The Department of Pharmaceutical Chemistry at The University of Kansas is one of the premier departments of its kind in the world, providing: (i) superior graduate didactic education and research in physical pharmacy, bioanalysis, cellular and molecular biopharmaceutics, and macromolecular pharmaceutics leading to MS and PhD degrees, and (ii) providing PharmD students with a firm academic foundation in pharmaceutical chemistry and pharmaceutics. The 13 faculty members of the Department supervise 40 graduate students and 25 postdoctoral fellows on site, and 22 Distance Masters students in our Distance Masters program. The latter program was established in 2007 to provide distance education in pharmaceutical chemistry predominantly to students currently employed in the pharmaceutical or biotechnology industry. Since 2001, the faculty members of the Department have published 573 scientific publications, and maintained an average of $4.8 million/year in funding through grants and contracts, both from Federal and private sources. For its PhD program, the Department typically receives 80-100 applications per year, from which approximately 6-8 new students are selected. The academic credentials for students admitted to the PhD program are excellent, with an average GPA of 3.54 and GRE scores of 467 (verbal), 689 (quantitative), and 4.0 (analytical). Typical candidates for the Distance Masters program have achieved a GPA of 3.0. PhD graduates of the Department have an excellent placement history, and usually have job offers prior to graduation. Virtually all participants in the Distance Masters program are employed by the pharmaceutical or biotechnology industry, so that no "placement history" is available. However, future assessment will involve following their career advancement after completion of the Masters program.
The Department of Pharmaceutical Chemistry, The University of Kansas: PhD Program and Distance Masters Program (2 page summary)

The Department of Pharmaceutical Chemistry at The University of Kansas is one of the premier departments of its kind in the world. At the graduate level, it provides superior graduate didactic education and research in physical pharmacy, bioanalysis, cellular and molecular biopharmaceutics, and macromolecular pharmaceutics leading to MS and PhD degrees while preparing graduates for careers in the pharmaceutical industry, academia and related fields. In the PharmD Program (i.e., the professional pharmacy program of the School of Pharmacy), the Department provides PharmD students with a firm academic foundation in pharmaceutical chemistry and pharmaceutics, in order to prepare them for advanced courses in the School of Pharmacy, for careers as practicing pharmacists in retail, hospital or industrial settings, and for graduate education in the pharmaceutical or biomedical sciences. The Department builds on many existing strengths such as its national and international reputation as a center of excellence for training scientists in physical pharmacy, cellular and molecular biopharmaceutics, pharmaceutical biotechnology, and bioanalytical chemistry, the high quality of the faculty, staff and students, its unique focus of training programs on physical chemical principles, the availability of state-of-the-art equipment in the Department and access to a variety of Service Laboratories on the Lawrence Campus, the availability of a state-of-the-art research facility in the Simons Research Laboratories and the Multidisciplinary Research Building, access to new centers such as the Structural Biology Center and the Proteomics Center, the availability of significant amounts of external funding to support graduate training and research programs, the availability of significant amounts of endowed funding to support the Department's PharmD and graduate training programs, as well as faculty development, the existence of a strong alumni base, which provides our graduates access to internship and employment opportunities, and which provides the Department with access to private funds, the involvement of our graduate students in organizing regional and international scientific meetings enhancing the Department's reputation in graduate training, the existence of strong industrial interactions, which provide access to highly qualified adjunct faculty, access to unique educational experiences for the students (e.g., industrial internships), and access to funding for research (e.g., grants, contracts) and training (e.g., fellowships) programs, the demand for our graduate program from national and international students, the existence of a significant number of postdoctoral students and visiting scientists in the Department, the existence of significant research and training interactions with other Departments and Centers in the School of Pharmacy (e.g., Medicinal Chemistry, and Pharmacology & Toxicology), in the School of Engineering (e.g., Chemical Engineering, Bioengineering, Electrical Engineering and Computer Sciences, Information and Telecommunication Technology Center), in the School of Medicine (e.g., Oncology, Physiology, The University of Kansas Cancer Center) and in the College of Liberal Arts and Sciences (e.g., Chemistry and Molecular Biosciences,), which afford the opportunity for multidisciplinary research and training experiences, the interaction of the faculty and students with the KU Center for Technology Commercialization (KUCTC) and/or the Institute for Advancing Medical Innovation (IAMI) for the development of research endeavors with commercialization potential, the existence of a formal joint program (Takeru Higuchi and Nigel Manning Intersearch Program) with Monash University in Melbourne, Australia, and many other informal interactions with universities in Europe, South America and Japan, the existence and expansion of the
Globalization of Pharmaceutics Education Network (GPEN), which affords the opportunity for our students to interact with foreign peers and to complete part of their training abroad, and an annual retreat of the Department organized since 2007, in which graduate and postgraduate students, faculty, and invited speakers from outside institutions gather for about 2 days to exchange research and research developments in specific emphasis areas of pharmaceutical sciences. To maintain and expand these strengths, the Department will continue aggressive fundraising, both from the public and private sector, and student recruiting (for example through attendance of major national and international conferences with recruitment events). In addition, the Department has developed a strategy for the replacement of faculty members, which will retire within the next couple of years. For example, fundraising for two endowed chairs has begun two years ago in order to have these chairs in place for the anticipated retirements of two senior faculty members in about five years. There are currently (June 2010) 13 tenured/tenure-track and 3 courtesy faculty members in the Department. Since July 1, 2010, the Department also provides laboratory and office space to a Research Professor, who directs a Laboratory of Physical Pharmacy within the Department, i.e. a laboratory, which emphasizes research in an area, in which the Department has maintained an international reputation since its foundation in 1967. The tenured/tenure-track faculty members currently supervise a total of 40 graduate students and 25 postdoctoral fellows on site, and 22 Distance Masters students. The faculty members of the Department are very productive both with regard to publication and sponsored research. For example, since 2001 the faculty of the Department have published 573 scientific publications, and maintained an average of $4.8 million/year in funding through grants and contracts, both from Federal and private sources. The Department maintains an on-site PhD program and a Distance Masters program. The Distance Masters program was initiated in Fall 2007. This program is available world-wide, but currently the majority of participants are employed in US pharmaceutical or biotechnology companies. Admission of students into both programs varies slightly. For the PhD program, the Department typically receives 80-100 applications annually. The initial evaluation process takes into account the applicant’s GPA, GRE scores, prior research experience, letters of recommendation from professionals in the field and a personal statement prepared by the applicant. Out of the initial pool, the most promising 10-15 applicants are interviewed on-site by the faculty. From this process, invitations to join the PhD program emerge, with the subsequent result of approximately 6-8 new students entering the PhD program. The academic credentials for students admitted to the PhD program are excellent, with an average GPA of 3.54 and GRE scores of 467 (verbal), 689 (quantitative), and 4.0 (analytical). PhD graduates of the Department are in very high demand in the industry, and usually receive offers from pharmaceutical or biotechnology companies prior to the defense of their PhD thesis. Admission to the Distance MS program is on a case by case basis. The candidates provide information about their past academics and research experience, their past and present industrial experience, letters of recommendation from a professional in the field, a personal statement of career goals and a proposed mentor at their current employer. Typically, candidates who have achieved a GPA of 3.0 are admitted to the program. As virtually all participants in the Distance Masters program are employed by the pharmaceutical or biotechnology industry, we have no "placement history" of graduates of the Masters program; however, for future assessment we will follow their career advancement after completion of the Masters program.
The Department of Pharmaceutical Chemistry, The University of Kansas:
PhD Program and Distance Masters Program

1. What we do and why do we do it

Mission of Unit. The Department of Pharmaceutical Chemistry at The University of Kansas is one of the premier departments of its kind in the world. At the graduate level, its mission is to provide superior graduate didactic education and research in physical pharmacy, bioanalysis, cellular and molecular biopharmaceutics, and macromolecular pharmaceutics leading to MS and PhD degrees while preparing graduates for careers in the pharmaceutical industry, academia and related fields. As part of this mission, the Department of Pharmaceutical Chemistry has reviewed and updated its graduate curriculum in the Spring Semester 2008. In the PharmD Program (i.e., the professional pharmacy program of the School of Pharmacy), the Department’s mission is to provide PharmD students with a firm academic foundation in pharmaceutical chemistry and pharmaceutics, in order to prepare them for advanced courses in the School of Pharmacy, for careers as practicing pharmacists in retail, hospital or industrial settings, and for graduate education in the pharmaceutical or biomedical sciences. A large part of the PharmD curriculum taught by the Department of Pharmaceutical Chemistry was reviewed, and course contents synchronized, in the Spring Semester 2010.

Unit Goals and Priorities. The goals and priorities of the Department of Pharmaceutical Chemistry must be discussed within the framework of existing strengths, which are summarized in the following. The strengths of the Department include: The national and international reputation of the Department as a center of excellence for training scientists in physical pharmacy, cellular and molecular biopharmaceutics (including new drug delivery methods), pharmaceutical biotechnology, and bioanalytical chemistry; the high quality of the faculty, staff and students; the unique focus of the training programs on physical chemical principles; the availability of state-of-the-art equipment in the Department and access to a variety of Service Laboratories on the Lawrence Campus; the availability of a state-of-the-art research facility in the Simons Research Laboratories and the Multidisciplinary Research Building; access to new centers such as the Structural Biology Center and the Proteomics Center; the availability of significant amounts of external funding (including interdisciplinary Training Grants) to support its graduate training and research programs; the availability of significant amounts of endowed funding to support the Department’s PharmD and graduate training programs, as well as faculty development; the existence of a strong alumni base, which provides our graduates access to internship and employment opportunities, and which provides the Department with access to private funds; the involvement of our graduate students in organizing regional and international scientific meetings enhancing the Department's reputation in graduate training; the existence of strong industrial interactions, which provide access to highly qualified adjunct faculty, access to unique educational experiences for the students (e.g., industrial internships), and access to funding for research (e.g., grants, contracts) and training (e.g., fellowships) programs; the demand for our graduate program from national and international students; the existence of a significant number of postdoctoral students and visiting scientists in the Department; the existence of significant research and training interactions with other Departments and Centers in the School of Pharmacy (e.g., Medicinal Chemistry, and Pharmacology & Toxicology), in the School of Engineering (e.g., Chemical Engineering, Bioengineering, Electrical Engineering and Computer Sciences, Information and Telecommunication Technology Center), in the School of Medicine (e.g., Oncology, Physiology, The University of Kansas Cancer Center) and in the College of Liberal Arts and Sciences (e.g., Chemistry and Molecular Biosciences,), which afford the opportunity for multidisciplinary research and training experiences; the interaction of the
faculty and students with the KU Center for Technology Commercialization (KUCTC) and/or the Institute for Advancing Medical Innovation (IAMC) for the development of research endeavors with commercialization potential; the existence of a formal joint program (Takeru Higuchi and Nigel Manning Intersearch Program) with Monash University in Melbourne, Australia, and many other informal interactions with universities in Europe, South America and Japan; the existence and expansion of the Globalization of Pharmaceutics Education Network (GPEN), which affords the opportunity for our students to interact with foreign peers and to complete part of their training abroad; an annual retreat of the Department of Pharmaceutical Chemistry organized since 2007, in which graduate and postgraduate students, faculty, and invited speakers from outside institutions gather for about 2 days to exchange research and research developments in specific emphasis areas of pharmaceutical sciences. The last two retreats focused on (i) pharmaceutical solids and (ii) aggregation and immunogenicity of protein pharmaceuticals, respectively, and were attended by well known scholars from various pharmaceutical and biotechnology companies, the Food and Drug Administration, and various US and European universities. The focus for our 2010 retreat is on biopharmaceutics and novel imaging approaches.

To maintain these existing strengths, a number of goals and priorities have been identified:

i) To develop the resources to allow the Department to provide all of its graduate students with both a competitive stipend and a scholarship to pay tuition, fees and health insurance.

ii) To develop aggressive graduate student recruitment strategies and mechanisms that will ensure a continued matriculation of highly qualified graduate students into the program and to increase gender, ethnic, cultural, and racial diversity in our graduate program.

iii) To provide more of the Department's graduate students with international educational and research experiences in order to prepare them for the new, globalized pharmaceutical industry, especially in an environment of company mergers and acquisitions.

iv) To provide more of the Department's graduate students with industrial or clinical internships in order to allow them to apply their basic scientific knowledge to solve practical problems and to increase their exposure to the overall process of drug discovery and development.

v) To develop new educational experiences for the Department's graduate students that will provide them with more breadth in their education so that they are more qualified to participate in the project teams that now manage drug discovery and development in the pharmaceutical industry.

vi) To develop new educational and leadership experiences for the Department's graduate students that will better prepare them for academic careers.

vii) To sustain the Department's strengths in the areas of physical pharmacy, cellular and molecular biopharmaceutics, pharmaceutical biotechnology, and bioanalytical chemistry.

viii) To expand our collaborative research and training programs with faculty colleagues on the Lawrence Campus and at the Medical Center and/or other Kansas City Area Life Sciences partners especially the KU Cancer Center.

ix) To obtain and maintain high quality, multi user, state-of-the-art equipment which is crucial to the success of our research and graduate training programs.
x) To maintain a well trained, well equipped and highly efficient classified and unclassified staff to assist in the administration of the Department's research and graduate training programs.

xi) To maintain a high quality Distance Masters Program.

xii) To continue to explore opportunities for technology transfer and entrepreneurship with the assistance of The University of Kansas (e.g., KUCTC and IAMI) and the Kansas Bioscience Authority (KBA).

**Passion Statement.** The practice of pharmacy and the pharmaceutical industry are global enterprises that provide for the safe distribution and discovery of medicines to help alleviate pain and suffering and improve the quality of life. In large part, the improved quality of life in an aging world population has been made possible by the advances made in pharmaceutical sciences. Continuing innovation and advances in the pharmaceutical sciences require a well-trained scientific workforce. Especially scientists working in the field of drug development are rather exclusively trained by Departments such as the Department of Pharmaceutical Chemistry at The University of Kansas, which works with passion “to educate and perform high level research with outstanding graduate and postgraduate students to form leaders in the field of pharmaceutical sciences”.

**Role of unit.** Within the general discipline of pharmaceutical sciences, the role of pharmaceutical chemistry is in drug development (which includes drug product and prodrug design based on biological and/or physico-chemical principles, preformulation, formulation, pharmacokinetics, and drug analysis). In essence, pharmaceutical chemistry is the discipline which brings drugs to the market (and/or bedside), while the discipline of pharmacology and toxicology provides drug targets and drug toxicology and the discipline of medicinal chemistry provides synthetic routes to drug discovery and commercial production. The discipline of pharmacy practice provides outcomes assessments of therapeutic approaches, which could go as far as personalized medicine. All four disciplines, pharmaceutical chemistry, pharmacology and toxicology, medicinal chemistry, and pharmacy practice are represented in the School of Pharmacy at The University of Kansas, which provide for a nationally and internationally well renowned collaborative research environment.

**Need and impact statements.** There is great need for graduate and postgraduate students trained by the Department of Pharmaceutical Chemistry at The University of Kansas. This is reflected not only by the number (i.e., 9 within the last year) of pharmaceutical and biotechnology companies, which visit the Department annually to conduct on-campus interviews (e.g., Abbott, Amgen, Bristol-Myers Squibb, Gilead, Hospira, Eli Lilly, Merck, Pfizer, Proctor & Gamble, and Schering Plough) but also by the number of industrial scholarships/fellowships, which are given annually to the Department to train pharmaceutical chemists. Long-standing scholarships have been/are provided by Eli Lilly, Amgen, Pfizer and Genentech. In a recent email from Eli Lilly, the Department has again been invited to apply for renewal of its long-standing fellowship from Eli Lilly with the following words: “As a result of these excellent interactions and our continued interest in supporting the training of students in the top Drug Disposition programs in the country, Lilly Drug Disposition would like to invite you to apply to the Foundation for continued funding…for…four years”. This is clearly an excellent comment about the quality of the Department. In addition, several companies continue to give annual awards to the best students of the Department (e.g. Genentech, Schering-Plough; 6 awards in the last four years). Students of the Department have also been very successful to obtain additional predoctoral fellowships and awards, e.g. from the American Association of Pharmaceutical...
Scientists (AAPS) (1 student), the American Foundation for Pharmaceutical Education (AFPE) (2), the Pharmaceutical Research and Manufacturers Association (PhRMA) (4), the Society for Free Radical Biology and Medicine (2), and the American Heart Association (AHA) (3). Over the last 10 years, a total of 17 students of the Department have been awarded prestigious Self Graduate Fellowships of the University of Kansas, which is an outstanding number. In general our students pursue highly successful careers in the pharmaceutical industry, and are promoted to higher ranks very quickly. A few representative examples include: a promotion from Senior to Principle Scientist within two years; two promotions from Scientist to Principle Scientist within 7 and 8 years, respectively; a promotion from Senior Scientist I to Technical project Leader I/Principle Fellow (Director) within 7 years; a promotion from Principle Scientist to Manager (World-Wide Business Development) within 7 years. These steep career paths of our students are probably the best evidence for the outstanding training provided by the Department of Pharmaceutical Chemistry.

Inventory of instructional programs. The Department of Pharmaceutical Chemistry provides instruction and mentoring to students pursuing a PharmD degree within the School of Pharmacy in the areas of Pharmaceutical Chemistry and Pharmaceutics. This includes courses in pharmacy calculations, pharmaceutical solution dosage forms, pharmacokinetics and clinical pharmacokinetics, biopharmaceutics and solid dosage forms, and clinical chemistry. The Department also provides numerous elective classes and the opportunity for PharmD students to pursue research within the field. The Department of Pharmaceutical Chemistry provides instruction and research mentoring to students pursuing an MS (both in house and a distance online/videoconferencing program) and PhD program in Pharmaceutical Chemistry with courses in pharmacokinetics (basic and advanced), chemical kinetics, drug deterioration and stabilization, pharmaceutical analysis, pharmaceutical equilibria, pharmaceutical biotechnology, molecular biology of the cell, drug delivery, issues in scientific integrity, and vaccinology.

2. Faculty in profile

A. Quantitative Indicators:

(1) Overall FTE. The Department has had an average of 14.5 FTE of tenure track faculty members from 2001–2010, and currently (as of June 2010) has 13 faculty members at a total of 11 FTE.

(2) Tenure-track, Other, GTA. There are currently (June 2010) 13 tenured/tenure-track and 3 courtesy faculty members in the Department. The tenured/tenure-track faculty consists of 5 Distinguished Professors, 4 Full Professors, 3 Associate Professors, 1 Assistant Professor, and 3 Courtesy Professors. Starting July 1, 2010, the Department also provides laboratory and office space to a Research Professor, who will direct a Laboratory of Physical Pharmacy within the Department of Pharmaceutical Chemistry. Currently, there are 40 graduate students and 25 postdoctoral fellows on site, and 22 Distance Masters students, enrolled in the graduate program of the Department; the number of graduate students or postdocs can vary from year to year. There is no GTA line in the Department and all graduate students are supported by grants, contracts, training grants, and fellowships. The day-to-day operation of the Department is supported by four staff members, of which one is supported entirely through external funds. In addition, the Department employs two journal editor staff members to assist the Editor of the Journal of Pharmaceutical Sciences, Professor R.T. Borchardt, who are funded entirely through the publisher, Wiley Intersciences.
(3) **Demographics.** Over the past ten years, the Department consisted of 5–6 Distinguished Professors, 6–7 Full Professors, 1–2 Associate Professors, 2–3 Assistant Professors, and 2–4 Courtesy Professors. Among the faculty, there were 2 female faculty members over the 10 year period and one minority faculty member. In the period of 2001–2004, there was no Assistant Professor in the Department and this void was filled starting from 2005 by hiring 4 new Assistant Professors. Three of these Assistant Professors are now tenured and promoted to Associate Professor. In 2010, the Department successfully recruited Dr. Volkin as the Aya and Takeru Higuchi Distinguished Professor and a KBA Eminent Scholar.

(4) **Scholarly Output.** In the past ten years, the faculty has been productive in publishing their research results in peer reviewed journals and presenting their results in Regional, National, and International scientific meetings as well as in universities and the industry. From 2001 to 2010, the tenure-track faculty published between 40 (by May 2010) and 94 (2009) peer reviewed papers per year in journals, with a total number of publications of 573. Several faculty members edited books in the field of Pharmaceutics and Pharmaceutical Biotechnology. Several faculty members have patented their results as US and/or Worldwide Patents. Most faculty members also serve as Editor-in-Chief, Associate Editor, Editorial Board Members, or Reviewers for the premier journals in the field of Pharmaceutics, Chemistry and Biology. Due to their expertise, the faculty members have also been invited to review grants, contracts, and fellowships for foundations (i.e., Alzheimer’s Association, American Heart Association) and federal funding agencies (i.e., National Institutes of Health (NIH) and National Science Foundation (NSF)).

(5) **Grants and Contracts.** The faculty has been very successful in attracting funds from foundations, industry and federal funding agencies (i.e., NIH and NSF). The total research expenditures of the Department over the period of 2001-2010 ranged from 3.8 to 6.0 million dollars per year (source: School of Pharmacy Sponsored Project Expenditures), with an average of 4.8 million/year.

(6) **Awards.** Several faculty members received awards for excellence in teaching, research, and service. In the past ten years, Professor Stella received the following awards: Graduate Teacher Award for Pharm Chem, Center for Teaching Excellence, 2001 and 2005; Inaugural Technology Leadership Award, KU, 2005; Marconi Science Award, UNICO, 2004; Chancellors Club Career Teaching Award, KU, 2008. Professors Lunte, Siahaan, Schöneich and Munson were elected to become AAPS Fellows. Professor Krise obtained the KINBRE Award in Molecular Cell Biology in 2008. Professor Borchardt served as the AAPS President in 2001; he also received the following awards: Research Achievement Award in Pharm Sci., AAPS, 2001; Higuchi Research Prize, APhA, 2003; Smissman Bristol-Myers Squibb Award, American Chemical Society, 2003; Chancellors Club Career Teaching Award, KU, 2005; SBS PolyPops Foundation Award, 2007; inducted into American Chemical Society-Medicinal Chemistry Division Hall of Fame, 2007; International Fellow, Acad. of Pharm. Sci. & Tech., 2008; Honorary degrees from the University of Copenhagen (Pharmaceutical Sciences), 2002; Katholieke University, Leeuwen, Belgium, 2004; Uppsala University, Sweden, 2006. Professor Lunte also received various awards, including: Award for Recognition of Undergraduate Teaching Excellence, 2002; American College of Pharmacy Teacher of the Year 2002; AAPS APQ Outstanding Manuscript Award, 2003; and AAPS Research Achievement Award in APQ, 2004.

(7) **Graduate Faculty Status and Dissertation Chair Status and Criteria.** All the tenure-track faculty members have graduate faculty and dissertation status.

**B. Qualitative Indicators:**
(1) How are you recruiting and retaining faculty to enhance the quality of the program?
Strategies that can be implemented in recruiting and attracting new faculty and retaining faculty members in the department are: To provide excellent start up funds, seek internal and external support for a faculty development fund, maintain a high quality graduate program, secure funding to maintain, update, and expand multi-user equipment in the Department, provide excellent staff support for the faculty, and maintain parity in salary of current faculty.

(2) Given the median of age of the faculty, what is your succession plan?
The Department is currently discussing a long-range plan anticipating the retirement of several senior members of the faculty in the next five years. As mentioned above, we have successfully recruited Dr. David Volkin to the Department as a Distinguished Professor and KBA Eminent Scholar in 2010. Although the Department also received a KBA Rising Star Grant in 2010, a faculty recruit targeted with the help of this grant for the area of bioanalytical chemistry did not accept our offer (April 2010). After additional discussions during April/May 2010, we are planning to hire two junior faculty members in the area of bioanalytical chemistry and protein design, respectively. Both recruits would further strengthen the Department in the area of pharmaceutical biotechnology, contribute to the efforts of the Macromolecule and Vaccine Stabilization (MVS) Laboratory hosted by the Department, while covering aspects of bioanalysis and physical (organic) protein chemistry. These recruits would also directly impact on our new plans to build a Center of Excellence in Pharmaceutical Biotechnology between the Department of Pharmaceutical Chemistry at The University of Kansas and the Department of Pharmaceutical Sciences at the University of Colorado (see also 5C., below).

3. Student profile, program productivity and quality outcomes

A. PharmD Program. To be completed by the Dean of the School of Pharmacy

B.1. Graduate Program, PhD degree Program

Except where indicated, this assessment will cover the time period from Fall 2001 to present. Admission to the program is a very competitive process. The Department typically receives 80-100 applications for admission on an annual basis. The initial evaluation process takes into account the applicant’s GPA, GRE scores, prior research experience, letters of recommendation from professionals in the field and a personal statement prepared by the applicant. The initial evaluation process typically narrows the pool to the most promising 10-15 applicants, who are then interviewed on-site by the faculty. From this process, invitations to join the PhD program emerge, with the subsequent result of approximately 6-8 new students entering the PhD program on a yearly basis. The average age of an entering student is 24 years, with most holding a bachelors or masters degree in Pharmacy, Pharmaceutical Sciences, Chemistry, Biochemistry or Engineering. The academic credentials for students matriculating to the PhD program are excellent, with an average GPA of 3.54 and GRE scores of 467 (verbal), 689 (quantitative), and 4.0 (analytical). Unlike many competitive programs, the Department of Pharmaceutical Chemistry does not have Graduate Teaching Assistantships (GTA) available to support graduate students in the initial one-two years of graduate study. As a result, students entering the PhD program are immediately appointed as Graduate Research Assistants (GRA). The current stipend level for students in the PhD program is set at $23,500, which is very competitive compared to our peer institutions. Each student entering the program is fully sponsored (i.e., stipend, tuition and health insurance) by Departmental funds for the first semester, after which time a faculty research advisor assumes this responsibility until completion of graduate studies. Graduate students in the PhD program are required to
successfully complete a rigorous group of seven core courses with grade B or better in the first year of graduate study in order to be eligible to undertake the Comprehensive Core Curriculum Examination (CCCE). After successful completion of the CCCE, each student selects a specialization track, either biotechnology or physical-analytical. Each track has additional required coursework and electives. One year after completion of the CCCE examination each student undertakes the comprehensive Oral Qualifying Examination (OQE). A major aspect of the comprehensive examination is the oral presentation and defense of a 10-page research prospectus that focuses on the students proposed dissertation research project. The examination committee consists of five faculty members (one external to the department) who are knowledgeable in the area of research proposed by the student. Successful completion of the comprehensive oral examination results in the award of a non-thesis MS degree in Pharmaceutical Chemistry and, importantly, the student's status becomes a candidate for the PhD degree. At this point the student's focus is largely conduct of research with the culmination being the preparation and successful defense of the doctoral dissertation, upon which time the PhD degree is awarded. Presently, the average time for a student to complete the OQE is 1.75 years, with the dissertation defense typically requiring a total of 5.1 years of advanced study. Graduate students in the Department of Pharmaceutical Chemistry Ph.D. program are globally highly regarded and frequently are the recipients of competitive fellowships and scientific awards (see also 1.). Graduates of the Department's PhD program are highly sought by private industry, government agencies and as faculty and/or trainees in seeking advanced postdoctoral training. In the past, graduates have been essentially 100% successful in obtaining positions within the aforementioned sectors, a trend that continues to present, even with the difficulties presented by the current national economical situation. The majority of graduates accept positions in the pharmaceutical industry (78%), while approximately 16% continue their training in academia as postdoctoral fellows and subsequently pursue academia or pharmaceutical industry positions. The remaining 6% of graduates have entered into academia directly after completing our program. The faculty members in the Department of Pharmaceutical Chemistry are dedicated to the mission of the program and are appropriately engaged in teaching, research and service activities. The Department has currently 11 Full Time Faculty Equivalents (FTEs) and the average number of graduate students advised per FTE is currently four. In addition the Department currently has a number of postdoctoral fellows and/or research faculty, which are supported by individual faculty (~2.3 per FTE). Departmental faculty participate in 13 didactic courses for students enrolled in the PharmD Program and in 11 didactic courses at the graduate level. The approximate number of student class room credit hours per FTE is 135 in the PharmD and 61 in the graduate program. After the OQE, graduate students continue to enroll for 15 credit hours per year in Doctoral Dissertation (PHCH 999), which means an additional 60 credit hours per year per FTE in the supervision of doctoral research. Collectively, the PhD program in the Pharmaceutical Chemistry Department has been and continues to be very strong, both from an academic and research standpoint, and in recent years appears to be gaining even more momentum to add to this distinguished history. As a result, the Department enjoys a very strong alumni base that includes 48 terminal MS, 239 PhD graduates (most of these also received the MS en route to the PhD degree), plus a further 365 postdoctoral fellows. The alumni are invited to gather each year at the national American Association of Pharmaceutical Sciences (AAPS) conference, at which time representatives of the Department host an alumni breakfast. Although a formal survey or assessment procedure is not currently in place, historically faculty, staff and current graduate student and postdoctoral fellow interactions with alumni have been highly positive. For student assessment, please see section 5B.
**B.2. Graduate Program, Distance Masters Program**

A Distance MS Program in Pharmaceutical Chemistry was initiated in the Fall 2007 semester. While in principle available to individuals around the world, virtually all of the participants are full-time employees of US pharmaceutical and biotechnology companies. Admission to the Distance MS program is on a case by case basis. The candidates are expected to provide information as regards their past educational academic transcripts, any prior research experience, their past and present industrial experience, letters of recommendation from a professional in the field, a personal statement of their career goals and a proposed mentor at their current place of employment. Typically, candidates who have achieved a GPA of 3.0 are admitted to the program, if the various aspects of the applicant package are in order. In certain cases, individuals with a GPA < 3.0 will be admitted on probation, if evidence is presented attesting to their motivation, work ethic and/or maturity gained by employment in the private sector for a number of years. The Distance MS students typically have achieved the BS degree in disciplines such as biology or chemistry. Over the brief history of the program, admissions typically have been at the rate of 9 individuals per year with the average age being 32. To date the average GPA for this group of students has been 3.11 who have maintained a GPA of 3.27 in the program. The students in the Distance MS program are all supported by their private sector employers, being reimbursed as they successfully complete each didactic course and/or research hour with a grade of B or better. Students in the MS program are required to successfully complete a rigorous group of four core courses and electives to a total of 18-21 hours of didactic coursework. The students are further required to prepare a brief written research proposal involving a project that can be fully conducted at their private sector site and conduct said research with the result being a total of 9-12 credit hours of research activity. Together these activities comprise a total of 30 hours of graduate coursework with a required minimum of a GPA = 3.0. For the typical student who remains fully employed, the program has been designed to take approximately three years to complete, with the last step being the preparation of an MS thesis that is defended before a committee consisting minimally of three KU faculty plus the private sector research mentor. While the program is very young, the initial group of graduates are now (Spring 2010) being to emerge, which represents a completion time of slightly less than three years. Of the nearly 30 individuals who have entered the program, there are five individuals who are not currently enrolled and at this time their eventual status is unclear, caused, in part, by changes in their employment status in the industry.

**4. Overall Quality**

**A. Quantitative indicators.** The Department of Pharmaceutical Chemistry has an excellent national and international reputation in pharmaceutics. In particular the department is known to be strong in areas that correlate chemistry and pharmaceutics. This includes the fields of physical pharmacy, biopharmaceutics, drug delivery and bioanalytical chemistry. The University of Kansas School of Pharmacy is accredited by the American Association of Pharmaceutical Education; however, there is no accrediting body for Pharmaceutical Chemistry or Pharmaceutics departments. The School of Pharmacy is ranked number 2 in funding in the United States behind UCSF while the pharmacy school graduate program as a whole was ranked 19th by US News and World Reports. The Department has a significant presence of faculty on both the national and international scale. Eight of the faculty (basically all the full professors) are Fellows of the American Association of Pharmaceutical Sciences (AAPS). Two of the faculty received research achievements awards from the AAPS within the past ten years. The Department also founded the Globalization of Pharmaceutics Education Network. GPEN sponsors international meetings of graduate students every two years. Two of the faculty are International Fellows of the Academy of Pharmaceutical Science and Technology in Japan.
Many of the faculty travel extensively and give presentations at universities, companies and professional meetings throughout Latin America, Europe and Asia on a yearly basis. They also play a key role in the organization of international meetings in the areas of biopharmaceutics, drug delivery and analysis.

B. Reflections on passion statement. The Department of Pharmaceutical Chemistry at the University of Kansas most directly demonstrates its commitment to its students and research through its high level of accomplishments. This is reflected in both its high rate of publication in leading scientific journals and research funding. Furthermore, the leading general journal in the pharmaceutical sciences is edited from this Department and has seen an explosion in size and impact factor under the direction of Professor R.T. Borchardt over the last 10 years. The Department graduates 5-10 students per year with the PhD degree and at any one time has 25-30 postdoctoral fellows in residence. Students and fellows typically receive multiple job offers even during difficult financial times and occupy leadership positions throughout the pharmaceutical and biotechnology industry (Pfizer, Merck, Amgen, Genentech, etc.) as well as faculty positions at leading Universities (The University of Colorado, Wayne State, Baylor, etc.). The University of Kansas Macromolecule and Vaccine Stabilization Laboratory provides worldwide leadership in the formulation of vaccines, protein therapeutics and nucleic acid based pharmaceutical while individual Department scientists are generally considered major leaders in the formulation of cancer drugs, covalent degradation of biomolecules and drug delivery.

C. Overall Assessment. Exceptional. The excellence of the Department of Pharmaceutical Chemistry graduate program at the University of Kansas is recognized throughout the state, the country and world.

5. Plans to advance the program

A. Strategic Plan. To address necessary improvements to the academic program, the Department has developed a Strategic Plan. The 2007-2012 Strategic Plan was approved in September 2007 and revised in November 2008. The Department's mission, strengths and weaknesses were considered and the faculty made an assessment of the changes that have occurred and will likely occur in our environment which directly or indirectly impact on the Department's ability to fulfill its mission. The strengths and weaknesses of the Department and the changes that have occurred or will likely occur in our environment were reviewed and documented.

B. Plans to enhance quality and competitiveness. A number of goals and priorities have been presented already under 1. B. A few additional strategies are discussed in the following: recruiting the Nation's top graduate students into our graduate program is a constant challenge due to the fact that we do not only compete with Schools of Pharmacy, but with chemistry and biochemistry departments in major research universities/medical schools such as, for example, the Mayo Clinic, Princeton University, UCSF and others. Many of these schools have implemented large translational research efforts, supported by CTSA grants, and the fact that KU does not (yet) have such a grant focusing on translational research represents a hurdle at attracting students interested in such a career. However, despite the lack of a CTSA grant, especially the School of Pharmacy has been very active at translational research, especially drug development, and the Department of Pharmaceutical Chemistry and its collaborators are playing an important role in this. It is, therefore, mandatory to relay this information to prospective graduate students. Since about two years, faculty of the Department have attended especially the graduate fairs of major national and international conferences, such as the American Chemical Society National and Regional Meetings, and we have accumulated a
database containing currently ca. 150-200 prospective graduate students (being now anywhere in their 2nd, 3rd, or 4th year of an undergraduate or masters program), who have expressed interest in our program. Frequently, these students had never heard the about the existence of “pharmaceutical chemistry” and became highly interested after reading through our poster presentations and/or through discussions with the faculty. In Fall 2010, the Department will initiate the design of a formal assessment plan. We are already rigorously assessing our graduate student progress in the classroom (through exams) and in research: prior to the OQE, all graduate students meet twice per year with the entire faculty to discuss course grades and research progress; after the OQE graduate students meet periodically with their dissertation committee to discuss the progress of the PhD dissertation. Subsequent to graduation, we keep in contact with our alumni to monitor their career progression. While this is outlined in the Student Handbook, it has so far not been separately outlined in a formal assessment plan.

C. Plans for innovation and new initiatives. The Department has started discussions with the School of Pharmacy at the University of Colorado, Department of Pharmaceutical Sciences, to implement a Center of Excellence in Biotechnology. The Colorado Department has a strong track record in biophysical chemistry and physical stabilization of biotechnology drugs, while the KU Department of Pharmaceutical Chemistry stands for excellence in protein chemistry and biochemistry, particle characterization, and vaccine design and stabilization. Building such a Center of Excellence would create a unique opportunity, with little national competition, which could be funded through the biotechnology industry as well as P30 Center grants from the National Institutes of Health (NIH). Both Departments are running an NIH-funded training grant in pharmaceutical Biotechnology, and as one of the initiatives we are planning to organize an annual meeting of all biotech training grant faculty and trainees of both universities. The Department has also initiated efforts to build two endowed chairs to help “replace” retiring faculty within the next 5 years. The Department and The University of Kansas are considering moving forward with a proposal that one of these endowed chairs will be named the "Ronald T. Borchardt Global Health Education Distinguished Professorship". This chair will be responsible for building and expanding the Department's global health research (e.g. vaccine discovery and development), for coordinating the admission of qualified students from emerging countries into our Distance Masters Program, which may be sponsored through fellowships from GPEN, and for fostering the Department's interaction with GPEN and the approx. 50 universities affiliated with GPEN to train the scientists and educators of the future who will be needed to improve health care World-wide.

6. How will you evaluate future progress and success

Within the Department, our metrics will remain student recruitment and success (i.e. retention, graduation time, and professional placement), student and faculty grant and research activity, and presentations and publications of students and faculty. These metrics will also be applied within the School and the University.