additional \$2,000 annual supply budget that can be used at the discretion of the student and mentor

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Graduate student travel: Each student will be provided with \$1,000 annually for travel to a national meeting.

Annual research symposium: All students, both undergraduate and graduate will gather each year for a symposium where they will present their research in either an oral or poster presentation. There will also be a keynote speaker who is either a distinguished national scientist or later on a graduate of the program who has his/her first post training position. In addition to the students' presentations, it is expected that there would be scientific presentations by COEE chairs and other endowed chair holders and distinguished faculty. These individuals serve as outstanding role models for the students. As a part of the research symposium, there will also be a careers workshop, highlighting professional opportunities for the students in the state's universities, colleges and industries. **Startup packages for alumni:** In order to ultimately retain the best and the brightest that participate in this program we must have the fiscal packages to recruit and hire them to our research institutions. Thus, eventually funds will need to be set aside to be used as part of the startup package for graduates of this program.

Source of funds for this program: At least 3 different sources of funds will be sought for this program. In the initial phase, funding from the South Carolina lottery will be sought. This should provide a significant upfront amount of funding to not only get the program started but also sustained on a yearly basis. This is also an excellent compliment for the COEE chair program. In addition funding will be sought from both philanthropic foundations and individual donors. Each participating university will also set aside funds for this program, based on the number of students enrolled in their programs.

Key features of the Best & the Brightest program

Candidates:

Targeted to the most promising SC STEM majors.
Identify the students while still in high school or early in college.

Attractions for students:

- Reduces by one year the time to get a PhD degree from the time the student enters college to the time the degree is awarded.
- Students spend their senior year at one of the PhD degree granting universities. Get credit for some of the graduate courses towards requirements for undergraduate degree.
- Receive a graduate student stipend, paid tuition and health insurance but pay tuition back to home institution.
- Students spend their summers conducting research at any of the participating institutions.
- Become part of a large camaraderie of students with similar interests.

Attractions for participating undergraduate institutions:

- Recruitment strategy for attracting outstanding STEM students.

Ultimate goals:

Graduates contribute to the knowledge based economy via research and discovery.
Graduates become the next generation of faculty.

Highlights of the Best and Brightest Program

- The economic growth of the State can be significantly increased via a knowledge based economy.
- Knowledge based economies rely on the generation of intellectual property that is patented, licensed and led to new companies.
- Intellectual property is generated via cutting edge research.
- Graduate students and faculty via their research make discoveries and intellectual property which lead to patents, licenses and new companies.
- To achieve the goal of increasing the knowledge based economy, we need to retain our best and brightest students.
- The best and brightest undergraduate students provide an outstanding pool of potential graduate students who will by their very nature conduct cutting edge research.
- The State has made a significant investment in the Life and Palmetto Scholarship programs. We do not want to lose these students to other states for their graduate education.
- The State has made a major investment in COEE chairs, who are outstanding scientists, charged with conducting cutting edge research and training the next generation of scientists.
- Unfortunately, many of our best and brightest students are attracted to conduct their graduate education in other states.
- The Best & Brightest program has the potential to attract and retain these students by:

Shortening the time to get a PhD by at least one year from the time of entry into college or university without compromising the rigor of the training.

Should contribute to attracting the State's best science oriented high school students (eg. GSSM) to attend our colleges and universities.

Students are indentified early in their college career, conduct research during the summers sponsored by this program in the State's participating colleges and universities.

Students officially enter the program at the beginning of their senior year by co-matriculating to graduate school at one of the State's 3 research intensive universities in addition to their undergraduate college or university.

They get credit for the first year of graduate school which counts towards senior year college requirements. They obtain their college degree with their class.

They also get all the perquisites that come with being a graduate student (stipend, paid tuition and health insurance).

Offer a highly competitive stipend.

Ultimately set aside money for startup packages to attract them onto the faculties of our colleges and universities.

- Funding for the program to come from the State, philanthropic foundations, donors and participating universities.

Commentary

'Best and Brightest' a vital investment in state's future

BY PERRY HALUSHKA

In the mid-1990s, two young men decided to enroll in Stanford University's doctoral program in computer science. Shortly thereafter they founded Google, creating a huge new business not far from Stanford's campus.

The success of Sergei Brin and Larry Page was no accident, because the pieces were all there:

- 1) They were extremely talented undergraduate students.
- 2) They chose a top-rated doctoral program.
- 3) And they were in an environment where entrepreneurship was considered to be a natural partner to scholarship.

South Carolinians know that one of the most powerful investments we can make is in the future of our best and brightest young people. We already do that at the undergraduate level with our Palmetto, Hope and Life scholarships. We also are building a great infrastructure of research excellence

with our Centers of Economic Excellence endowed chairs program. South Carolina should now take the next and final step, by making sure our investment in the best and brightest undergraduate students is translated into retaining them in South Carolina as graduate students who will remain in the state once they receive their graduate degree.

It is the intellectual capital of these graduates that will drive new and important discoveries and economic development via creating intellectual property that leads to patents, licenses and then new products that in turn generate new jobs and income.

The discoveries made by faculty and graduate students provide the opportunity to create intellectual property which comes at a significant time for Charleston with the opening of the S.C. Research Authority MUSC Innovation Center that will house start-up biotech companies, the arrival of Boeing and the announcement of Clemson's new wind turbine initiative.

Students in both our undergraduate and graduate institutions represent one of South Carolina's most important investments. Those in graduate school working toward doctorates have the potential to become our next

generation of research scientists.

By working with professors on cutting-edge research projects, graduate students also make the state more competitive for federal and industrial research funding — an enterprise that by itself supports a large number of high-value, high-wage jobs. But graduate students do more than work in labs; they serve as a conduit to bring new knowledge and ideas into the mainstream economy.

Our state is fortunate to have major research universities with active research and graduate training programs as well as strong comprehensive colleges and universities with outstanding faculty. The state has a major investment in Centers of Economic Excellence, which have helped bring outstanding scientists to our three research universities. These world-renowned scientists have track records of training students who themselves have gone on to make major discoveries. Faculty at all our state's colleges and universities are ideally poised to train the best and brightest students from South Carolina.

But if we do not provide incentives to keep these students in the state, other states will. Our plan, the Best and the Brightest, would identify those very

bright students early in college and place them in a unique program that will incentivize them to stay in South Carolina to receive their graduate education and become the next generation of faculty and research scientists.

These undergraduate students would spend their summers working in the research laboratories of our state colleges and universities. As college seniors, they would work with a faculty advisor from a graduate program at one of our three research universities, and perhaps take selected graduate-level courses while still at their undergraduate institutions. When they graduate from undergraduate school, they already may have finished one year of graduate school during the summers, which would reduce the time it takes to obtain a doctorate by a year.

This program would be available only to those students who are judged by their faculty as truly outstanding and likely to stay in South Carolina for faculty, corporate or government positions.

A second program that would help the state achieve greater economic impact is the Innovations Scholars Program. This program could provide enhanced stipends (beyond the current

level) to truly exceptional graduates who state their intention to seek employment in the state after receiving a graduate degree from a participating S.C. institution.

Many institutions in neighboring states have the interest as well as the capability to recruit our best and brightest graduate students — students whose undergraduate educations have been provided courtesy of the S.C. taxpayer. We need to complement the investments we are making via the Palmetto and Life scholarships to keep this from happening. At this time of economic crisis, let us take advantage of the opportunity to develop new support programs for graduate students who will enhance the economic development of our state.

Dr. Perry Halushka is the dean of the College of Graduate Studies at the Medical University of South Carolina. He wrote this column in collaboration with **J. Bruce Raifort**, chairman of the S.C. Graduate Professional Alliance and vice provost and dean of the graduate school at Clemson University; **Gail Morrison**, deputy director of the S.C. Commission on Higher Education, and **Garrison Walters**, the commission's executive director.



Halushka

DRAFT

January 24, 2010

Meeting with Senator Leatherman

Drs. Morrison, Zimmerman and Halushka met with Senator Leatherman and Craig H. Parks, MPA, Senior Research Analyst, Senator Leatherman's assistant, on January 21, 2010 for approximately 15 minutes. The senator appeared to be very interested in the proposal for the Best and the Brightest program. He asked several questions pertaining to the plan. They can best be summarized as the following;

1. How will this plan affect all the colleges and universities in South Carolina and particularly in the more rural areas?
2. Will consideration be given to disadvantaged and first time college students?
3. Has the plan been approved by all the college and university presidents?
4. Has the CHE approved the plan?
5. What are the guidelines for participants in the program?

He asked about the cost of the plan and we presented the budget to him. We pointed out to him that eventually money would have to be set aside for the recruitment of the graduates of this program to obtain faculty positions. No dollar amount was given for that. It should be noted that right at the beginning of our meeting the Senator stated that he has no money for the program. We expected that he would say something like that.

After our meeting was over, we had brief hallway conversation with Mr. Parks who thought that we did very well. However, I would have expected him to be complimentary, so I do not know how much to place on his comment. He did, however, share with us the lottery fund projections and pointed out that it is over-committed.

The action plan for moving the program forward consists of the following:

1. Get buy in from all the college and university presidents.
2. Develop guidelines for the program.
3. Get CHE approval.