Few would disagree with the premise that graduate education in the pharmaceutical sciences has made substantial progress in modern times. The contrast between the current reputation of this enterprise and that extant when I first became a participant (some 40 years ago) is truly remarkable. Then, it was a rare college of pharmacy that actively embraced the mission of graduate education and nationally recognized centers of excellence for such training were very scarce. Today, a majority of our institutions offer graduate training programs and a significant number view such effort as a critical part of their overall mission. Those schools which have a major commitment to such activities have seen a modernization of research facilities and equipment and an increase in faculty strength, student/trainee populations, scholarly outcomes and research funding. Recent growth in the latter has been quite extraordinary. For example, during the period from 1986-90, the twenty pharmacy schools which consistently enroll the most PhD students collectively generated some $216 million in NIH support. During 1991-95, these same schools secured some $302 million from this source; an increase of 40 percent. Moreover, academic pharmaceutical scientists have become increasingly visible in the larger arena of biomedical science, individual noteworthy accomplishments are achieving broad public recognition, disciplinary programs are gaining peer designation as national centers of excellence for graduate training and pharmacy deans are quick to exploit such opportunities to better position their school among competing academic units. Thus, at a glance, it would seem that the current status of graduate education in the enterprise of academic pharmacy is healthy and secure. A closer observation reveals a darker and more foreboding picture.

Graduate education in the pharmaceutical sciences represents a small part of a national effort which evolved as a mechanism to train future generations of biomedical academicians and researchers. As such, it is susceptible to the real and perceived ills which have befallen that larger undertaking. As anyone who is currently involved can attest, all is not well in the research trenches of academe and cries of alarm are clearly being raised (1-3). Common concerns include: the production of PhD-level researchers seems to be outstripping academic demand; new PhD’s are spending ever longer periods as postdoctoral fellows while seeking permanent employment; individuals have become frustrated and disillusioned with the inability to move ahead with their careers; and, once having landed an academic post, the stress to establish and sustain an independent research program makes the postdoctoral years seem like a cakewalk. It is easy to conclude that there is an extraordinary high level of discontent among young trainee/scientists who, upon their recruitment into graduate programs, were relatively confident and enthusiastic about the prospects for a successful academic career.
ful academic career. And to further aggravate the situation, merger mania and industrial downsizing have decreased alternative employment opportunities.

What has brought this about? The factors are many and varied and provide the basis for numerous recent publications (1-5). However, several such factors seem especially pervasive and deserving of discussion.

The culture at research-intensive universities and, particularly, at health science centers has changed dramatically. From its earliest days, science has been a competitive venture with scientists competing against ignorance to unravel the mysteries of the natural world and against one another to win the respect and praise of peers. While an irrepressible curiosity and peer approval remain potent motivators for the behavior of academic scientists, it now appears that, too often, university-based biomedical research is a competition for amassing resources rather than validating hypotheses. During the period of the Cold War, national security demands, domestic priorities for health initiatives, a baby boom and ample tax revenues fueled a rapid growth in academic based research and graduate training programs. Over time, a large cadre of individuals was created whose university responsibilities gravitated toward research with less involvement in teaching. Because universities benefited in terms of prestige and a substantial influx of federal funds which paid for direct and indirect research costs, such activities were further encouraged and expanded. And society enjoyed the fulsome benefits of numerous advances in basic and applied research and the subsequent development of technology. But there was a price to be paid.

During this period, the recruitment and selection of many new faculty were based largely on their potential to advance the institution’s research agenda. At research-intensive universities, the requirements for faculty advancement became increasingly focused on the attainment of investigative outcomes with less and less emphasis on teaching proficiency. Moreover, faculty peers gradually increased their expectations of what young colleagues would be required to accomplish in the research arena in order to earn tenure. Such expectations changed qualitatively as well as quantitatively. Initially the focus was largely on scholarly accomplishments, e.g., publications in peer-reviewed journals, invitations to major scientific forums and the development of some national recognition in the discipline. Receipt of research funding from agencies external to the university was also recognized as a component in this equation but was appropriately viewed as a necessary means to accomplish scholarly ends. Somewhere along the way, the means became as or more important than the ends. Thus, today’s tenure decisions frequently rest heavily upon an analysis of the candidate’s grantsmanship with assumptions that plentiful funding ensures meaningful scholarly achievement and that a grant in hand is worth a large number of publications in the bush. I would question the validity of both of these assumptions. I also question the wisdom of the prevalent practice which allows successful grantsmanship to compensate for poor teaching performance in those who will form the ranks of tomorrow’s tenured faculty.

It is the practical consequences of this heavy emphasis on securing research funding that have had dramatic direct and indirect effects on graduate training. With a marked expansion in the numbers of academic researchers and a limitation in federal and state research funding, the competition for scarce resources has become ever more intense. Moreover, grant reviewers now routinely require that proposals be supported by substantial amounts of “preliminary” published data that have been generated by the applicant. Thus, to be competitive, new (and old) investigators must produce sizable amounts of data which support the very hypotheses that form the basis of the funding request. As has always been the case, such investigative effort is very labor intensive and graduate students and postdoctoral trainees form a convenient and cheap labor pool. However, with the large amount of data now required to support proposals, the exalted importance of funded research in tenure decisions and the abundant supply of graduate and postdoctoral trainees, the opportunities for exploitation of this labor force have never been greater. I suspect that there are relatively few cases of direct, conscious exploitation. Nonetheless, there has been scant incentive for faculty to consider the long-term, broad ramifications of the apparent inequality between numbers of research trainees and research career opportunities. Certainly, this issue has received relatively little priority attention until recently and its continued widespread persistence forms a legitimate basis to indict the enterprise that trains the next generation of pharmaceutical scientists and educators.

An equally important consequence relates to the acculturation of new faculty in such an environment. In the basic science departments of a majority of those institutions that train most of our graduate students, it is made abundantly clear that academic survival (retention) requires evidence of external funding. The path to such success is arduous, time consuming and frequently very frustrating. Indeed, the process has been described as, “... the world’s most inefficient system for funding of research”(6). Most often, proposals must be submitted, revised and resubmitted several times before achieving a fundable score. With so much at stake, it is hardly surprising that new faculty seldom place as much emphasis on developing teaching skills. Yet, there are few departments where retention and tenure documents do not demand that faculty provide evidence of considerable teaching proficiency. So, what happens? With increasing frequency. I have observed that a grant in hand can not only deflect criticism of minimal scholarly contributions, but can also blunt evidence of mediocre teaching. With career survival at stake, astute young faculty quickly recognize the relative importance of teaching vs. grantsmanship as markers on the road to success. And these lessons are readily assimilated by the trainees who work with them and envision an academic vocation. The future of the academy is not well served by the transmission of such attitudes and behaviors.

As the discontent mounts among those most directly affected, i.e., postdoctoral trainees and limited term faculty, a number of opinions for remedy have been offered (1-5, 7, 8). Some employ marketplace approaches, e.g., no specific actions are really needed because the lack of employment opportunities and attendant pain will eventually decrease the applicant pool and the problem will go away. A variant suggests that conventional PhD training sharpens intellectual and communicative skills and thus prepares an individual well for a host of nontraditional jobs. Others take a more humane position and advise that graduate enrollments should be limited until supply and demand are in better balance. Still others recommend that PhD training be revamped to offer a broader range of academic options directed toward increasing the versatility of graduates and enhancing their marketability for available positions in
mentoring is the eventual quandary that results from an ever-increasing pool of highly competent applicants competing for constrained resources.

Thus, it seems certain that many of the graduate students now in training are not going to find permanent employment in academic departments of research-intensive universities. This mandates that training programs expose students to alternative ways in which their education can lead to useful, productive, and satisfying careers. These may involve positions in research foundations, governmental agencies, teaching institutions, and in applied research, development, and management in industry. Preparation for such careers may require qualitative changes in the nature of training programs including greater emphasis on communication skills, more interdisciplinary exposure and a more flexible curriculum. It would also require that faculty eschew thoughts of achieving immortality by replicating themselves in their students. For, in the final analysis, what we should hope for our trainees is that, at the end of their life labors, they can look back and realize that their efforts made a beneficial difference. And there are many career paths to that happy conclusion.

We should also take some initiative to restore the culture in our research environments to one where the competition is over ideas rather than dollars. I recognize that cultural mores change slowly and that academic cultures are more resistant to change than most. I am also well aware of the inordinate value that university and college administrators place on generating external funding. However, as faculty, we are hardly blameless and yet we can have an impact. How? By resisting the urge to recruit new colleagues largely on the basis of the funding they will bring to the department; by insisting that promotion and retention decisions rest more heavily on scholarly outcomes than on money generated; and by working to create a climate where it is unacceptable to substitute funding success for teaching deficiencies. In each of these actions, we take tangible steps that, over time, may help to rectify a major underlying cause of the difficulties which currently confront graduate education and postdoctoral training.

In recent years, this Association has devoted much time and energy to examine, debate, and, consequently, professional education. While that work continues apace, it is essential that a similar effort now be directed toward graduate education. The continuing viability and future promise of such endeavors is undeniably critical to the overall mission of pharmaceutical education and thus commands our attention, active concern, and involvement.

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References

5. Rajan, T.V., "Cause of current funding crises may lie in de-emphasis of scholarship," The Scientist, 10(9), 1996.