

## AACP REPORTS

### **The Path Forward: The Future of Graduate Education in the Pharmaceutical Sciences: The Report of the 2010-2011 Research and Graduate Affairs Committee**

Robert W. Brueggemeier, PhD, Chair,<sup>a</sup> Alice M. Clark, PhD,<sup>b</sup> Sudip K. Das, PhD,<sup>c</sup> David S. Forbes, PhD,<sup>d</sup> Richard D. Leff, PharmD,<sup>e</sup> Sven Oie, PhD,<sup>f</sup> Bernard A. Sorofman, PhD,<sup>g</sup> Dennis F. Thompson, PharmD,<sup>h</sup> Lucinda L. Maine, PhD,<sup>i</sup> and Rosalie Sagraves, PharmD<sup>i</sup>

<sup>a</sup>Ohio State University

<sup>b</sup>University of Mississippi

<sup>c</sup>Butler University

<sup>d</sup>University of Montana

<sup>e</sup>Texas Tech University Health Sciences Center

<sup>f</sup>University of Georgia

<sup>g</sup>University of Iowa

<sup>h</sup>Southwestern Oklahoma State University

<sup>i</sup>American Association of Colleges of Pharmacy

According to the Bylaws of the American Association of Colleges of Pharmacy (AACP), the Research and Graduate Affairs Committee (RGAC) shall provide assistance to the Association in developing its research, graduate education, and scholarship agenda. This assistance may include facilitating colleges and schools in formulating and advancing legislative and regulatory initiatives, and nurturing collaborative activities with organizations sharing an interest in issues related to the pharmaceutical sciences.

President Rod Carter presented the following charge for the 2010-11 RGAC: Utilizing the report titled “The Path Forward: The Future of Graduate Education in the U.S.”<sup>1</sup> from the Commission on the Future of Graduate Education, critically examine the current status of graduate programs in colleges and schools of pharmacy across the spectrum of pharmaceutical sciences and recommend actions by AACP and/or its member colleges and schools that would allow pharmacy graduate programs to flourish in this envisioned future. President Carter further recommended that the Committee consider key past reports, including those of former Research and Graduate Affairs Committees, AACP task forces and council reports.

The Committee met in person in Crystal City, Virginia, in October 2010 and communicated subsequently by conference calls and other electronic communication. During the October meeting the committee was fortunate to have Patricia McAllister, Vice President of Government Relations and External Affairs from the Council of Graduate Schools (CGS) and staff for the “Path Forward” report, meet with the Committee to summarize the issues and recommendations contained in this April 2010 analysis of graduate education. The Committee also considered the recently

released report from the National Research Council which offers a data-based assessment of doctoral programs in 62 fields in the United States.<sup>2</sup>

#### **BACKGROUND: THE PATH FORWARD**

“The Path Forward” report focused on graduate education as defined by master’s and doctoral programs and did not examine first-professional degrees, including the Pharm.D. degree. It was a joint effort of the Educational-Testing Service and the Council of Graduate Schools aimed at examining critical issues associated with the structure and well-being of graduate education in the U.S. It was undertaken at a point of great controversy regarding U.S. competitiveness on a global economic stage and the role of education at all levels in assuring the country’s continuing competitive position. A fundamental premise of the report is that U.S. competitiveness “hinges on our ability to produce sufficient numbers of graduate-degree holders – people with the advanced knowledge and critical-thinking abilities to devise solutions to grand challenges such as energy independence, affordable health care, climate change and others.”

Graduate education in the United States gained world class status during the 20<sup>th</sup> century, attracting the most talented students from across the globe. Our programs are among those top ranked by several ranking systems and it is notable that from 1997 to 2009 more than half the Nobel Prize winners in chemistry, physics, medicine and economics received their graduate degrees in the U.S. Graduates of master’s and doctoral programs enjoy higher rates of employment and higher lifetime earnings than individuals with lower levels of education.

According to the report there are key points of vulnerability to the dominant U.S. position in graduate education, including:

1. Competition from graduate education in other countries as governments in both developed and emerging economies work to strengthen their programs thereby attracting students who might otherwise have sought graduate degrees from U.S. programs;
2. Demographic trends in the U.S. indicate the greatest future growth in the population among those racial and ethnic groups who have historically been the least likely to pursue graduate education;
3. Attrition rates and time to completion in U.S. doctoral programs, coupled with the increased cost burden and declining support for graduate education from public and private sources; and
4. An uncertain postgraduate job market with full-time faculty positions disappearing and new skill sets becoming important to prospective employers in nonacademic positions.

Recommendations are articulated for three audiences – universities, corporations and policymakers. These will be summarized briefly as they are germane to the discussion of the way forward for graduate programs in the pharmaceutical sciences.

#### **Recommendations for Universities**

- Improve degree completion rates – the Council of Graduate Schools is poised to release the work of the Ph.D. Completion Project which is critically examining issues associated with attrition and completion of doctoral programs. Individual programs and institutions should analyze their own completion rates and work to address the causes of attrition in both doctoral and master's programs; recently released National Research Council findings should inform these analyses;
- Clarify career pathways for graduate students – graduate programs should provide guidance for students on the diverse careers available to those with graduate education, including academia, business, government and nonprofit sectors. In addition, there are essential skills (such as those emphasized in emerging professional science master's degree programs) which should be incorporated into contemporary master's and doctoral degree granting programs to equip graduates with a competitive skill-base for postgraduate employment;
- Prepare future faculty – with the aging of the professoriate and national goals for increasing the pro-

portion of the U.S. population with college degrees by 2020, an emphasis must be placed on the preparation of individuals in graduate programs to become the next generation of outstanding faculty. CGS continues to emphasize the importance of its Preparing Future Faculty model launched in 1993 which reached 45 doctoral degree-granting institutions and almost 300 “partner” institutions across the U.S.;

- Emphasize key professional development issues in graduates – as noted above, there are key skills often noted lacking in graduates of doctoral programs which are essential for 21<sup>st</sup> century competitiveness: creativity and entrepreneurship, self-organization, project management skills, professional/research ethics, and teamwork, communications, and insights into how one's work relates to the broader context or social purposes;
- Enhance the pipeline – learn from existing successful programs (e.g., Meyerhoff Scholars Program, McNair Post-baccalaureate Achievement Program) and link K-12, undergraduate and graduate programs to create clear pathways for students from all demographic groups to pursue advanced education and training.

#### **Recommendations for Employers**

- Provide financial support for graduate education – endowing graduate school chairs, creating “life-long learning accounts” and tuition reimbursement programs, targeted programs supporting under-represented minorities, and industry-sponsored graduate fellowship programs;
- Collaborate with universities to clarify entry points into careers – clarifying the educational skills needed for 21<sup>st</sup> century jobs so that educators can help students make informed judgments and plans about their educational pathways;
- Offer internships and work study opportunities for graduate students.

#### **Recommendations for Policymakers**

- Enact new federal support for doctoral education – the America COMPETES Act passed the House of Representatives but languished in the Senate during the 111<sup>th</sup> Congress. The legislation contained important provisions to cover direct student support of tuition, fees and others costs of graduate education; [America COMPETES Act reauthorization was passed by both House and Senate and was signed by President Obama on January 4, 2011];

- Create/fund innovative master's degree programs – in keeping with the recommendations for the professional science master's degree with skills focused on innovation, teamwork and competitiveness, funding should be created to stimulate the design/redesign of master's programs at 4-year institutions;
- Continue support in key areas – federal graduate training/fellowship programs, loan forgiveness programs for graduate students in priority fields, amend tax policies for graduate fellowships and scholarships, and align federal and state research and graduate grant programs;
- Address international student issues – improve the visa process to continue attracting outstanding graduate students from outside the U.S. and retaining doctorates in science, technology, engineering and math (STEM) fields, create incentives for global collaborations with universities abroad, and encourage more U.S. graduate students to engage in international experiences, such as the Fulbright or study abroad programs.

The Committee discussed the most obvious implications in “The Path Forward” report for pharmacy graduate programs. The percentage of graduate students with U.S. pharmacy degrees has declined sharply in the past decade and many programs find their master's and doctoral programs populated by a majority of international students. The availability of funding for graduate programs is in jeopardy, especially in the face of state budget deficits and sharp declines in funding for higher education. Career pathways for graduates are also changing with employment prospects at the research intensive pharmaceutical companies declining in the face of major personnel reductions and shifts in the approach to the research enterprise by the shrinking number of corporations struggling to remain competitive.

## **NATIONAL RESEARCH COUNCIL AND OTHER ASSESSMENTS OF US RESEARCH DOCTORATE PROGRAMS**

### **National Research Council Assessment**

The National Research Council (NRC) conducted an assessment of U.S. research doctorate programs beginning in 2006. The NRC collected data from university graduate schools and surveying graduate faculty during the 2006-07 academic year. The analysis phase required additional extended studies, and the report from the NRC was finally released in October 2010. The report describes the assessment approach utilized and the general findings about U.S. doctoral education, with Excel

spreadsheets of the data and illustrative rankings available. The report and related materials are available at <http://www.nap.edu/rdp>. Additional resources for exploring the NRC data are available at the Chronicle of Higher Education Web site, <http://chronicle.com/nrc>, and an independent Web site, <http://graduate-school.Ph.D.s.org>.

The assessment methodology analyzed 20 characteristics related to program and faculty data. Program characteristics included student demographics, student support, Ph.D.s produced by the program, time to degree, percent completion rate, diversity of the academic environment, and student support activities. Faculty characteristics including items such as faculty demographics, publications per faculty, percentage of faculty with grants, and faculty activities. Two approaches were utilized to analyze the data, with different weights given to program and faculty characteristics. The S-rankings placed the greatest weight on faculty-related characteristics, while the R-rankings placed the greatest weight on program-related characteristics. The rankings were reported in broad ranges rather than as single numbers, reflecting uncertainties inherent in any effort to rank programs by quality.

The graduate programs in pharmacy such as pharmaceutical sciences, medicinal chemistry, pharmaceuticals, and pharmacology were included in the larger specialization category of “Pharmacology, Toxicology, and Environmental Health.” Pharmacy faculty were included in the NRC Faculty Surveys, and pharmacy graduate programs were included in the data collection by their universities. Although the NRC assessment does not provide a single ranking number for each program, the data and assessment tools enable faculty, current and prospective students, and administrators to examine program and faculty characteristics of importance to each. One weakness of the NRC assessment is that the data, gathered in 2006-07, may no longer be relevant due to changes in department faculty, student support services, and financial support over recent years.

Approximately 30 doctoral programs from colleges/schools of pharmacy participated in the NRC assessment. A total of 116 doctoral programs were included in the specialization category of “Pharmacology, Toxicology, and Environmental Health,” with the majority being pharmacology programs in colleges of medicine and toxicology/environmental health programs in schools of public health. Examination of both the S-rankings and R-rankings find that the doctoral programs in colleges of pharmacy were distributed evenly throughout the upper to lower quartiles as indicated by the arrows in Appendices 1 and 2.

### **Additional Information on Evaluation of Graduate Programs at Colleges/Schools of Pharmacy**

Given that explicit information about the quality of current graduate programs in colleges and schools of pharmacy is somewhat dated and difficult to derive from the NRC assessment, the RGAC embarked upon a query to AACP member institutions to provide additional insights into the evaluation of their programs. A 5-question inquiry was sent to those identified as individuals with administrative responsibility for research and/or graduate education at U.S. colleges and schools of pharmacy. The questions sought information on whether and how frequently graduate program reviews were undertaken, whether the reviews were conducted for all programs on campus and whether the review was conducted by a state authority (e.g., higher education office) or by the college/school independently of the university or other authority.

The responses provide insights into the nature and frequency of graduate program reviews though they could not be generalized to characterize all graduate programs given the nature of the query and limited number of responses. Of the 15 programs responding, all indicated that their master's and doctoral programs were reviewed on a frequency ranging from four to 10 years with a median frequency of every five to seven years. Twelve of the 15 reporting program reviews were part of a campus-wide review process and none were conducted by state authorities. In three of 15 cases the school conducted its own reviews independent of the university.

Respondents were also asked to briefly describe the nature of the review process and/or send supportive materials describing the process. In general, programs engage in a self-study process and the reviews are conducted by external reviewers or by a combination of internal and external reviewers. A combination of qualitative and quantitative metrics appear to be used though generalization based on the information provided is difficult.

Two members of the RGAC were administrators at universities that evaluated their doctoral programs, including The Ohio State University (2008-09) and The University of Iowa (2009-10). Since the doctoral program characteristics were gathered in the 2006-07 academic year for the NRC, this data provided the baseline and was supplemented by university-specific measures (such as graduate placement data and publications per student). External and internal faculty review teams evaluated the data and reports from the programs as part of the assessment processes. At both Iowa and Ohio State, the doctoral programs in pharmacy and pharmaceutical sciences were rated among the highest quality on the measures used by their respective universities.

### **RELEVANT FINDINGS IN PREVIOUS RESEARCH AND GRADUATE AFFAIRS REPORTS**

Given that the AACP Bylaws specify that the Research and Graduate Affairs Committee is one of the Association's standing committees charged annually by the incoming president to study key issues, it is not surprising that several recent committee reports examine issues included in both "The Path Forward" and NRC reports. Members of the 2010-11 RGAC agreed to examine these reports and study their recommendations to determine where progress has been made and what priorities remain for AACP with a goal of ensuring that graduate education across all disciplines remains world class and on point with the needs of society.

### **Commission on the Future of Graduate Education in the Pharmaceutical Sciences (1999)<sup>3</sup>**

The most comprehensive review of graduate education in the pharmaceutical sciences was initiated by AACP Past-President Charles O. Rutledge in 1996. Dr. Rutledge charged the Commission to examine qualitative and quantitative issues in graduate education and make recommendations for the future. In general the Commission felt there was a bright future for graduates of pharmaceutical sciences programs given the robust nature of the pharmaceutical and related biotechnology industries. In addition, the dawning of the genetic era, the rise in research on the molecular basis of disease and the increasingly interdisciplinary nature of research bodes well for our graduate programs. The Commission recommended that pharmaceutical science programs at once become more competitive (e.g., better funded, more outstanding faculty and facilities) and more collaborative with other relevant academic disciplines within their universities. Certainly the current trends toward interdisciplinary research teams and centers of excellence in basic and translational science bear out these recommendations. An increase in clinical science graduate programs was also recommended.

In keeping with "The Path Forward" recommendations, the 1999 Commission Report further recommended enhanced recruitment efforts for U.S. students from both pharmacy and non-pharmacy majors and that those skills identified as essential to career success (ethics, communications, teamwork, teaching) be emphasized by pharmaceutical sciences graduate programs. Finally, AACP was encouraged to enhance its annual collection of relevant indicators of graduate program vitality to enhance the ability of graduate programs to benchmark their quality against peers.

### **Doctoral Education: Another Tragedy of the Commons? (2002)<sup>4</sup>**

A statement concerning graduate education by David J. Triggler and Kenneth W. Miller was published in the *American Journal of Pharmaceutical Education* in 2002. The article provided pharmacy faculty and administrators a perspective for evaluating their own graduate programs. The authors believed that increased National Institutes of Health (NIH) funding and a need for personnel by academic research enterprises helped increase graduate student numbers in the biological sciences rather than an increase based on employment demands or an educational need. This situation they called *The Tragedy of the Commons*, which is defined as when a common resource that is available for use in the public domain by all is over exploited because there is an individual benefit, albeit to the ultimate detriment of both the common pool resource and its users.<sup>5-7</sup> The end result was an excess of biomedical science Ph.D. graduates, which could result in graduates ending up in increasingly prolonged postdoctoral positions. A large supply of talented foreign/international students helped negate the role of market factors in moderating the demand for graduate education. Many of these students ended up in postdoctoral positions because U.S. universities were stretching their resources by offering lower salaries than what might be otherwise possible. This exacerbated the trend of fewer U.S. students selecting graduate education, and of those who did, many were poorly prepared for the rigors of a science-based career.

The authors offered examples of how colleges/schools of pharmacy could solve some of their problems. Solutions included having an appropriately sized graduate program, looking for duplication, increasing stipends, shortening the time to degree completion, developing better mentoring systems, offering teaching experiences for graduate students, and offering dual degree programs such as the Pharm.D./Ph.D.

It has been noted by some members of the 2010-11 Research and Graduate Affairs Committee (RGAC) that the above article may not fully represent today's graduate programs since faculty and industrial positions vary from what they were in the past. One must consider that Ph.D. graduates today are among the most capable individuals in our society and most able to use their creative skills for new and innovative avenues. This is especially important when other countries are advancing education on all levels. To have the best students possible, graduate programs need to be strengthened via new infusions of resources. The time to graduation for the Ph.D. degree needs to be shortened. If this were implemented, some of the best and brightest Pharm.D. students would consider Ph.D. training, if appro-

priately mentored, and exposed to various aspects of faculty research during Pharm.D. education.

### **2003-04 Research and Graduate Affairs Committee Report<sup>8</sup>**

This committee critically examined the AACP Excellence Paper on "Developing and Maintaining a Culture of Scholarship."<sup>9</sup> Recommendations included the convening of a task force jointly with the Accreditation Council for Pharmacy Education to develop the indicators of faculty and institutional scholarship in keeping with relevant standards and guidelines. Of note is the work of recent Brodie Scholars-in-Residence at AACP. In 2009-10 Professor Peggy Piascik (University of Kentucky) examined promotion and tenure guidelines for AACP member institutions to characterize how the scholarship of teaching and learning was evaluated. The following year, Professor Dennis Thompson (Southwestern Oklahoma State University) analyzed and refined bibliometric parameters of faculty productivity and creativity using publications and authorship as key indices. ACPE guidance documents released in early 2011 affirm the importance of faculty and institutional scholarship as part of accreditation. Enhancing the assessment of faculty scholarship remains an important priority for AACP.

The 2004 report also recommended the convening of an institute on the topic of graduate program assessment and improvement. To date this has not been the focus of an AACP Academic Institute. Given the release of the NRC rankings and general concern about maintaining the vitality of graduate programs, the 2010-11 RGAC affirms that such an institute would be timely and important.

### **Impact of the NIH Roadmap: 2004-05 Research and Graduate Affairs Committee<sup>10</sup>**

Over the past eight years marked changes have been noted in the priorities and funding practices of the NIH as more emphasis has been placed on translational research and interdisciplinary education and research. To date, there have been 55 Clinical and Translational Science Awards granted to universities. Researchers from colleges and schools of pharmacy are significantly involved in the work of approximately half of these programs. The question of what the optimal education for pharmacists to contribute to translational research led to the convening of two subsequent task forces in 2006-07 and 2007-08. Relevant recommendations from the Educating Clinical Scientist Task Forces I and II are included below.

This RGAC also emphasized the importance of Practice-based Research Networks (PBRN) for the purpose of conducting research on practices and practice models

that can lead to improved health through the more effective translation of clinical research to patient care. In 2007, AACP convened an invitational conference on the development of PBRNs and their utility in advancing translational research, especially T2 activities. Information from that conference may be found on the AACP Web site.<sup>11</sup>

### **Educating Clinical Scientists Task Force I and II Reports<sup>12,13</sup>**

The imperative of engaging our graduates, graduate students and faculty in the conduct of translational research led to two task forces, new policy recommendations and several important meetings. The NIH held a Special Conference on Pharmacy Research on their campus in December 2006. Several recommendations were forthcoming from speakers and breakout sessions.<sup>14</sup> A few of these follow:

- There is more than one pathway of education/training that an individual can take to become a successful clinical scientist, but with the present focus on clinical training programs sponsored by NIH, such as the K awards and the Clinical and Translational Science Award (CTSA) program, a master's degree appears to be the minimally accepted pathway to becoming an independent clinical scientist.
- Attracting Pharm.D. students to a clinical research career must begin early in the professional degree program, preferably that first professional year. The major obstacle to attracting students to clinical research however, is the lack of significant numbers of clinical researcher role models or mentors at many institutions. Curricular modifications such as tracking, summer research opportunities and dual degree programs can assist in attracting students, but most students are enticed into a research career by a faculty member whose career they wish to emulate and who encourages the student to join them in their research program. With few clinical scientist mentors, in addition to the difficulty in attracting students into clinical research, there is insufficient funding to support them in a graduate degree program. This led to the recommendation that ACPE should add a new competency similar to that in medicine regarding the necessity to introduce all students to the basic principles of clinical and translational research as part of professional education.

In November 2009, AACP facilitated the convening of Graduate Education/Training in Experimental Therapeutics Summit. Training requirements, curricular resource sharing possibilities, faculty development, funding and career opportunities were among the topics

covered. Resources from that meeting are also available on the AACP Web site. A recent article published by Poloyac and colleagues is also related to this area of graduate education and training and provides a set of core competencies for clinical pharmaceutical sciences education.<sup>15</sup> Further work to increase the number of faculty and graduate students prepared to conduct translational research remains a high priority for AACP and many of its members.

### **“The Role of Dual Degree Programs in Colleges and Schools of Pharmacy”: RGAC 2008-09<sup>16</sup>**

The 2008-09 RGAC was charged with a critical assessment of the status of dual degree programs offered by member institutions. This included both master's and doctoral level programs which have increased markedly in number over the past several years. The need for both AACP and the colleges/schools where dual degree programs are offered to collect more information on enrollments, degree completion and postgraduate activities of those completing the program is a recurrent theme across many of these recent reports. The early identification of Pharm.D./master's and Pharm.D./Ph.D. students is encouraged in order to increase participation in dual degree programs and shorten, as appropriate, time to completion of both degrees.

These reports address key components of graduate education programs at U.S. colleges and schools of pharmacy and offer important recommendations for AACP and its members. A number of those recommendations have been implemented but others, notably the need for better data collection and analysis on graduate education, remain to be implemented.

### **ANALYSIS OF STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS TO GRADUATE PROGRAMS**

With the background information provided by current and past reports, the Committee articulated key points of strength and weakness in U.S. pharmaceutical sciences graduate education.

#### **Strengths**

- U.S. pharmaceutical science graduate programs have been successful in attracting top international candidates to their programs
- Time to degree and completion rates are competitive with national data
- Student debt burdens reflect lower accumulation of debt than for other graduate students

- Graduates are competitive for available post-doctoral training positions (in those disciplines where postdoctoral training is common)

#### **Weaknesses**

- Increasing numbers of faculty who do not have degrees in pharmacy are not as equipped to envision career pathways for professional doctoral students
- Assumptions that Pharm.D. students cannot be attracted to graduate programs in the pharmaceutical sciences blunt faculty efforts to find those exceptional students who could be recruited into programs
- Our faculty tend to shy away from advocacy efforts that draw attention to the significant accomplishments of our faculty and graduate students
- Faculty fail to communicate the full benefits of academic life to graduate and professional degree students

#### **Opportunities**

- It is an excellent time to critically examine the career paths available to graduates of master's and doctoral programs in new biomedical companies, clinical research organizations, regulatory agencies, etc.
- Increased numbers of colleges and schools of pharmacy are recruiting faculty
- Junior faculty are entering faculty positions with extended post-doctoral experience and grants
- Ensuring that our graduate students and post-doctoral fellows are gaining the essential skill sets of grantsmanship, publication, communication, teamwork and globalism
- Softening of job market for Pharm.D. graduates may increase the potential interest in graduate education
- There are an increasing number of dual degree programs and learners in pharmacy and relevant fields
- Greater attention to the importance of advocacy for science and academic careers

#### **Threats**

- Challenged ability to sustain support for graduate programs in the face of university, state and federal trends in financing of research and graduate education
- Top international students may elect to study at home or be attracted to graduate programs in the United Kingdom, Asia and Australia

- Uncertain market for graduates as large pharmaceutical companies continue layoffs of personnel and academic institutions face budget constraints
- Pharm.D. graduate debt burden exceeding \$100,000 is an impediment to recruitment to graduate programs
- Uncertainty of success for junior faculty related to securing research support in tenure-track positions

### **CURRENT POLICIES ON RESEARCH AND GRADUATE EDUCATION**

An examination of current policies adopted by the AACP House of Delegates between 1980 and 2010 reveals more than 30 statements related to research and graduate education. Many of these relate to the inclusion of an emphasis on research in the professional curriculum as one effort to increase interest among Pharm.D. students in graduate education and research careers. Other policies encourage all faculty to be scholarly in the broadest definition of scholarship. The policies seemingly most germane to the 2010-11 RGAC charge are as follows:

#### **Policies on Graduate Education and Research**

AACP encourages its member institutions to support the development of dual degree programs that provide student pharmacists increased educational and research opportunities resulting in an expansion of graduates' academic or non-traditional pharmacy/healthcare career options. (*Source: Research and Graduate Affairs Committee, 2009*).

AACP encourages research intensive university pharmacy programs associated with academic health centers (AHCs) to accept as a necessary component of their research/graduate training mission, a significant interdisciplinary education/training program for clinical scientists in experimental pharmacotherapeutics at the Ph.D. level. (*Source: Educating Clinical Scientists Task Force, 2007*).

AACP should assume a leadership role in promoting pharmaceutical sciences graduate education and research and in integrating the goals of professional pharmacy education and graduate education and research. (*Source: Amended statement based on language proposed by the 2005-06 RGAC published in the consolidated report of the standing committees, 2006*).

AACP encourages schools of pharmacy to increase funding support for post-Pharm.D. clinical research fellowships, works with other professional pharmacy organizations to increase collaborative funding support of post-Pharm.D. clinical research fellowships, and works

with appropriate agencies to provide funding for post-Pharm.D. clinical research fellowships, and degree-granting programs. (Source: *Council of Faculties*, 1993).

### **Policies on Faculty**

Faculty development programs and collaborative research and teaching strategies should be expanded such that faculty at colleges and schools of pharmacy are prepared to lead and contribute significantly to education and research related to cell and systems biology, bioengineering, genetics/genomics, proteomics, nanotechnology, cellular and tissue engineering, bioimaging, computational methods, information technologies, and their psychological, social and economic implications. (Source: *Argus Commission*, 2008).

### **CONCLUSION**

“The Path Forward” report highlights timely and important areas of vulnerability for graduate education in all disciplines and the 2010-11 Research and Graduate Education Committee recognized that programs at U.S. colleges and schools of pharmacy are not immune to these issues. The potential competition for international graduate students by other countries, the importance of interdisciplinary graduate education, and funding constraints are top among these considerations. A fresh examination of the career paths for graduates from master’s and doctoral programs in the pharmaceutical sciences is warranted given the changes in the most significant employer in the past, the research intensive pharmaceutical companies. Programs would also benefit from additional efforts to collect benchmarking information for meaningful assessment of program vitality and quality. The new AACP Graduate Education Special Interest Group will provide a forum for communication among those directing graduate programs at AACP member institutions that can guide future work to improve graduate education across the pharmaceutical sciences and keep our programs at their competitive best.

### **RECOMMENDATION OF THE 2010-2011 RESEARCH AND GRADUATE AFFAIRS COMMITTEE**

Recommendation 1: AACP should assist with recruitment of pharmacy and non-pharmacy students into graduate programs at member institutions by developing a centralized information portal on master’s and doctoral programs that includes information on why students should consider graduate education, the characteristics and admissions policies of U.S. programs, career pathway information and links to the Web sites of current programs.

Recommendation 2: AACP and the Graduate Education Special Interest Group should determine what data

should be collected and the frequency of data collection from graduate programs in colleges and schools of pharmacy as part of the Association’s Institutional Research program.

Recommendation 3: A future Academic Institute should focus on the topic of graduate program quality assessment and improvement.

Recommendation 4: AACP should design a new Academic Research Fellows Program, modeled upon the success of the Academic Leadership Fellows Program, that will accelerate the careers of promising pharmaceutical scientists as collaborative research leaders. Such a program might include scientists from other disciplines (e.g., medicine, dentistry, public health, and nursing) and should include mentoring programming/training.

Recommendation 5: AACP should increase advocacy efforts focused on the development of new and expansion of existing state and federal programs supporting graduate education.

### **RECOMMENDATION TO ARCHIVE POLICY STATEMENT**

The RGAC recommends the following policy be archived:

AACP encourages schools of pharmacy to increase funding support for post-Pharm.D. clinical research fellowships, works with other professional pharmacy organizations to increase collaborative funding support of post-Pharm.D. clinical research fellowships, and works with appropriate agencies to provide funding for post-Pharm.D. clinical research fellowships, and degree-granting programs. (Source: *Council of Faculties*, 1993).

### **REFERENCES**

1. Wendler C, Bridgeman B, et al. *The Path Forward: The Future of Graduate Education in the United States*. April 2010. Educational Testing Service, Princeton, NJ.
2. Ostriker JP, Hinshaw VS, et al. *A Data-Based Assessment of Research-Doctorate Programs in the United States*. 2010. National Academies of Science, Washington, DC.
3. Triggler DJ, Miller KW. Commission on the future of graduate education in the pharmaceutical sciences: final report. *Am J Pharm Educ*. 1999;63:(Summer).
4. Triggler DJ, Miller KW. Doctoral Education: Another Tragedy of the Commons? *Am J Pharm Educ*. 2002;66 (Fall).
5. Hardin G. The Tragedy of the Commons. *Science*. 1968;162:1243-1248.
6. Hardin G. Extensions of the tragedy of the commons. *Science*. 1998;280:682.
7. Ostrom E, Burger J, et al. Revising the commons: local lessons, global challenges. *Science*. 1999;284:278-282.
8. Leslie SW, Corcoran GB, MacKichan JJ, et al. Pharmacy scholarship reconsidered: the report of the 2003-04 research and graduate affairs committee. *Am J Pharm Educ*. 2004;68(3): Article S6.



***American Journal of Pharmaceutical Education 2011; 75 (10) Article S13.***

9. Kennedy R, Gubbins PO, et al. Developing and maintaining a culture of scholarship. *Am J Pharm Educ.* 2003;67(3):Article 92.
10. Beck WT, Ablordeppey SY, et al. Impact of the NIH roadmap on the future of graduate education in colleges and schools of pharmacy: report of the 2004-05 research and graduate affairs committee. *Am J Pharm Educ.* 2005;69(5):Article S18.
11. <http://www.aacp.org/resources/research/PBRN/Pages/default.aspx>. Accessed November 7, 2011.
12. Blouin RA, Bergstrom RF, Ellingrod VL, et al. Report of the AACP educating clinical scientists task force. *Am J Pharm Educ.* 2007;71(Suppl):Article S05.
13. Carter BL, Blouin RA, Chewning BA, et al. Report of the AACP educating clinical scientists task force II. *Am J Pharm Educ.* 2008;72(Suppl):Article S10.
14. Fagan SC, Touchette D, Smith JA, et al. The state of science and research in clinical pharmacy. *Pharmacother.* 2006;26:1027-1040.
15. Poloyac SM, Empey KM, et al. Core competencies for research training in the clinical pharmaceutical sciences. *Am J Pharm Educ.* 2011;75(2):Article 27.
16. Crismon L et al. Role of dual degree programs in colleges and schools of pharmacy. *Am J Pharm Educ.* 2009;73(Suppl):Article S6.