COVER PAGE FOR TRADITIONAL AND UNDERGRADUATE ENHANCEMENT PROPC
BOARD OF REGENTS SUPPORT FUND, FY 2007-08

007CHE-08

1. This Proposal Involves: __X__ One Institution
____More Than One Institution

2. Enhancement Subprogram: (check one)
__X__ **TRADITIONAL** ENH Program (Includes all multidisciplinary proposals)
____ **UNDERGRADUATE** ENH Program

3. This Proposal Is: (check one) __X__ Primarily an Equipment Request ____ Not Primarily an Equipment Request

4. Name(s) of Submitting Institution(s) of Higher Education (Include Branch/Campus/Other Components): **Louisiana State University in Shreveport**

5. Address of Institution of Higher Education: **Department of Chemistry and Physics, One University Place, Shreveport, LA 71115**

6. Title of Proposed Project: **Enhancement of the Biochemistry Laboratory Courses at LSUS**

7. First-Year Support Fund Money Requested: **$72,432**

8. Second-Year Support Fund Money Requested (if applicable): $

9. Proposed Duration (Circle # of Yrs.): (1) 2

10. Category In Which Proposal Is Being Submitted (check one only)
__ **BUSINESS** __ **MATHEMATICS**
__X__ **CHEMISTRY** __ **PHYSICS/ASTRONOMY**
__ **EDUCATION** __ **Special Multidisciplinary**

11. Using the Taxonomy in Appendix A of the RFP, Identify All Specific Subcategories of the General Category That Apply to This Proposal and Provide Taxonomy Numbers:
Subcategory(ies): **Chemistry-Other** Taxonomy Number(s): **0399**

12. This Proposal Is a: (check one) __X__ New Request ____ Request for Continuation of a Previously-Funded Support Fund Project
Provide previous contract number:

By signing and submitting this proposal, the signators are certifying that: (1) the proposed project has not already been funded/is not currently being funded/has not been promised funding; (2) this proposal has been reviewed and approved by an Institutional Screening Committee; and (3) the institution and the proposed project are in compliance with all applicable Federal and State laws and regulations, including, but not limited to, the required certifications set forth in: (a) Grants for Research and Education in Science and Engineering, NSF Grant Proposals Guide (GPG), NSF 03-2, effective 10/1/02, and (b) 45CFR 620, Subpart F (Requirements for a Drug-Free Workplace).

Name/Title/email (type or print) Institution (if different from Item #5 above)	Dept./Telephone No.	Degree/Year	Signature
PI/PD **Elahe Mahdavian** Assistant Professor of Chemistry Elahe.mahdavian@lsus.edu	**Chemistry & Physics** *318-797-5227*	**Ph.D./1998**	Mahdavian
Co-PI/PD **Richard E. Thompson** Professor of Chemistry Richard.thompson@lsus.edu	**Chemistry & Physics** *318-797-5087*	**Ph.D./1974**	
Co-PI/PD **M. Cran Lucas** Professor of Biological Sciences Cran.lucas@lsus.edu	**Biological Sciences** *318-797-5086*	**Ph.D./1974**	M. Cran Lucas

Campus Head or Authorized Institutional Representative		**Dean**		**Authorized Fiscal Agent**	
Name/Title/email: (type or print) **Stuart E. Mills, Provost**		Name/Title/email: (type or print) **Paul Sisson, Dean**		**Name/Title/email: (type or print)** **Mike Ferrell, VCBA**	
Signature: Stuart E Mills		Signature:		Signature:	
Date: 10-23-07	Telephone Number: **(318)-797-5374**	Date: 10/23/07	Telephone Number: **(318)-797-5231**	Date: 10/23/07	Telephone Number: **(318)-797-5278**

Name of Institution (Include Branch/Campus and School or Division)

Louisiana State University at Shreveport, College of Sciences

Address (Include Department)

Department of Chemistry and Physics
One University Place
Shreveport, LA 71115

Principal Investigator(s):

Elahe Mahdavian, Richard Thompson, Cran Lucas

Title of Project:

Enhancement of the Biochemistry Laboratory Courses at LSUS

Abstract (DO NOT EXCEED 250 WORDS)*

The enrollment of students pursuing science degrees especially the B.S. degree in Biochemistry at LSUS has steadily increased. Students are choosing such science majors in order to fulfill their undergraduate training and preparation to enter to graduate, medical, dental, pharmacy, and other professional schools. The strength of our academic environment is increasingly dependent on our ability to provide interactive, inquiry driven, and exciting hands-on experimentations in fully equipped science laboratories. Therefore, the faculty members conducting such laboratories are constantly revising the curriculum to provide students with best training of modern biochemical techniques and experiments. Currently, the biochemistry and related laboratories have insufficient equipment available to effectively perform several crucial experiments. The lack of advanced technological equipment in these laboratories has significant negative impact on the training, recruitment, and retention of our students.

We propose to address this deficiency by requesting funds for the purchase of 1) two *PCR thermal iCycler for DNA amplification*, 2) two *Experion* systems for *DNA/RNA/protein electrophoresis*, 3) and two *low-pressure (LP) liquid chromatography* systems for protein purification. These additions will greatly enhance the laboratory infrastructure, improve students' inquiry-based learning, students' problem solving skills, and effective time management. The students will spend more time on their own instrument, obtaining and analyzing data, and less time waiting in line to gain access to limited equipment. Ultimately, this will produce a greater number of higher quality, more marketable biochemistry graduates to meet the increasing needs of Louisiana and the nation.

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NARRATIVE

A. THE CURRENT SITUATION

1. Institutional Description: Louisiana State University in Shreveport (LSUS) serves 4,500 full-time students (28% minority; 37% low income) per year, drawn largely from the Shreveport metropolitan area (population: 400,000). It is the only public, comprehensive, four-year institution of higher learning in this metro area, which is Louisiana's third largest urban area. Established in 1967 and awarding B.S. degrees since 1975, LSUS now has several graduate programs, including the Master's in Biochemistry in cooperation with LSU Health Sciences Center (LSUHSC) in Shreveport. In the last academic year, 1,800 students took chemistry courses, largely from these six B.S. curricula: Chemistry, Biochemical Science (Biochemistry), Biological Sciences, Environmental Science, Allied Health, and Science Education. LSUS is accredited by the *Southern Association of Colleges and Schools (SACS),* and the LSUS Chemistry program is certified by the *American Chemical Society (ACS).* The College of Sciences enrolls the largest number of student majors at LSUS. In responding to regional needs, the College stresses solid preparation for chemists, biochemists, biologists, and related scientists to support area industries, in particular the rapidly growing biomedical and environmental sectors.

In addition to the *ACS*-accredited B.S. program in chemistry, LSUS offers a B.S. in Biochemistry that is jointly operated by the Departments of Chemistry and Biological Sciences. These two departments also partner to offer a B.S. program in Environmental Science as well as the M.S. program in Biochemistry/Molecular Biology in cooperation with Louisiana State University Health Sciences Center (LSUHSC) in Shreveport and the M.S. program in Environmental Science in cooperation with Louisiana State University in Baton Rouge. A total of 20 full-time faculty members and several part-time faculty at LSUS are involved in these programs. In the Fall semester, the number of chemistry majors formally declared was 31, biochemical science, 62, environmental science, 14. A five-year average of five *ACS*-certified graduates/year places our Chemistry Dept. near the top of Louisiana universities in production, without considering the respective campus student populations. The number of graduates in the chemistry program has been steadily increasing over the last six years, countering a Louisiana trend of declining numbers. The introduction of our biochemistry program has drawn many majors, and we graduate 10-15 biochemistry students annually.

This enhancement project is proposed to improve student training in biochemistry and related courses through utilization of new instrumentation: a PCR thermal iCycler for DNA amplification, two automated *Experion* systems for DNA/RNA/protein electrophoresis,and and two low-pressure liquid chromatography systems for protein purification. With this new instrumentation, students will be better able to perform relevant hands-on experiments with in their laboratory courses and in independent research projects. Students and faculty will also utilize the new instrumentation in research focusing on the Department's biochemistry research emphases.

2. Rationale for Project: Today, students with diverse backgrounds are seeking an education that will prepare them for careers in a global economy, with science, medicine, and technology serving as the common currency. New fields, such as nanotechnology, are opening up career opportunities for biochemists and will allow biochemistry to make an impact on our lives in more ways than ever before. Furthermore, science is becoming far more interdisciplinary than most people could have anticipated just10 years ago. These new developments place challenges upon us as educators in shaping our undergraduate curriculum to keep current with significant new educational paradigms. Doing this successfully is one of our main goals as educators. The NSF advocates undergraduate broad-based education that is not only interdisciplinary, but also fosters "direct experience with the methods and processes of scientific inquiry". In its report, Shaping the Future, NSF calls for educational innovations that make "direct experience with the methods and process of scientific inquiry" accessible to all undergraduate students. [NSF Advisory Committee for the Review of Undergraduate Science Education, Shaping the Future, 1996].

LSUS has an excellent reputation for providing quality undergraduate science education. Providing an exciting science laboratory experience to students is an essential component of our

science course curriculum at LSUS. As science educators, we believe strongly that our students' positive experience in the laboratory has a great impact on their recruitment, retention, and training. Solid laboratory training is a crucial component for building a strong foundation in basic biochemical science education.

As a result of the renovation of the Science Building, the biochemistry, cell and moleular biology, and applied biotechnology laboratories are taught in an upgraded lab facility dedicated to these laboratory courses (second floor of science building, SC-206). The laboratory is divided into six student workstations. The number of students at each workstation will vary from course to course and with the number of students enrolled in each section. Currently, we have insufficient equipment in three major areas of biochemical experimentation including, 1) PCR-DNA amplification, 2) DNA/RNA/Protein electrophoresis; 3) Chromatography.

PCR-DNA Amplification -- The polymerase chain reaction (PCR) is a very important biochemistry technique for exponentially amplifying a fragment of DNA, via enzymatic replication, without using a living organism (such as *E. coli* or *yeast*). Developed in 1983 by Kary Mullins, PCR is now a common technique used for a variety of tasks in medical and biochemical research laboratories, such as DNA sequencing, identifying genetic fingerprints, detecting and diagnosing infectious diseases, and creating transgenic organisms. PCR-DNA amplification complements a number of different experiments in our biochemistry and related laboratories at LSUS (see table 1). Currently only two PCR machines are housed in the College of Sciences, one is dedicated for the genetics lab that is taught by the Department of Biology, and the other one is used for graduate student/faculty research in the Department of Biology. Both of these PCR systems are single-temperature machines. With the increasing number of students enrolled in biochemistry and related laboratory courses, we clearly need to purchase additional PCR machines to better equip these laboratories. In this proposal, we request the funds to purchase two new dual-temperature PCR systems, which will be used in the Biochemistry laboratories as well as in the Cell and Molecular laboratories that support the Biochemistry, B.S. degree program. The dual-temperature PCR instruments have the added advantage that they can run two experiments simultaneously at two different temperatures. This instrument will also allow us to incorporate new exercises in *forensics and genetic-fingerprinting* in these laboratory courses.

DNA/RNA/Protein Electrophoresis -- Gel electrophoresis is a technique used for the separation of biomolecules, such as nucleic acids and proteins, using an electric field. It is usually performed for analytical purposes, but may be used as a preparative technique to partially purify biomolecules prior to the use of other methods (e.g., mass spectrometry, PCR, cloning, DNA sequencing, or southern blotting). Electrophoresis is a very important and widespread technique that complements a number of our experiments in biochemistry and related laboratories (see table 1). Currently, we have an insufficient number of conventional electrophoresis units (DNA/agarose & protein/PAGE). Students are forced to work in larger groups of 4-5, which deprives them from obtaining up-close and adequate access to the instrumentation. Our electrophoresis units also run on obsolete and inefficient power supplies. The gels are often not developed within the time frame of one laboratory session and therefore the experiment exceeds the allotted laboratory time. The instructor must come back after the laboratory hours to turn the power supply off, stain, and destain the gels. As a result, it takes an additional week before the students can see and analyze their results. Furthermore, the students do not gain the hands-on experience that comes with running a gel and are deprived of a good practical learning opportunity. These students also miss out on an opportunity to further develop proper analytical and critical thinking skills. As a result, students often lose interest and become frustrated. In this proposal, we request the funds for the purchase of two automated *Experion* electrophoresis systems. The *Experion* is the most versatile gel electrophoresis system currently commercially available. It performs all the steps of gel-based DNA/RNA/protein electrophoresis. We also request funds to purchase *Experion* DNA/RNA/ protein student analysis kits to be used with the new *Experion* systems. The *Experion* system is based on similar principles as the one used in the conventional electrophoresis units. Students pour the gel onto each microchannel-configured well on the chip and wait for the gel to solidify. Students then load the controls and samples onto appropriate wells on the chip. The electrical current is then applied to the chip and the samples are separated based on the *size/charge* ratio. The main advantage of the *Experion* system is that it performs electrophoresis, staining, destaining, imaging, band detection, quantitation, and even some data analysis

in a single 30-minute step. This provides tremendous timesaving advantages for our undergraduate laboratories that will allow our students to carry out an entire gel-electrophoresis experiment in a single laboratory session. The students will benefit by using a lot of the advanced features of the *Experion* system and will thereby be able to analyze their electrophoresis data more thoroughly and accurately. This instrument will also allow us to incorporate new exercises in gel-based DNA/RNA/protein electrophoresis. In addition to substantial time savings for the teaching laboratories, the *Experion* systems will also be used for all of the basic protein and DNA/RNA separations/purifications necessary for our research. For example, the *Experion* will be used for protein separations (Western blotting), PCR and cloned DNA fragment analysis and isolation (Southern blotting), determination of mRNA quality prior to use for microarray analyses, and for traditional determination of mRNA levels (Northern blotting).

Low Pressure Liquid chromatography -- Chromatography is the collective term for a family of laboratory techniques for the separation of mixtures. It involves passing a mixture dissolved in a "mobile phase", through a "stationary phase ", which separates the analyte to be measured from other molecules in the mixture and allows it to be isolated and purified. There are three major types of chromatography; 1) ***Ion exchange chromatography*** is a process that allows the separation of ions and polar molecules such as amino acids, DNA, and proteins, based on the charge properties of the molecules; 2) ***Size exclusion chromatography*** is a chromatographic method in which large molecules such as polymers and proteins are separated based on their size. Smaller molecules enter a porous media and take longer to exit the column, whereas larger particles leave the column earlier; 3) ***Affinity chromatography*** is a chromatographic method of separating biochemical mixtures, based on a highly specific biologic interaction such as that between antigen/antibody, enzyme/substrate, or receptor/ligand. Chromatography is an important technique that is used in a number of experiments in biochemistry and related laboratories at LSUS (see table 1). Currently, our core laboratory severely suffers from inadequate chromatography instrumentation. We have constructed two semi-automated liquid chromatography systems using several stand-alone components such as columns, UV detector, pump, and fraction collector. These fabricated systems are low-performance, inefficient, inadequate, and obsolete. In this proposal, we request the funds for the purchase of two standard *Biologic Low Pressure (LP)* systems. The *BioLogic LP* chromatography system offers high performance, versatility, ease of use, and affordability to biomolecules chromatography. The *Biologic LP* system carries out all three different type of chromatography using different pre-packed columns and cartridges. The addition of these two instruments will allow students to work in smaller groups of 2-3. These instruments (dedicated to the core laboratory) will also allow us to add new exercises, including separation of biomolecules such as amino acids, DNA, and RNA, using *LP* chromatography.

The core instructors involved in the teaching of the biochemistry and related laboratories feel that it is very important to improve the quality and the quantity of the advanced instrumentation in the three areas of PCR/electrophoresis/chromatography. Giving these laboratory courses their own dedicated and adequate number of PCR/Electrophoresis/LP systems will provide each student with much improved hands-on experience and learning opportunity. Students gain better experience in learning modern biochemical skills that will be critical to their success in the future as they enter into graduate schools, professional schools, or industrial careers.

Table 1: Laboratroy Experiments that Involves *DNA Amplification/Electrophoresis/LP Chromatography*

Course	DNA Amplification *PCR Termal ICycler*	DNA/RNA/Protein *Experion Electrophoresis*	Chromatography *Biologic LP-System*
Biochemistry ***BCHM410L***	1) BioRad-PV92 PCR Informatics Kit DNA Extraction/ PCR Amplification	1) BioRad-PV92 PCR Informatics Kit DNA Electrophoresis	
Biochemistry ***BCHM412L***		1) Isolation & Purification of α-lactalbumin from Bovine Milk 2) Protein Purification Project	1) Isolation & Purification of α -lactalbumin from Bovine Milk 2) Protein Purification Project
Cellular Biology ***BIOS330L***	1) Amplification of VNTR Sequences from Nuclear DNA	1) Electrophoresis and Characterization of RBC Plasma Membrane Proteins	
Genetics ***BIOS363L***	1) DNA Isolation	1) DNA Electrophoresis 2) Protein Isolation/Electrophoresis	
Molecular Biology ***BIOS 430L***	1) Isolation of Rat Liver DNA 2) Isolation of Plasmid DNA 3) PCR amplification of Ribosomal Genes	1) Electrophoresis Analysis of Green Fluorescent Protein (GFP) 2) Electrophoresis of Rat Liver rRNA & tRNA	1) Purification of Green Fluorescent Protein Expressed in *E. coli*
Applied Biotechnology ***BIOS465***	1) Extraction of chromosomal DNA from *Wild-type* and *pma1* strains 2) PCR Amplification of *PMA1*, and *pma1-s1* from *Yeast*	1) DNA Analysis: Agarose Gel Electrophoresis, and Quantification of DNA 2) DNA Analysis: Agarose Gel Electrophoresis, and Quantification of DNA	

3. Impact on Existing Resources.

The requested equipment will complement and significantly enhance the infrastructure of our teaching laboratories and give our students hands-on experience with modern PCR/Electrophoresis/LP chromatography equipment and procedures. The procurement of these instruments will be a major catalyst for stimulating additional laboratory experimentation and development of new laboratory exercises. The new equipment will also improve the pedagogical environment and allow the students to work more efficiently and effectively. The requested equipment will greatly facilitate the undergraduate research program. Student research experiences will be aided by access to state-of-the-art equipment that will enhance their technical skills, problem-solving abilities, and confidence. Enhancing the practical and advanced learning environment will contribute to student success in their future endeavors in graduate school, medical school, other professional schools, or in the technology dependent job market of the 21st century. Utilization of up-to-date scientific equipment in the laboratory will provide students enhanced technological training to maximize their educational and professional success. These critical resource improvements will also stimulate the department to seek additional avenues of support for the acquisition of other equipment necessary to continue advancing the biochemistry and related laboratory experience for our students.

B. THE ENHANCEMENT PLAN

1. Project Goals and Objectives:

The overall goal is to improve laboratory training for students in biochemistry and related fields at LSUS. The primary project objective is to address specific instrumentation needs for the biochemistry and related science laboratories. This proposal requests funds to support the purchase of *PCR/Electrophoresis/LP Chromatography* systems necessary to improve student's practical and advanced science laboratory learning. Approximately 190 students per year are served in the biochemistry and related laboratories. The new instruments will allow students to effectively use the laboratory time to perform inquiry-driven experiments and to become familiar in using technologically advanced instrumentation. These technical skills will greatly serve students as they explore various biomedical related avenues either graduate schools or any medical professional schools. In this proposal we are requesting the purchase of key equipment including: **1.** Two *Bio-Rad -- PCR thermal icycler* systems (one per three workstations); **2.** Two BioRad -- *Experion* DNA/RNA/protein electrophoresis systems (one per three work stations); **3.** Two *BioRad* -- chromatography *standard biologic LP* systems (one per three work stations). In addition, we are also requesting the purchase of the following smaller items to fully equip each of the six workstations in our core laboratory, 1) six microcentrifuge systems (one per work station), 2) six sets of three micropipettes ranging: 0.5-10 μL, 20-200 μL, 0.2-1 mL (three micropipettes per work station). The direct beneficiaries will include an estimated of 631students at LSUS enrolled as biochemistry and related majors (according to 2007 statistics).

2. Work Plan of Proposed Project:

The acquisition of the proposed equipment will allow our teaching laboratories to operate far more efficiently. Enrollment in biochemistry labs for 2007 is up 33% from 2002/03. With the number of students in our science undergraduate teaching laboratories steadily growing, the plan of this project is to improve technological advances in three major areas: PCR-DNA amplification; DNA/RNA/protein electrophoresis; and chromatography.

Biochemistry Lab Enhancement: Major Equipment Needs:

BioRad -- DNA Amplification: PCR Thermal iCycler -- The *iCycler* instrument offers excellent thermal performance, fast ramping, intuitive programming, flexible assay formats, and optional upgrades for real-time PCR. It includes many user-friendly features, including help screens and reference lists, which guide students through experiments. The high-resolution graphical interface

simplifies file and protocol management and allows printing of a variety of reports. In addition, this PCR is a dual-temperature machine capable of running two experiments at two different temperatures simultaneously. The two PCR machines in the biology department are not capable of this type of performance (and both are dedicated to specific other labs/programs).

BioRad -- Experion Automated DNA/RNA/Protein Electrophoresis System -- The DNA/RNA/protein *Experion* elctrophoresis system will expand student access and have capability far beyond our current conventional electrophoresis equipment. The *Experion* system automatically performs all the steps of gel-based DNA, RNA, and protein electrophoresis. It performs sample separation, staining, destaining, imaging, band detection, quantitation, and even some data analysis in a single automated 30-minute step. The system allows for accurate, single step protein electrophoresis ranging from 10 to 260 kD and DNA/RNA purity determination at nanogram and picogram levels. The *Experion* system contains convenient data analysis tools including: automatic sizing and quantitation calculations, intuitive navigation of separation and data analysis screens, quick comparisons of protein or DNA/RNA components across the chip. The *Experion* system is also the ideal complement to a number of research applications, including, determination of mRNA levels (Northern blotting), mRNA integrity assessments prior to microarray and real–time PCR experiments. It also provides quick protein purity analysis and results in digitized formats, which complements protein applications such as protein separations (Western blotting), laboratory-scale chromatography, crystallography, and process-scale purification.

BioRad -- Low Pressure Liquid Chromatography Biologic LP System -- The *BioLogic LP* low pressure liquid chromatography system offers high performance, versatility, ease of use, and affordability to biomolecule purifications. Its compact design minimizes the workspace required in the coldroom or on the laboratory bench. The *BioLogic LP* system includes features such as: ***1) LP Data View Software***-- easy to use software designed for the *BioLogic LP* System; the software captures data, multitasks, and prints data from any computer that runs on Windows 95,98, Me, NT version 4.0, 2000, or XP operating systems; requires use of one serial port, **Methods storage-** The system stores up to 50 methods; each method can include up to 50 pump steps and 50 fraction collection steps. ***2) Buffer selection*** -- Select up to 5 buffers and completely automate sample separation with the addition of an SV-5 buffer select valve; the valve can also be used to automatically load large sample volumes. ***3) Detection capabilities*** -- The system includes both 280 and 254 nm filters for protein and nucleic acid detection, and a conductivity cell to monitor gradient progress. ***4) A high flow pump*** --The system houses a peristaltic pump with a flow rate range of 0.05- 40 ml/min and maximum backpressure of 30 psi; the system is compatible with Econo- Column low pressure chromatography columns, UNO sphere, Bio-Gel P, and Macro Prep chromatography media, Bio-Scale Mini and Econo Pac cartridges, Amersham Hi Trap cartridges, SOURCE media, and all other low- pressure chromatography media. ***5) Fraction Collection*** --The system offers both simple and sophisticated fraction collection choices; collect into eighty 13 x 100 mm tubes or microtubes using model 2110 fraction collector, or collect into virtually any size container, from microplates to carboys, using the BioFrac fraction collector; in addition, the BioLogic LP System supports the use of many non Bio-Rad collectors.

All new major equipment, the *PCR/Experion automated electrophoresis/LP Chromatography* systems, will be housed and maintained in core laboratory space (SC206) dedicated to the biochemistry and biotechnology laboratories.

Plan for Equipment Utilization: The proposed equipment will primarily be used in instruction and research as described below:

Instructional Utilization: To achieve our objectives, experiments utilizing the new instruments will be selected and modified into a more inquiry-driven (discovery) mode. The following courses will utilize the new instrumentation **(see also a list of experiments in table 1)**.
BCHM 410L Biochemistry and Molecular Laboratory I (and graduate-level parallel course BCHM 610L): 20 students/year. This course is required for biochemistry majors and is often chosen as an elective by biological sciences majors, and required for students in either curriculum who wish to specialize in molecular biology. This course provides a hands-on introduction to the techniques

practiced in a modern biochemistry laboratory including, buffer chemistry, pipetting, spectrophotometry, DNA isolation/amplification/electrophoresis, protein concentration, enzyme structure/function/kinetics, and bioinformatics. Students are usually divided into small groups of 2-3 to utilize the principles of interactive-learning and team working skills. The availability of multiple PCR/Electrophoresis/LP systems makes the small-group activities practical, productive, and an efficient use of student laboratory time.
BCHM 412L: Biochemistry and Molecular Laboratory II (and graduate-level parallel course BCHM 610L): 20 students/year. This course is required for biochemistry majors, often chosen as an elective by other sciences majors, and required for students who wish to specialize in molecular approaches This lab allows students to explore important biochemical concepts and techniques including; protein isolation, determination of protein structure/function/concentration/ electrophoresis /purification/, immunoassays, and bioinformatics . The requested LC system will be utilized in two experiments throughout this course. The first experiment involves the isolation of a-lactalbumin from Bovine milk. In the second experiment, students will be given an unknown solution, which contains two or three proteins and will be asked to identify, purify, and quantify each component of their unknown protein mixture. Exercises, written by the instructor, have been specifically designed to expose the pre-graduate, pre-medical and other pre-professional students to a variety of biochemical techniques and associated computer methods.

BIOS 330L: Cellular Laboratory- 50 students/year. This course is required for biochemistry majors and serves as an elective for other majors. This laboratory course is an introduction to the structure/function of a variety of moneran, plant, and animal cells and provides techniques of investigation of cell structure/ function, microscopy, isolation of cell organelles, and cytochemistry. Exercises, written by the instructor, are specifically designed to expose the pre-medical and other pre-professional students to biochemical and cellular techniques used to characterize cellular organelles and their associated enzymes as well as other cellular physiological processes. Table II summarizes the experiments in this course that will utilize the new instrumentation. Laboratory sections for this course average 20-30 students and 2-3 lab sections are offered as needed. Students are usually divided into groups of 4-6 students. If each group has access to its own instrumentation the efficiency of operation and the efficacy of the learning environment will be greatly enhanced.

BIOS363L: Principal of Genetics Laboratory- 50 students/year. This course is required for both biochemistry and biology majors. This laboratory course provides the opportunity to apply basic genetic principals in analyses of various experiments including: DNA isolation/purification/electrophoresis and protein isolation/purification/electrophoresis.

BIOS430L: Molecular Laboratory- 15 students/year. This course serves as an elective for biochemistry and other majors who wish to specialize in molecular biology. It provides training in the experimental techniques of molecular approaches including: macromolecular purification, electrophoretic analyses, recombinant DNA and cloning techniques, DNA sequencing, and polymerase chain reaction. Exercises have been specifically designed to expose the pre-medical and other pre-professional students to molecular techniques used to characterize DNA, RNA, and nucleic acid functions.

BIOS 465: Applied Biotechnology Laboratory- 20 students/year. This course consists of one hour of lecture and six hours of lab per week. It is often chosen as an elective in the biochemistry and other curricula and is required for students in either curriculum who wish to specialize in molecular biology. This course is an enquiry-based laboratory that gives students "hands-on" experience with gene cloning technology. Students tackle real problems, design experiments, and analyze results. The exact experiments will vary from one semester to another. Techniques utilized include plasmid purification by cesium chloride density gradient centrifugation, dialysis, UV spectroscopy, bacterial electroporation, agarose gel electrophoresis, restriction digestion, ligation, and genetic transformation using the *Agrobacterium* system. In previous semesters, students have transferred pea glutathione reductase genes and yeast protein kinase genes into cotton callus using the *Agrobacterium* transformation system. PCR/Electrophoresis/will be utilized in several experiment in this laboratory course which are listed in table 2.

CHEM 290 and CHEm490, BIOS490, BIOS491, BIOS492: 20 students/year. Independent Study, Undergraduate Research, Honors Thesis, Graduate Thesis (CHEM 690). These courses are often taken as electives by the students with approval from the department, or by graduate students in the Environmental Science and Biochemistry M.S. programs. The faculty at LSUS has made a major effort to transform our programs from a tradition of primarily teaching to an orientation in both teaching and research by encouraging qualified upper level majors to enroll in at least one semester of basic research in addition to the regular teaching laboratories. These courses allow undergraduates to receive credit for original research projects carried out under the direction of a faculty member. These courses will benefit greatly by access to the new PCR/Electrophoresis/LP equipment requested in this proposal.

Research Utilization: In addition to use of the *PCR/Electrophoresis/LP Chromatography* in biochemistry and related laboratory courses, The PI and the two co-PIs along with their undergraduate research assistants will employ the proposed instrumentation in their research. Dr. Mahdavian and her collaborators at *LSUS* and *LSUHSC* are involved in a number of research projects in the field of medicinal chemistry, with an emphasis on the design and synthesis of new cancer therapeutic agents. Dr. Mahdavian is the PI on a funded *BORSF-RCS (2005-08)* grant entitled, "*Synthesis of Novel Vitamin E Analogs with Potent Anti-Cancer Activity*". She has also received several summer *LA-BRIN* grants for her research project entitled "*Synthesis and Biological Activity Assessment of Fusarochromanone Analogs*". The goals of this research include the development of new mitochondrially-targeted anti-cancer drugs and new anti-angiogenic agents. During the course of the chemical syntheses, we currently purify the synthetic intermediates using conventional flash liquid chromatography in glass columns that we pack with silica gel. This is both time-consuming and inefficient. An automated *LP chromatography* system would enable us to purify our synthetic compounds more quickly and efficiently by automating some of our purification efforts. This would be a great addition to the research infrastructure of our core chemistry research program at LSUS.

After purification and structural characterization of our compounds, we submit some of them to our research collaborators at *LSUHSC* for the assessment of their biological activity. The new *Experion* gel electrophoresis will enable us to carry out some of the aspects of this research in the core chemistry research laboratory at LSUS. The *Experion* system could also be utilized in collaborative projects with Dr. Clifford at *LSUHSC* to investigate the *mRNA* integrity assessments prior to microarray experiments.

In addition, the two co-PI's, Drs. Thompson and Lucas frequently perform biochemical, cell, and molecular research with undergraduate students at LSUS. They will be able to utilize the new *Experion* system to carry out a number of foundation techniques such as protein separations (Western blotting), *PCR* and cloned *DNA* fragment analysis and isolation (Southern blotting), determination of *mRNA* quality prior to use for microarray analyses, and for traditional determination of *mRNA* levels (Northern blotting). Overall, this new instrumentation will make research efforts in the LSUS College of Science much more versatile and efficient.

Roles/Responsibilities: General faculty responsibilities will involve the PI and two co-PI's in the instruction of the designated courses and in research. These individuals will also train other faculty members in the selection of appropriate experiments for instructional purposes. Dr. Mahdavian's (PI) primary responsibility will involve purchasing, general oversight, upkeep of the instrumentation, and faculty training and orientation. Drs. Thompson and Lucas will oversee the use of the new *PCR/Electrophoresis/LP Chromatography* instruments in their instructional coursework in lab. They will also help with faculty training and coordination of student and faculty use of the new instrumentation for both teaching and research. In all cases, faculty members associated with particular demonstrations or new experiments will test them in the lab and revise as necessary.

Schedule: This is a 1-year grant request (7-1-08 to 6-30-09). If fully funded, the six major instruments will be purchased and installed in time for use in fall 2008. The equipment will be used in the courses as they are scheduled during their normal rotation through the 2008-2009 academic years (and beyond), and by researchers, both faculty and students, beginning in fall 2008.

July 1, 2008 -- Bids will be solicited and major instrumentation will be ordered, and the

installation will be scheduled.

August 15, 2008 -- Preliminary instructional experiments will be written and testing of the experiments underway.

September 1, 2008 -- Utilization of the new resources in the lab courses will be underway.

October 1, 2008 -- Faculty will be trained by the PI and co-PIs on the new instrumentation. All new and revised laboratory experiments will be tested by faculty and selected teaching assistants. Faculty and student research using the new instrumentation will also be underway.

June 1, 2009 -- All experiments will have been performed in appropriate courses and revised as needed. More faculty and student research will be in progress. Project evaluation reports will be completed for the Board of Regents.

3. Evidence of Potential to Achieve Recognized Eminence. Biochemical instrumentation enhancement will help to increase LSUS's level of regional eminence, commensurate with our status as a primarily undergraduate institution. Biochemistry faculty members are already active in scholarly activity, participation, and publication. This project will support increased eminence in LSUS's tri-fold mission of Education, Research, and Community Service/Outreach:

Educational Eminence: Undergraduate Education: LSUS's College of Sciences has taken the lead in applying innovations in science education reform to its degree programs and to teacher training programs, both on and off campus. Guided inquiry (discovery) laboratory work is now a major part of all lower and upper level science courses. For example, Chemistry has adopted the spiral learning approach recommended by the *Council on Undergraduate Research* and the *Journal of Chemical Education.* This pedagogy builds student interest with relevant, real-world examples to introduce concepts and experiments in lecture, laboratory, and research experiences. The final report of the review of Louisiana chemistry programs by the Louisiana Board of Regents states "The (LSUS) department maintains a quality undergraduate program," and that the "Faculty are dedicated and competent." A five-year average of ACS-certified graduates/year places LSUS second only to LSU-BR among Louisiana universities in annual production of *ACS*-certified graduates, without considering the respective campus student populations; LSUS ranks first in the state in the **percentage** of graduates certified by the American Chemical Society.

Clearly, we have high expectations from our chemistry and biochemistry graduates, and student success provides a good measure of eminence for a primarily undergraduate program. In the past eight years, LSUS chemistry graduates have sought advanced education and have been accepted into graduate programs at the LSUHSC and at other institutions: LSU-BR, University of New Orleans, Mississippi State University, Arizona State University, University of Colorado, University of Arkansas, University of Idaho, and the University of South Carolina.

Over the past eight years, faculty members have received awards for instructional laboratory improvement from the NSF for integration of UV-visible spectrometry, liquid chromatography, and NMR technology into undergraduate chemistry education. For chemistry faculty, 20 campus research and development grants have helped the chemistry and biochemistry faculty publish more than 20 papers. The undergraduate chemistry program at LSUS has made the transition from the original strictly teaching mission of this institution to a more balanced blend of instruction and research. In recognition of the early phase of this transition, the National Science Foundation awarded the College of Sciences an Academic Research Infrastructure (ARI) grant of $1.47 million (largest NSF-ARI award ever given in LA) to renovate the Science Building. This award supplemented $3.5 million in state funds for the renovation, which included HVAC, wiring, ADA, and other infrastructure upgrades. Most chemistry faculty members are active in research and seriously involve their students in research. The Departments of Chemistry and Biological Sciences have formed major cooperative interdisciplinary efforts in biochemistry, biotechnology, and environmental science. During the past 8 years, more than 300 chemistry, biochemistry, and environmental science undergraduate majors have participated in faculty-led research projects, and LSUS has been officially recognized by the Board of Regents for excellence in involving undergraduates in research.

Science Teacher Preparation: LSUS Sciences faculty has provided leadership in applying the

concepts of science education reform to primary and secondary education teacher training. Teacher preparation has been the focus of *LaSIP* (*La. Systemic Initiative Program*) and *LaCEPT* (*La. Collaborative for Excellence in Preparation of Teachers*) grants to science faculty who have conducted annual summer workshops to train over 600 teachers in the guided inquiry approach to science teaching. Such programs held on the LSUS campus are part of a statewide effort designed to bring about systemic change in the way science is taught. The Chemistry faculty also developed a sequence of integrated science lecture and laboratory courses based on inquiry pedagogy to serve as the science foundation sequence for elementary teacher education majors. (LSUS offers the only *NCATE*-accredited Education programs in Shreveport, Louisiana's third largest metro area.)

Research Eminence: New opportunities for LSUS to gain greater research eminence will be enhanced via utilization of the proposed biochemical instrumentation. The P.I. and co-P.I.s are actively involved in several exciting research projects which have already attracted significant external funding, given LSUS's status as a regional, primarily undergraduate institution. These investigators all have consistent publication track records, demonstrating that they are serious about research. The LSUS College of Science has several established collaborations and partnerships with major area universities, industries, federal and state agencies, and local governments. These include: LSUHSCS, Fiest-Weiller Cancer Center, BASF, International Paper, Calumet, UOP, Olin, Calloway Chemicals, Willis Knighton Health Care System, Christus Schumpert Health System, EPA, USDA, Barksdale AFB, LDEQ, LSU AgCenter, among others.

In order to maintain this degree of research eminence, we must meet the ever-increasing challenges of attracting high caliber students, as well as significant long-term state and federal research funding. The new PCR/Electrophoresis/LP systems will help our faculty members succeed in higher caliber research efforts, and it will allow our graduates to compete in today's science job market. Our current science students will likely go on to work in exciting new fields like nanotechnology, rational drug design, and "smart polymer" chemistry, and companies are seeking students who not only have very strong fundamental classroom and practical laboratory knowledge, but also interdisciplinary research experience. Our new instrumentation will enable us to continue meeting the new research demands placed upon it by our faculty and students.

Community Service/Outreach Eminence: LSUS College of Sciences faculty are active in community service and outreach programs designed to foster science-related activities for the public and improve science instruction at the pre-college level. *LaPrep*, a summer science enrichment program for minority and women middle school students has won national acclaim from the U.S. Dept. of Education Minority Science Improvement Program and the U.S. Dept. of Energy. The College of Sciences has hosted the *NSF Young Scholars Program*, in which promising high school students participated in faculty research projects. LSUS annually hosts the Regional Science Olympiad for school students. LSUS Science faculty members also assisted in the establishment of *SciPort*, a "hands-on" science museum, and several faculty serve on *SciPort's* board of directors.

4. Impact on Curriculum and Instruction: The new *PCR/Electrophoresis/LP Chromatography* instrumentation enhancement will contribute to the college of science's efforts to emphasize laboratory experiences as a source of learning concepts in Biochemistry and related courses. Students will often use the equipment to engage in discovery (guided inquiry) experiments in order to enhance learning and the development of improved problem-solving skills. The availability of the new instrumentation will increase the focus on improved student access to relevant modern techniques in biochemistry and related laboratories. All students in advanced science laboratory courses will conduct hands-on experiments that utilize PCR DNA amplification, DNA/RNA/Protein electrophoresis, and LP purification/chromatography techniques. Science education students in these courses will obtain additional experience in inquiry-driven learning pedagogy and interdisciplinary concepts, important components of science reform. Expanded opportunities for student research will offer experience in a greater range of research methods and projects. This in turn will enhance curricular interest and retention in chemistry, biochemistry, and related fields. (See table 1 for list of courses/experiments facilitated with the new equipment.)

5. Impact on Quality of Students. The Louisiana community college system has significantly expanded statewide for the past couple of years. Therefore, we need to increase our competitive

advantage in attracting those students who want more than just a textbook education. Enhanced practical training and research opportunities in the sciences are two big advantages that LSUS has over community colleges. By supporting instrumentation enhancement for both education and research, this grant will increase our ability to attract a greater percentage of the best and brightest students from area high schools. About 190 students per year at LSUS will be exposed to the enhanced biochemical instrumentation in biochemistry and related courses. The proposed instrumentation will allow the students to carry out experiments more effectively, and with more hands-on access to the equipment. Furthermore, the new enhanced instrumentation will be employed in new ways within Biochemistry/Biotechnology/Genetics/Cell/Molecular laboratory courses. This grant project will also help address the problem of too few students, especially women and minorities, entering science related careers. Access to modern technology can attract students who are undecided about a curriculum. High quality research projects will also attract high quality students. According to the Report of the NSF Disciplinary Workshops on Undergraduate Education, involvement in research is one of the best ways to recruit and retain good science students. The enhanced instrumentation, combined with the two recent new chemistry faculty hires, will increase faculty-led research opportunities for students in our department. The result will be production of a greater number of better-trained chemistry and biochemistry graduates who go on to success in their careers and/or advanced academic endeavors.

6. Impact on Faculty Development. The LSUS institutional motto is "Expect Excellence", and we as faculty members try to adhere to this in every aspect of the profession. We expect it from ourselves and from our students. The excellence of instrumentation is also very important, as it helps set the standard for how we convey knowledge to our students, and how they acquire a practical understanding of the things we teach them. This is particular important in science laboratory courses. In a recent evaluation of the our faculty, the Board of Regents stated, "The caliber of faculty at LSU-Shreveport is very high". It went on to say that the sciences faculty, as a whole, are "meeting the triad of teaching, research, and service in various ways." The requested instrumentation will improve pedagogical effectiveness as well as provide effective practical experience to students in laboratory courses and in research. Faculty members, especially in the sciences, need to keep abreast of powerful new experimental techniques and to convey those new techniques to our students. This is particularly true for things that are difficult to teach with a textbook alone such as modern biochemical techniques. Since the P.I. and co-P.I.'s will use the new instrumentation in research, they can bring this knowledge directly to students, regardless of how it is described in the textbook. Faculty involved in this project will also develop new experiments to utilize the more advanced capabilities of the new instrumentation in upper level laboratory courses as well as in research. Modern equipment is also important for future recruitment of new faculty. Excellent facilities and up-to-date instrumentation are the catalysts that will further our pursuit of excellence.

7. Performance Measures: Quantitative and qualitative measures will be used to document progress toward meeting objectives, with specific benchmarks to be achieved by the end of the grant funding. These short-term benchmarks include: **1.** At least 190 students from the described courses will have performed one or more experiments with the new instrumentation. **2.** At least three faculty and 6 students will have used the new equipment in independent research projects with publications/presentations. **3.** At least two new research grants will be submitted by July 1, 2009, describing key experiments that take advantage of the enhanced capability of the new biochemical/biomedical instrumentation. For assessing longer-term effectiveness, several types of information will be collected. Records of usage of the equipment and the nature of that usage will be maintained. Student enrollment, retention, completion, grades and other records will be analyzed. Students in each of the courses using the new instrument will be surveyed, at the end of the course, concerning the value of the enhanced practical training in the course and their intent to take additional related courses. Faculty will be surveyed on how the new *PCR/Electrophoresis/LC* instrumentation has affected their teaching and research activities and their students' learning. Over the longer term, faculty and student research production can be assessed from publications, presentations, successful grant applications, etc. The Department will continue to maintain accurate records of the post-graduate activities of alumni. Graduates will be surveyed to determine the value of skills learned in their careers. On a regular semester basis, the existing institutional effectiveness process will continue. Students will

evaluate instructors, and faculty will evaluate the competence of students in the courses and in research work.

C. EQUIPMENT

1. Equipment Request: (See details in Budget Narrative)

The following equipment items are needed to enhance both laboratory instruction and research in biochemistry at LSUS. **Total Request: $72,432.**

PCR-DNA Amplification -- The College of Sciences has two PCR machines, and both are single-temperature machines dedicated for specific Department of Biology programs. With the increasing number of students enrolled in biochemistry and related laboratory courses, we need additional, more modern PCR machines for biochemistry training. Funds are requested to purchase two new dual-temperature PCR systems which can run two experiments simultaneously at two different temperatures. These instruments will enable incorporation of new exercises in *forensics and genetic-fingerprinting*. **2 *PCR iCycler* systems, 4 PCR tubes: $15,188.**

DNA/RNA/Protein Electrophoresis -- We have an insufficient number of conventional electrophoresis units. Students are forced to work in larger groups of 4-5, which deprives them from up-close and adequate access to the instrumentation. Our electrophoresis units also run on obsolete, inefficient power supplies which require an additional week before students can analyze their results. We request the funds to purchase of two automated *Experion* electrophoresis systems, including student analysis kits. **2 *Experion* Electrophoresis systems, 6 student kits: $34,058.**

Low Pressure Liquid chromatography -- The laboratory suffers from inadequate chromatography instrumentation. We have constructed two semi-automated liquid chromatography systems using several stand-alone components such as columns, UV detector, pump, fraction collector. These fabricated systems are low-performance, inefficient, inadequate, and obsolete. We request funds for two standard *Biologic Low Pressure (LP)* systems, the addition of which will allow students to work in smaller groups of 2-3. These instruments will also allow us to add new exercises, including separation of biomolecules such as amino acids, DNA, and RNA, using *LP* chromatography. **2 *Biologic LP Chromatagraphy* systems, with analysis kits, etc.: $18,306.**

Small equipment/materials (minicentrifuges, micropipettes, etc.) needed: **$4,880.**

2. Equipment on Hand for Project:

LSUS has renovated the Science Building, providing upgraded space (HVAC, wiring, etc.) for the proposed new equipment. In 2002, we set up the core laboratory to accommodate six workstations. The lab possesses a number of equipment items related to the proposed project such as several conventional gel-based DNA/agarose and protein/PAGE electrophoresis systems, growth incubators, top-loading balances, centrifuges, water baths, microscopes, etc. LSUS and LSUHSC established an additional core analytical laboratory on the LSUS campus as a cooperative effort. This analytical laboratory, designed to support a multidisciplinary approach to scientific analysis, includes instrumentation such as: gas chromatography/mass spectroscopy, ion chromatography, atomic absorption spectroscopy, ultraviolet/visible spectrometry, and high-pressure liquid chromatography. The analytical laboratory complements our biochemistry lab and is available to all faculty, and, with supervision, to students for hands-on experimentation.

3. Equipment Housing & Maintenance: The new *PCR/Experion automated electrophoresis/chromatography LP systems* will be housed and maintained in core laboratory space (SC206) dedicated to the biochemistry and biotechnology laboratories. The laboratory space will be kept locked when not in use. The PI, Dr. Mahdavian and the two co-PIs, Drs. Thompson and Lucas will be responsible for any "out of the ordinary" maintenance of the equipment. Regular maintenance will be funded via the LSUS budget. Adequate maintenance, repair and technical advice are available from the LSUS technical staffs who have considerable experience in installing and maintaining scientific equipment. Safety and security procedures are already in place to protect the equipment, faculty, staff, and students.

D. FACULTY AND STAFF EXPERTISE

Elahe Mahdavian, PI -- Assistant Professor of Chemistry, Ph.D., University of South Carolina. Dr. Mahdavian joined the LSUS faculty in Fall 2003. Her background in teaching includes both classroom and laboratory courses in introductory chemistry, general chemistry, organic chemistry, biochemistry, and physical chemistry. Although teaching constitutes the major part of her job, she is also implementing research with undergraduates at LSUS. Through her M.S. and Ph.D. training, she has obtained extensive experience in several areas of biophysical chemistry, organic chemistry, and biochemistry. She is knowledgeable in qualitative and quantitative analytical characterization methods, such as PCR, DNA/Protein electrophoresis, enzyme kinetics, protein purification, UV-VIS, IR, ^{1}H- and ^{13}C- NMR, mass spectrometry. Her current research interests involve medicinal chemistry and bioorganic chemistry, with an emphasis on the synthesis and characterization of potential anti-angiogenic and anti-cancer agents. Dr. Mahdavian's primary responsibility will involve purchasing, general oversight, upkeep of the instrumentation, faculty training and orientation. She will also utilize the new instrumentation in her research.

Richard E. Thompson, co-PI -- Professor of Chemistry, Ph.D., Oklahoma State University. Dr. Thompson has a total of 31 years of professional experience in both academia and industry. His experience includes 17 years in the Diagnostics Division of Abbott Laboratories. Dr. Thompson is a former chair of the Dept. of Chemistry/Physics, and in that capacity, he was instrumental in hiring both Dr.Mahdavian in 2003. His current research interests focus on the biochemistry of peptide antibiotics. In addition, his industrial experience has included the metabolic regulation of monoclonal antibody production, computer modeling of erythromycin production, design of an expert system for controlling renal dialysis, and the development of medical diagnostic assays at Abbott Labs. Dr. Thompson has authored 16 research publications in refereed journals and 12 published abstracts of presentations at national meetings. He holds one U.S. patent, based on work completed at Abbott Laboratories. Dr. Thompson will oversee the use of the new *PCR/Electrophoresis/LP Chromatography* instruments in his instructional coursework in the chemistry department.

M. Cran Lucas, co-PI -- Professor of Biological Sciences, holds a Ph.D. from Washington State University, has coordinated the LSUS pre-medical/pre-dental and pre-allied health programs for the past 13 years. Currently, he teaches Cell Biology, Molecular Biology, and Molecular Genetics. He will assist in coordinating use of the new lab resources for lower division courses. He maintains active collaborations with faculty at LSUHSCS and has been instrumental in advising the P.I. in experimental design. He is a co-author of the Laboratory manual, Lucas, M.C., Banks, S.W., Burden, B.J., 2002 General Principles of Biological Science Laboratory Manual for BIOS 120L published by LSU-Shreveport Press. Dr. Lucas was awarded the LSUS outstanding faculty award for teaching in 2002. As a co-project director, he will be responsible for assisting the P.D. equipment acquisition, installation, and reporting as appropriate.

E. ECONOMIC AND/OR CULTURAL DEVELOPMENT AND IMPACT

1. Relationships With Industrial/Institutional Sponsors: The LSUS science program has numerous industrial/institutional collaborations, and the enhancement of the biochemistry instrumentation at LSUS will enhance these collaborations. The *Biomedical Research Foundation (BRF) of Northwest Louisiana*, which established the $50+ million Biomedical Research Institute adjacent to LSUHSC, has provided instrumentation grants to LSUS faculty. The *BRF Positron Emission Tomography Imaging Center* and CTI Cyclotron Systems also partnered in a three-year *BORSF Industrial Ties* research grant with chemistry faculty. The *BRF* was also instrumental in recruiting the PI and other scientists to LSUS and has paid for some of the instrumentation in our research laboratories. Students are also part of these research partnerships. Our students often develop relationships with local companies and then go on to work for them after graduation. For example, after being heavily recruited, three of our graduates accepted jobs in research and development at Red River Pharma, a new company in the *InterTech Science Park*, and we anticipate maintaining close ties with these students and this company. Partnerships between industry, the BRF, and LSUS are paying off, as more of our top chemistry graduates take jobs in the area. Enhanced biochemistry instrumentation for education and research will advance our relationships with existing

and future partners/sponsors.

In the regional Industrial/Manufacturing field, our chemistry program is well respected by firms who have hired our graduates. The first students graduated from our B.S. chemistry program in 1975, and many have been placed in regional positions in industry. For example, our graduates have earned managerial laboratory positions in the regional facilities of BASF Pharmaceuticals, International Paper, Calumet, UOP, Union Carbide, Vista Chemical, Olin, Calloway Chemicals, and Texas Instruments. Several area laboratories of major industrial firms and commercial analytical laboratories partner with us on opportunities for mutual benefit, such as the internship program, which benefits both LSUS students and the sponsors.

2. **Promotion of Economic Development and/or Cultural Resources**: The Chemical & Allied Products (incl. Pharmaceuticals) sector is the largest manufacturing employment sector in Louisiana, employing more than 30,000 workers (av. annual earnings - $50,688) with more than $1.52 billion in annual payroll. Other major Louisiana economic sectors employing scientists, include: health care services, environmental services, paper and forest products, food manufacturing, petroleum refining, oil and gas production, and government agencies. Production of better-trained chemists, biochemists, and related scientists has a direct impact on economic development in this State. Major **existing firms** already established in Louisiana with manufacturing, research and distribution facilities that employ chemists and biochemists include: Abbott Laboratories, Akorn Inc., American Biomedical, BASF, Betz labs, Ciba-Geigy, Cytec, Dow, DuPont, ICI, LaRoche, Medco Pharmaceuticals, Monsanto, Nalco, Rhone-Poulenc, Sage Pharmaceuticals, Sherman Pharmaceuticals, and Witco. Major petrochemical firms include Exxon, Chevron/Texaco, Mobil, Marathon, BP, Shell, OxyChem, Olin, Citgo, etc. **New companies** in North Louisiana are also seeking trained scientists. Kinzie & Payne Biomedical, a biotech firm with a focus on water treatment with enzymes and microbial agents, has recently located in Shreveport. The Biomedical Research Foundation has established InterTech Science Park (about 8 miles from the LSUS campus), which is projected to add at least 6,000 technology jobs with a $225 million annual payroll over the next 25 years. Besides Red River Pharma, another new chemistry-related company in the Park is SteriFx, Inc., a specialty chemical company specializing in antimicrobial solutions for industrial, consumer, healthcare, and defense markets. Louisiana's Economic Development Dept. has restructured to focus on "Industry Clusters" to improve the economy. Five of the major clusters offer opportunities for chemists/biochemists: Biotechnology/Biomedical; Petrochemical/Environmental; Ag/Forest/Food Products; Advanced Materials; and Oil & Gas. Many of our graduates find employment in regional laboratories and government agencies, such as EPA, USDA, National Wetlands Research Center, Barksdale AFB, US Army Corps of Engineers, La.Dept. of Natural Resources, La. Dept. of Environmental Quality, City of Shreveport, Caddo and Bossier Parish (county) agencies, NW LA Crime Laboratory, Southwest Laboratories, ArkLaTex Environmental Lab, Region 7 Public Health Lab (state designated bioterrorism lab), etc.

Our relationships with the Biomedical Research Foundation (*BRF*) described in the preceding section emphasize projects that have high potential to become technology for the regional and national biomedical industry. Several of our biochemistry graduates are now Research Associates at LSUHSC and the BRF. **More and better biochemistry graduates will help address the need for science professionals.** One response to this need has been the establishment of industrial internships for students. Several chemistry students have received excellent on-site training with internships at local firms (See previous section) and an optional professional project is now part of our B.S. in chemistry. More and better-prepared professional chemists/biochemists in our region will also assist the regional industry, biomedical/health care and government sectors to improve regional environmental quality and overall quality of life for residents, thus providing additional support for economic expansion.

F. ADDITIONAL FUNDING SOURCES:

LSUS will contribute $38,200 in institutional matching support for this project. The new equipment will help make our department more competitive for additional external funding from Federal sources such as *NSF* and *NIH* as well as from corporate sources.

PREVIOUS *BORSF* AWARDS:

1) LEQSF (2003-04)-- "*Enhancement of the 300 MHz NMR Instrument at LSUS*", Drs. Brian Salvatore, Elizabeth Zippi, and Elahe Mahdavian, $76,600. The primary objective of this project was to enhance the nuclear magnetic resonance (*NMR*) instrumentation. It involved both hardware upgrade and acquisition of new software that increased the capabilities of our facility and enabled us to place more practical emphasis on *NMR* in a variety of chemistry courses as well as research.

2) BORSF-RCS (2005-08) -- "Synthesis of Novel Vitamin E Analogs with Potent Anti-Cancer Activity", Drs. Elahe Mahdavian, and Brian Salvatore, $66,542. The objective of this project was to synthesize a broad spectrum of novel *vitamin E* amide and ester derivatives. We are currently in the last year of the grant. Thus far, we have synthesized and determined biological activities of a number of the *vitamin E* synthetic analogs. We have established the *structure-activity* relationships of these molecules and have demonstrated the important structural features for the observed potency and anti-cancer activity. We have also gathered further evidences that the *vitamin E* molecules exhibit selective toxicity toward cancer cells, with virtually no toxicity exhibited against normal cells. Unlike *vitamin E* analogs, most other currently established anti-cancer drugs are either non-selective, causing considerable systemic toxicity, or they lose of efficacy, due to constant mutations of malignant cells.

3) LEQSF (2004-05) ENH-TR-42 -- "*Development of the Principles of Genetics Laboratory at LSUS*". Drs. Tara Williams-Hart, Stephen Banks, Stephanie Aamodt, and M. Cran Lucas, $33,400.
This project involved a major curriculum initiative to develop the genetics laboratory. The acquired resources included a growth, shaking water bath incubator, agarose gel electrophoresis apparatus, microcentrifuges, microscope with micromanipulator and initial reagents, *etc.* The new laboratory enhancement successfully supported increased application of classical and molecular genetics in the instruction of students. With the requested resources, the genetics laboratory introduced majors in pre-medicine, biology and related fields to the techniques of classical and modern genetics including the analysis of crosses, gene mapping, gene interactions, gene regulation, mutagenesis, cytogenetics, and recombinant DNA using virtual *Drosophila melangoster*, live *Saccharomyces cerevisiae* and live Wisconsin fast plants as model organisms.

4) LEQSF (2006-07) ENH-TR 40 -Proposal 016BS-06 BS, -- "*Enhancement of the Applied Biotechnology Course at LSUS*". Drs. Tara Williams-Hart, Stephen Banks, Stephanie Aamodt, M. Cran Lucas, and Nathan Hutchings, $33,000. The majority of the requested funds financially supported students who conducted the following research project. The long-term goal of the research program was to determine how protein phosphatase type 1 regulates ion transport in *Saccharomyces cerevisiae*. The results from this work will serve as the preliminary data for a grant proposal for the Research Initiative grant to the National Science Foundation in the Molecular and Cellular Biosciences Division of the Cellular Systems Cluster.

5) LEQSF (2006-07)-ENH-UR, Proposal 013BS-06 BS -- "*Enhancement of Computational Analysis in Cellular and Molecular Biology Laboratories*". Drs. M. Cran Lucas, Stephen Banks and Tara Williams-Hart, $14,288.

Elahe Mahdavian (P.I.)
LSUS Dept. of Chemistry

BOARD OF REGENTS SUPPORT FUND
TRADITIONAL AND UNDERGRADUATE ENHANCEMENT, FY 2008-2009

Budget and Budget Justification Pages

Directions: Each line item under the columns "Support Fund Money Requested," "Institutional Match," and "Private Sector/Other Match" must be itemized, fully explained, and justified **on a separate budget justification page(s).** Attach additional justification pages as needed.

Title of Proposal: **Enhancement of the Biochemistry Laboratory Courses at LSUS**

Project Director(s): **Drs. Elahe Mahdavian, Richard Thompson, and Cran Lucas**
Institution(s) of Higher Education: **Louisiana State University in Shreveport (LSUS)**
PROPOSED BUDGET:

	Support Fund Money Requested	Institutional Match[1]	Private/Other Match[2]
A. Equipment[3]	$72,432	$5,000 in cash	None
B. Software		As Needed	
C. Supplies		$5,000 in cash	
D. Shipping/handling		As Needed	
E. Installation		$2,000 in kind	
F. Personnel training		$1,000 in kind	
G. Other			
1. Faculty Time		$12,000 in kind	
2. Fringe benefits		$3,000 in kind	
3.			
4.			
5. (etc.)			
H. Indirect costs	Not allowed	$8,200 in kind	
I. Maintenance	Strongly discouraged	$2,000 in kind	
J. Total costs (A-I)	**$72,432**	**$38,200**	

1 Stipulate whether in-cash or in-kind. The Board strongly encourages the sharing of costs for proposed projects. Applicants and institutional officials should note, however, that the employing institution will be required to honor the commitments made in the original proposal before any awards are made. Discounts for equipment purchases are not allowable as institutional match.

2 The budget page(s) must reflect and the budget justification pages must explain any external funds that are claimed in the proposal. External funds and their expenditure must be accounted for in the same manner as Support Fund money and institutional match.

3 Equipment. If applicable, itemize and describe briefly the proposed equipment and its intended use in the project.

Include the name, model number, and manufacturer(s).

Budget Justification:

The necessary equipment for this enhancement grant is itemized in the table on the next page. This table includes a brief justification for each major item. Written documentation of the vendor equipment description and price quotes is provided in Appendix B (*Equipment Manufacturer's Price Quotes*).

INSTITUTIONAL MATCH:

A. Equipment: LSUS will provide $5,000 in related equipment for the project.

B. If Needed

C. Supplies: LSUS will provide $5,000 in related supplies needed for the project.

D. As needed.

E. Installation: $25/hr X 80 hrs = $2,000

F. Personnel training: $40/hr. X 25 hrs = $1,000

G1. Faculty time: $40 X 300 hrs. = $12,000

G2. Fringe benefits: @ 25% of G1= $3,000

H. Indirect costs: 41% of E, G1, G2, and I = $8,200

I. Maintenance: $25/hr X 80 hrs = $2,000

TOTAL LSUS MATCHING FUNDS: **$38,200**

PROJECT ACTIVATION DATE AND ANTICIPATED DATE OF COMPLETION

Activation Date: July 1, 2008.

Completion Date: June 30, 2009.

The necessary equipment for this enhancement grant is itemized in the table on the next page. This table includes a brief justification for each major item also. The price quotes are provided in *Appendix A* (*Equipment Manufacturer's Price Quotes*), and the documentation of the vendor equipment description is provided in *Appendix B.*

BUDGET NARRATIVE

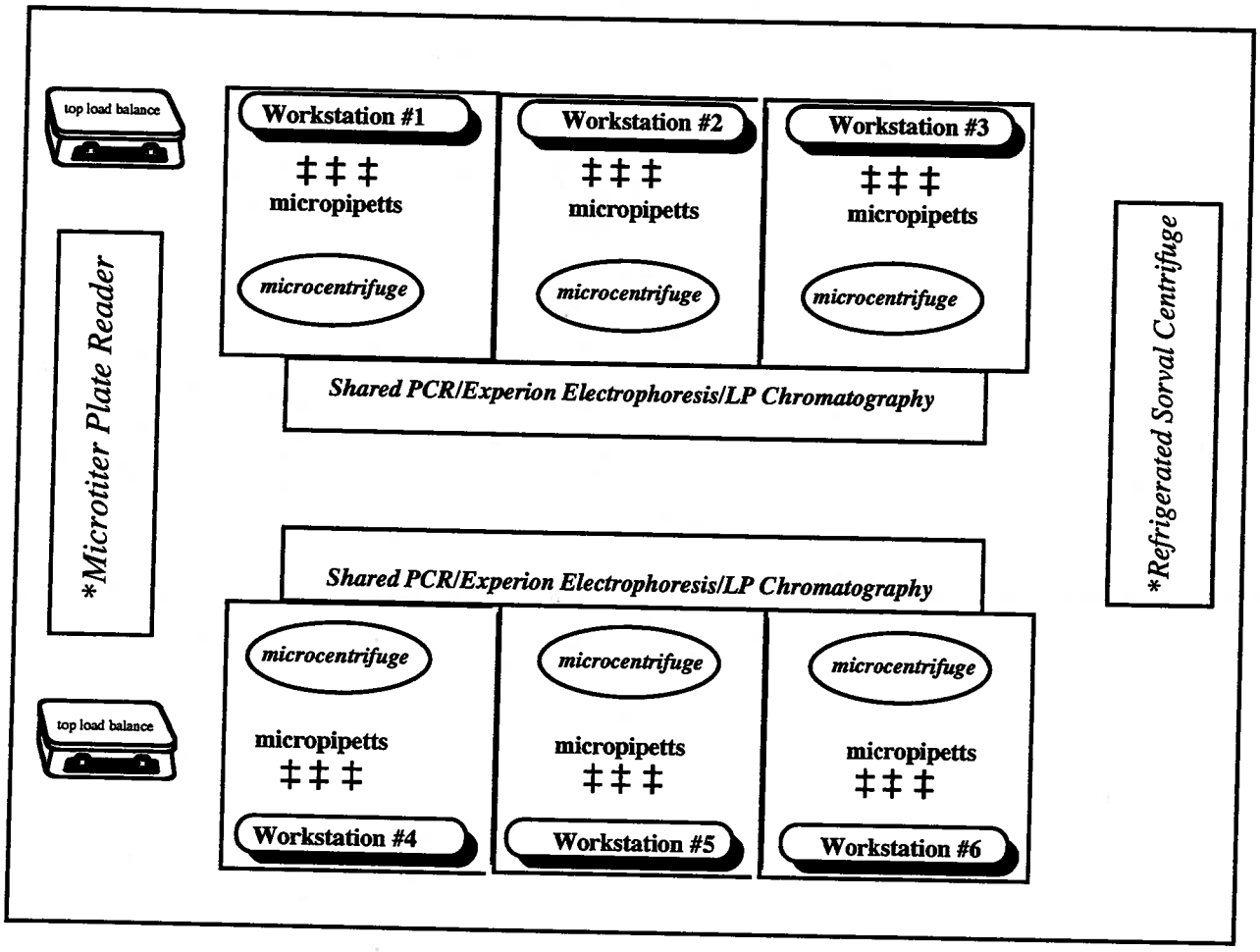
A.	Equipment	Quantity	Unit Price	Total Price	Justification
1	*PCR Thermal iCycler*	2	$7,500.00	$15,000.00	The purchase of two requested dual-temp *PCR iCycler* systems will provide one PCR per three student work stations (see figure 1). This will insure for efficient completion of team collaborative DNA amplification experiments.
	Support Supplies	**Quantity**	**Unit Price**	**Total Price**	
1	PCR tubes	4	$47.00	$188.00	
	Subtotal			**15,188.00**	

B.	Equipment	Quantity	Unit Price	Total Price	Justification
1	*Experion* Electrophoresis Systems	2	$15,475.00	$30,950.00	The purchase of two requested *Experion* DNA/RNA/protein electrophoresis systems will provide one *Experion* per three student work stations (see figure 1). This will insure for efficient completion of team collaborative electrophoresis experiments.
	Support Supplies	**Quantity**	**Unit Price**	**Total Price**	
1	*Experion* Protein Analysis Kit	2	$607.00	$1,214.00	
2	*Experion* RNA Analysis Kit	2	$577.00	$1,154.00	
3	*Experion* DNA Analysis Kit	2	$370.00	$740.00	
	Subtotal			**$34,058.00**	

C.	Equipment	Quantity	Unit Price	Total Price	Justification
1	*Biologic LP* System	2	$8,122.00	$16,244.00	The purchase of two requested *Biologic LP Chromatography* systems will provide one *LP system* per three student work stations (see figure 1). This will insure for efficient completion of team collaborative chromatography experiments.
	Support Supplies	**Quantity**	**Unit Price**	**Total Price**	
1	Bio-Scale Mini UNO Q, 5x5mL	2	$372.00	$744.00	
2	Bio-Scale Mini Kit, 1x5mL	2	$107.00	$214.00	
3	Bio-Beads S-X8, 200-400	2	$276.00	$552.00	
4	Bio-gel P-10, Medium, 100g	2	$276.00	$552.00	
	Subtotal			**$18,306.00**	

D.	Equipment	Quantity	Unit Price	Total Price	Justification
1	Minicentrifuges	6	$260.00	$1,560.00	The six requested Minicentrifuges will provide each of six work stations with one minicentrifuge system. This will facilitate and insure the efficient completion of group collaborative *PCR/Electrophoresis/LP* exercises. Many of the experiments require micropipetting and also the use of consumable items such as micropipet tips.
	Supplies	**Quantity**	**Unit Price**	**Total Price**	
1	Micropipettes (0.5-10 µl)	6	$159.00	$954.00	
2	Micropipettes (20-200 µl)	6	$159.00	$954.00	
3	Micropipettes (200-1000 µl)	6	$159.00	$954.00	
4	Pipet tips (0.1-10 µL)	2	$91.00	$182.00	
5	Pipet Tips (20-200 µL)	2	$73.00	$146.00	
6	Pipet Tips (200-1000 µL)	2	$65.00	$130.00	
	Subtotal			**$4,880.00**	
	Total			$72,432.00	

Figure 1: The Schematic Diagram of the Fully-Funded Biochemistry Core Laboratory



* The two major equipment, *microtiter plate reader* and the *Sorval refrigerated centrifuge* already exist in the core biochemistry laboratory.

Principal Investigator/Program Director (Last, First, Middle): **Mahdavian, Elahe**

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Elahe Mahdavian	**Assistant Professor of Chemistry**
eRA COMMONS USER NAME	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Tabriz University, Tabriz, IRAN	***B.S.***	**1987**	**Chemistry**
Sharif University of Technology, Tehran, IRAN	***M.S.***	**1991**	**Organic Chemistry**
University of South Carolina, Columbia, SC	***Ph.D.***	**1998**	**Biochemistry**

RESEARCH/PROFESSIONAL EXPERIENCE

2003-present Assistant Professor of Chemistry, Louisiana State University, Shreveport, LA
1999-2003 Assistant Professor of Chemistry, South Carolina State University, Orangeburg, SC
1993-1998 Research & Teaching Assistant, University of South Carolina, Columbia, SC
1991-1993 Chemistry Lecturer, Sharif University of Technology, Tehran, IRAN

Publications

1. **Elahe Mahdavian**, Trent Spencer, and Bruce Dunlap, "*Kinetic Studies on Drug Resistant Variants of Escherichia coli Thymidylate Synthase: Functional Effects of Amino Acid Substitutions at Residue 4*", Archives of Biochemistry and Biophysics, 368: 257-264, **1999**.

2. Jason Phan, **Elahe Mahdavian**, W. Minor, Sandra Berger, Trent Spencer, Bruce Dunlap, and Lucas Lebioda, "Catalytic Cysteine of Thymidylate Synthase is Activated Upon Substrate Binding", *Biochemistry*, 39: 6969-6978, **2000**.

3. Adisa Tomic-Vatic, H. John EyTina, James M. Chapmann, **Elahe Mahdavian**, Jiri Neuzil, and Brian Salvatore, "Vitamin E Amides, A New Class of Vitamin E analogs with Enhanced Pro-Apoptotic Activity, *International Journal of Cancer*, 117 (2), 188-193, **2005**.

4. Fan Wu, **Elahe Mahdavian**, and Brian A. Salvatore, "Total Synthesis of *Fusarochromanone* and its Novel Analogs", *J. Org. Chem*, **2007**, *Manuscript In Preparation.*

Papers Presented at Professional Meetings

1. **Elahe Mahdavian**, and Firouz Matloubi, "Synthesis of 1,4-Phenanthrene Quinone Derivatives", Sharif University of Technology, Tehran, Iran, September **1991**, *M.S.-Chemistry Dissertation Defense Seminar.*

2. **Elahe Mahdavian**, and Bruce Dunlap, "Kinetic Studies on Drug Resistant Variants of *Escherichia coli* Thymidylate Synthase: Functional Effects of Amino Acid Substitutions at Residue 4" and "Catalytic *Cysteine* of Thymidylate Synthase is Activated Upon Substrate Binding", University of South Carolina, Columbia, SC, December **1998**, *Ph.D.-Biochemistry Dissertation Defense Seminar.*

3. **Elahe Mahdavian**, Bruce Dunlap, Trent Spencer, and Jason Phan, "Catalytic *Cysteine of Thymidylate Synthase* is Activated Upon Substrate Binding", Eight South Carolina State Wide Research Conference (SCSRC) meeting, Wild Dunes, SC, January **1999**, *Poster Presentation.*

4. Brian Salvatore, and **Elahe Mahdavian**, "Synthetic *Ion Channels* Incorporating Novel Templates for Sensor Development", South Eastern Regional Meeting: *American Chemical Society (SERMACS),* Savanna, GA, October **2001**, *Poster Presentation.*

5. John EyTina, **Elahe Mahdavian**, and Brian Salvatore, "Synthesis of a Novel Class of *Vitamin E* Derivatives as potential Chemptherapeutic Agents", *224th National ACS Meeting*, Boston, MA, August **2002**, *Poster Presentation.*

6. **Elahe Mahdavian**, Sally Maharaj, and Brian Salvatore, "*Vitamin E* Derivatives as Inducer of Apoptosis", *USDA 1890-Association of Research Directors*, Atlanta, GA, March **2003**, *Oral Presentation.*

7. **Elahe Mahdavian**, "Kinetic Studies on Drug Resistant Variants of *Escherichia coli Thymidylate Synthase*: Functional Effects of Amino Acid Substitutions at Residue 4" and "Catalytic *Cysteine of Thymidylate Synthase* is Activated Upon Substrate Binding", Faculty Job Interview, LSUS, Shreveport, LA, July **2003**, *Oral Presentation.*

8. **Elahe Mahdavian**, and Brian Salvatore, "Synthesis of *Vitamin E* Analogs as Potential Anti-Cancer Agents", Bio-Research Day sponsored by NLPI, Shreveport, LA, April **2005**, *Poster Presentation.*

9. **Elahe Mahdavian**, Charles Thompson, and Brian Salvatore, "*Fusarochromanone* and Its New Analogs as Potential Anti-Cancer & Anti-Angiogenic Compounds", College of Sciences Annual Student Research Forum, LSUS, May **2005**, *Poster Presentation.*

10. Brian Salvatore, **Elahe Mahdavian,** and Jirka Neuzil, "Synthesis and Studies of a New Class of Pro-Apoptotic Amide Analogs of *Tocopheryl Esters*", Society for Free Radical Research 14th Annual Meeting, Queensland, Australia, December **2005**, *Oral Presentation.*

11. **Elahe Mahdavian**, and Brian Salvatore, "*Fusarochromanone* and its Amide Analogs as Potential Anti-Cancer and Anti-Angiogenic Agents", Annual LA-BRIN Symposium, Baton Rouge, February **2006**, *Poster Presentation.*

12. Smink Sangsura, **Elahe Mahdavian**, and Brian Salvatore, "The Synthesis of New Functional Domain Analogs of *α-Tocopherol Succinate*" LSUS College of Sciences Undergraduate Research Forum, April **2006**, *Oral Presentation.*

13. Serena Green, **Elahe Mahdavian**, and Brian Salvatore, "Isolation of Pure *Delta Tocotrienol* from Natural Extracts and Synthesis of Derivatives with Anti-Cancer Activity" LSUS College of Sciences Undergraduate Research Forum, April **2006**, *Oral Presentation.*

14. **Elahe Mahdavian**, "Biological-Activity Assessments of *Fusarochromanone* and its Amide analogs", Experimental Therapeutic Group, Feist Weiller Cancer Center, Shreveport, LA, June **2006**, *Oral Presentation.*

15. Brian Salvatore, **Elahe Mahdavian**, and James Cardelli, "Design and Synthesis of Novel Polyphenolic Probes of c-Met Signaling in Cancer" Society for Free Radical Research 15th Annual Meeting, University of Western Australia, Perth Australia, December, **2006**, *Oral Presentation.*

16. **Elahe Mahdavian**, Brian Salvatore, and John Clifford, "Novel Derivatives of *Fusarochromanone*: Potential Therapeutic Compounds", American Association of Cancer Research (*AACR*) Annual Meeting, Los Angeles, CA, April **2007**, *Poster Presentation.*

Awards, Prizes, Lectureships

1. *Ph.D.* Research and Teaching Assistantship, University of South Carolina, Columbia, SC, **1993-1998**.

2. Best Poster Presentation Award, *Sixth South Carolina State Wide Research Conference* (*SCSRC*), Wild Dunes, SC, January **1997**.

3. Durig Graduate Student Travel Award, University of South Carolina, Columbia, SC, March **1998**.

4. Hollings Cancer Center Award, *Eight South Carolina State Wide Research Conference* (*SCSRC*) meeting, Wild Dunes, SC, January **1999**.

6. Science & Engineering Education Scholars Program Award, University of Wisconsin, Madison, WI, July **1999**.

5. *McGraw-Hill Presidents Club* membership, preferred reviewer for *McGraw-Hill* textbooks in organic chemistry, **2003-Present**.

Grants and Contracts Funded

1. United States Department of Agriculture, (1890- Evans-Allen), "Synthesis of a New Class of Vitamin E Derivatives as Potential Chemotherapeutic Agents", South Carolina State University, Orangeburg, SC, *January 2002*, (**$300,000**), ***PI***.

2. *South Carolina Biomedical Research Infrastructure Network (SC-BRIN),* "Total Synthesis of Fusarochromanone and New Analogs to Probe its Potent Anti-Cancer Activity", South Carolina State University, Orangeburg, SC, *May 2002*, (**$74,914**), ***Co-PI***.

3. Louisiana Biomedical Research Infrastructure Network (LA-BRIN), "Synthesis and Study of Novel Template Based Ion Channels", LSUS, Shreveport, LA, *June 2004*, (**$52,000**), ***PI***.

4. Louisiana Biomedical Research Infrastructure Network (LA-BRIN), "Fusarochromanone Analogs as Potential Anti-Cancer and Anti-Angiogenic Agents", LSUS, Shreveport, LA, June 2005, ($32,586), PI.

5. Louisiana Board of Regents Support Fund (BORSF), "Enhancement of the 300MHz NMR Instrument at LSUS", *LSUS, Shreveport, LA*, June 2005, (**$76,600**), ***Co-PI***.

6. Louisiana Biomedical Research Infrastructure Network (LA-BRIN), "Synthesis and Biological Assessments of Fusarochromanone Amide Analogs", LSUS, Shreveport, LA, June 2006, ($25,614), PI.

7. Louisiana Board of Regents Support Fund (BORSF-RCS), "Synthesis of Novel Vitamin E Analogs with Potent Anti-Cancer Activity", *LSUS, Shreveport, LA*, June 2005-May 2008, (**$66,542**), ***PI.***

8. *LSUS Faculty Research Grant,* "Biological-Activity Assessments of *Fusarochromanone* Amide-Analogs: Potential Anti-Cancer and Anti-Angiogenic Agents", *LSUS, Shreveport, LA, September 2006, ($550), PI.*

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and consultants and collaborators. Begin with the principal investigator/program director. Photocopy this page for each person.

Name Richard E. Thompson	Position Title Associate Professor of Chemistry

EDUCATION (Begin with baccalaureate or other initial professional education and include postdoctoral training.

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
Wichita St. Univ., Wichita, KS	B.S.	1968	Chemistry
Wichita, St. Univ., Wichita, KS	M.S.	1969	Chemistry
Oklahoma St. Univ., Stillwater, OK	Ph.D.	1974	Biochemistry
Univ. of Cincinnati, Cincinnati, OH	Postdoctoral	1974-1977	Biochemistry

RESEARCH AND PROFESSIONAL EXPERIENCE: Starting with present position, list, in reverse chronological order, previous relevant employment,
experience, and honors. Key personnel includes the principal investigator and any other individuals who participate in the development or execution of the project. Key personnel typically will include all individuals with doctoral or other professional degrees, but in some projects will include individuals at the masters or baccalaureate level provided they contribute in a substantive way to the development or execution of the project. Include present membership on any Federal Government public advisory committee. List, in reverse chronological order, the titles, all authors, and complete references to pertinent publications during the past five years and to representative earlier publications pertinent to this application. DO NOT EXCEED TWO PAGES.

2002-Present – Associate Professor of Chemistry, Louisiana State University in Shreveport

2001-2003 – Chair, Department of Chemistry and Physics, Louisiana State University in Shreveport

2000-2002 – Assistant Professor of Chemistry, Louisiana State University in Shreveport

1983-2000 – Biochemist and Manager, Abbott Labs, Chicago, IL

1977-1983 – Assistant Professor of Chemistry, North Texas State University, Denton, TX

A. S. Kester and R. E. Thompson. Computer-Optimized Normal-Phase High-Performance Liquid Chromatographic Separation of *Cornebacterium poinsettiae* Carotenoids, J. Chromatography 310: 372-378,1984.

J. P. Chandler, R. E. Thompson, H. 0. Spivey, and E. L. F. Li.
An Improved Computer Program for Calculating Formation Constants of Ligand Complexes from pH Data, Anal. Chem. Acta 162: 399-402, 1984.

K. S. Chong, S. Hara, R. E. Thompson, and A. G. Lacko. Characterization of Lecithin:Cholesterol Acyltransferase from Human Plasma: II. Physical Properties of the Enzyme, Arch. Biochem. Biophys. 222: 553-560, 1983.

T. K. Echols, R. E. Thompson, and R. A. Masaracchia. Primary Substrate Specificity Determinants for H4-Specific, Protease-Activated Protein Phospho-transferase, Eur. J. Biochem. 134: 249-254, 1983.

D. L. Dunn and R. E. Thompson, J. A Reverse Phase High-Performance Liquid Chromatographic Separation for Pilocarpine and Isopilocarpine Using Radial Compression Columns, Chromatog. 264: 264-271, 1983.

R. E. Thompson, S. W. Morrical, D. P. Campbell, and W. R. Carper. Guanidinium and Temperature-Induced Conformational Changes in Glucose Dehydrogenase, Biochem. Biophys. Acta 745: 279-284, 1983.

V. L. Smith, L. G. Brent, M. S. Shabbot, and R. E. Thompson. Regulation of Microsomal HMG-CoA Reductase by Enzyme Lipid Interactions, Biophys. J. 37: 42-44, 1982.
D. P. Campbell, W. R. Carper, and R. E. Thompson. Bovine Liver Glucose Dehydrogenase: Isolation and Characterization. Arch. Biochem. Biophys. 215: 289-301, 1982.

D. H. Clyne, A. J. Pesce, and R. E. Thompson. Nephrotoxicity of Bence Jones Proteins in the Rat: Importance of Protein Isoelectric Point, Kidney International 16: 345-352, 1979.

P. M. Yuan, R. N. Dewan, H. Zaun, R. E. Thompson, and R. W. Gracy. Isolation and Characterization of Triosephosphate Isomerase Isoenzymes from Human Placenta, Arch. Biochem. Biophys. 198: 42-52, 1979.

R. E. Thompson, E. L. F. Li, O. Spivey, J. P. Chandler, A. J. Katz, and J. R. Appleman. Apparent Stability Constants of H^+ and Mg^{2+} Complexes of 5-Pyrophosphoryl-a-1-Pyrophosphate, Biomorganic Chemistry 9: 35-45, 1978.

M. S. Herrmann, C. E. Richardson, L. M. Setzler, W. D. Behnke, and R. E. Thompson. A Circular Dichroic Investigation of the Secondary Structure of Lectins, Biopolymers 17: 2107-2120, 1978.

R. E. Thompson, H. O. Spivey, and A. J. Katz. Rat Liver Cytoplasmic GIucose-Phosphate Dehydrogenase Steady State Kinetic Properties and Circular Dichroism, Biochemistry 15: 862-867, 1976.

Name M. Cran Lucas	Position Title Professor of Biological Sciences

EDUCATION (Begin with baccalaureate or other initial professional education and include postdoctoral training.

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
Lewis and Clark College, Portland, OR	B. S.	1969	Biology
Washington State University, Pullman, WA	Ph.D.	1974	Molecular Genetics
University of Illinois, Urbana, IL	Postdoctoral	1973-1975	Plant Physiology
University of Georgia, Athens, GA	Postdoctoral	1975-1977	Fungal Genetics
University of Idaho, Moscow, ID	Postdoctoral	1977-1978	Insect Virus Biochemistry

Professional Experience:

1988-Present – Professor of Biological Sciences, Louisiana State University in Shreveport

1983-1988 – Associate Professor of Biological Sciences, Louisiana State University in Shreveport

1978-1983 – Assistant Professor of Biological Sciences, Louisiana State University in Shreveport

1977 – Adjunct Assistant Professor of Biology, Florida State University

Publications:

Gossett, D.R., Banks, S.W., Lucas, M.C., (2002) Signal Transduction Pathways Associated with the NaCl-Induced Up-regulation of Antioxidant Enzyme Activity in Cotton Callus Tissue. *In* Current Research Developments in Plant Physiology **3**:99-133. ISBN: 81-7736-154-6

Fowler, R. W., D. R. Gossett, S. W. Banks, M. C. Lucas, M.C. 2002. NaCl Stress Induces DNA Damage in Cotton Callus. *Proceedings of the Beltwide Cotton Production and Research Conference.* National Cotton Council Memphis.

Virgen, A., D. R. Gossett, S. W. Banks, M. C. Lucas. 2002. Salt Stress Induces Nitrous Oxide Production in Cotton Callus. *Proceedings of the Beltwide Cotton Production and Research Conference.* National Cotton Council Memphis.

Bellaire, B., J. Carmody, J. Braud, D. R. Gossett, S. W. Banks, and M. C. Lucas. 2000. Involvement of abscisic acid-dependent and Bindependent pathways in the upregulation of antioxidant enzyme activity during NaCl stress in cotton callus tissue. *Free Radical Res.***33:**531-545.

Bellaire, B., J. Carmody, J. Braud, D. R. Gossett, S. W. Banks, and M. C. Lucas. 2000. Involvement of abscisic acid-dependent and independent pathways in the upregulation of antioxidant enzyme activity during NaCl stress in cotton callus tissue. *Free Radical Res.***33:**531-545.

Manchandia, A., S. W. Banks, D. R. Gossett, B. A. Bellaire, M. C. Lucas, and E. P. Millhollon. 1999. The influence of _-amanitin on the NaCl-induced upregulation of antioxidant enzyme activity in cotton callus tissue. *Free Radical Research* **30:**429-438.

Rajguru, S. N., S. W. Banks, D. R. Gossett, M. C. Lucas, T. E. Fowler, and E. P. Millhollon. 1999. Antioxidant respons to salt stress during fiber development in cotton ovules. *Journal of Cotton Science* **3:**11-18.

Gossett, D.R., S.W. Banks, E.P. Millhollon, M. Cran Lucas. 1996. Antioxidant response to NaCl Stress in a control anc NaCl-tolerant cotton cell line grown in the presence of paraquat, buthionine sulfoximine, and exogenous glutathione. *Plan Physiology* **112:**803-809.

Rainwater, D. T., D.R. Gossett, H.H. Hanna, E.P. Millhollon, S.W. Banks, and M.C. Lucas. 1996. The relationshi between yield and the antioxidant defense system in tomatoes grown under heat stress. *Free Radical Res.* **25:**421-435.

Gossett, D. R., E. P. Millhollon, S. W. Banks, and M. Cran Lucas. 1995. Antioxidant Response to salt stress in cotton *In* Biochemistry of Cotton. Cotton Incorporated, Raleigh, NC . pp 3-10.

Gossett, D. R., E. P. Millhollon, M. C. Lucas, S. W. Banks, and M. M. Marney. 1994. The effects of NaCl on antioxidan enzyme activities in callus tissue of salt-tolerant and salt-sensitive cultivars of cotton. *Plant Cell Reports.* **13:** 498-503.

D. R. Gossett, E. P. Millhollon, and M. C. Lucas. Changes in antioxidant levels in response to NaCl treatment in salt tolerant and sensitive cultivars of cotton, Gossypium hirsutum L. *Crop Science.* 34: 706-714, 1994.

S. W. Banks, D. R. Gossett, M. C. Lucas, E. P. Millhollon, and M. G. LaCella.
Agrobacterium-Mediated Transformation of Kenaf (Hibiscus cannabinus L.) with the beta-Glucuronidase (GUS) Gene. *Plan Molecular Biology Reporter.* 11:101-104, 1993.

L. M. Hardy and M. C. Lucas. A crystalline protein is responsible for dimorphic egg jellies in the salamander, Ambystoma maculatum. *Comp. Biochem. and Physiology.* 100A: 653-660, 1991.

CURRENT AND PENDING SUPPORT

The following information MUST be provided for each investigator and other senior personnel.

NAME OF INVESTIGATOR: **Elahe Mahdavian**

Status of Support: _X_ Current ___ Pending ___ Submission Planned in Near Future

Contract Number/Proposal Title: **LEQSF (2005-08)-RD-A-15, "Synthesis of Novel Vitamin E Analogs with Potent Anti-Cancer Activity"**

Source of Support: **BORSF-RCS**

Award Amount (or Annual Rate): **$ 66,542** Period Covered: **7/2005-6/2008**

Location of Activity: **LSUS**

Person-Months or % of Effort Committed to the Project: ____ Cal Yr ____ Acad **12.0%** Summ

---

Status of Support: ___ Current _X_ Pending ___ Submission Planned in Near Future

Contract Number/Proposal Title: **Enhancement of the Chemistry Laboratory Courses at LSUS**

Source of Support: **BORSF - Traditional Enhancement Program**

Award Amount (or Annual Rate): $ **122,590** Period Covered: **7/2008- 6/2009**

Location of Activity: **LSUS**

Person-Months or % of Effort Committed to the Project: ____ Cal Yr **5%** Acad **5%** Summ

---

Status of Support: ___ Current _X_ Pending ___ Submission Planned in Near Future

Contract Number/Proposal Title: **Bridging Molecular Modeling and Chemical Synthesis to Enhance Inquiry-Based Learning**

Source of Support: **BORSF - Traditional Enhancement Program**

Award Amount (or Annual Rate): $ **98,500** Period Covered: **7/2008- 6/2009**

Location of Activity: **LSUS**

Person-Months or % of Effort Committed to the Project: ____ Cal Yr **5%** Acad **5%** Summ

---

Status of Support: ___ Current _X_ Pending ___ Submission Planned in Near Future

Contract Number/Proposal Title: **Enhancement of the Biochemistry Laboratory Courses at LSUS**

Source of Support: **BORSF - Traditional Enhancement Program**

Award Amount (or Annual Rate): $ **72,432** Period Covered: **8/2008- 7/2009**

Location of Activity: **LSUS**

Person-Months or % of Effort Committed to the Project: ____ Cal Yr **5%** Acad **5 %** Summ

---

Status of Support: ___ Current _X_ Pending ___ Submission Planned in Near Future

Contract Number/Proposal Title: **Enhancement of Spectrophotometry in Biochemistry Laboratory**

Source of Support: **BORSF - Undergraduate Enhancement Program**

Award Amount (or Annual Rate): $ **58,200** Period Covered: **7/2008- 6/2009**

Location of Activity: **LSUS**

Person-Months or % of Effort Committed to the Project: ____ Cal Yr **5%** Acad **5%** Summ

---

(Form 3, rev.2007)

CURRENT AND PENDING SUPPORT

The following information MUST be provided for each investigator and other senior personnel.

NAME OF INVESTIGATOR: **Richard Thompson**

Status of Support: ___Current __X__Pending ___Submission Planned in Near Future

Contract Number/Proposal Title: **Enhancement of the Chemistry Laboratory Courses at LSUS**

Source of Support: **BORSF - Traditional Enhancement Program**

Award Amount (or Annual Rate): $ 122,590 Period Covered: 7/2008- 6/2009

Location of Activity: **LSUS**

Person-Months or % of Effort Committed to the Project: _____Cal Yr __5%__Acad __5%__Summ

---

Status of Support: ___Current __X__Pending ___Submission Planned in Near Future

Contract Number/Proposal Title: **Enhancement of the Biochemistry Laboratory Courses at LSUS**

Source of Support: **BORSF - Traditional Enhancement Program**

Award Amount (or Annual Rate): $ 72,432 Period Covered: 7/2008- 6/2009

Location of Activity: **LSUS**

Person-Months or % of Effort Committed to the Project: _____Cal Yr __5%__Acad __5 %__Summ

---

Status of Support: ___Current __X__Pending ___Submission Planned in Near Future

Contract Number/Proposal Title: **Enhancement of Spectrophotometry in Biochemistry Laboratory**

Source of Support: **BORSF - Undergraduate Enhancement Program**

Award Amount (or Annual Rate): $ 58,200 Period Covered: 7/2008- 6/2009

Location of Activity: **LSUS**

Person-Months or % of Effort Committed to the Project: _____Cal Yr __5%__Acad 5%__Summ

(Form 3, rev.2007)

CURRENT AND PENDING SUPPORT

(From ALL sources, including Board of Regents Support Fund)

The following information MUST be provided for each investigator and other senior personnel. Use additional sheets as necessar

NAME OF INVESTIGATOR: M. Cran Lucas

Status of Support: ___Current _X__Pending ___Submission Planned in Near Future

Contract Number/Proposal Title: Enhancement of Spectrophotometry in Biochemistry Laboratories

Source of Support: BORSF

Award Amount (or Annual Rate): $_$58,000_____ Period Covered:__07/01/08-06/30/09__

Location of Activity:

Person-Months or % of Effort Committed to the Project: __5___Cal Yr _____Acad _____Summ

---

Status of Support: ___Current _X__Pending ___Submission Planned in Near Future

Contract Number/Proposal Title: Enhancement of the Biochemical Laboratories at LSUS

Source of Support: BORSF

Award Amount (or Annual Rate): $__72,432_____ Period Covered:__07/01/08-06/30/09__

Location of Activity:

Person-Months or % of Effort Committed to the Project: ___5__Cal Yr _____Acad _____Summ

---

Status of Support: ___Current ___Pending ___Submission Planned in Near Future

Contract Number/Proposal Title:

Source of Support:

Award Amount (or Annual Rate): $_____ Period Covered:_____

Location of Activity:

Person-Months or % of Effort Committed to the Project: _____Cal Yr _____Acad _____Summ

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Status of Support: ___Current ___Pending ___Submission Planned in Near Future

Contract Number/Proposal Title:

Source of Support:

Award Amount (or Annual Rate): $_____ Period Covered:_____

Location of Activity:

Person-Months or % of Effort Committed to the Project: _____Cal Yr _____Acad _____Summ

(Form 3, rev.2007)

Appendix A -- Equipment Vendor Quotes

BIO-RAD Bio-Rad Laboratories

Life Science Group
2000 Alfred Nobel Drive
Hercules, CA 94547
Telephone: 800-4BIORAD
Fax: 1-800-879-2289
www.bio-rad.com

Price Quotation # 07-Q27284V1

Date: October 22, 2007

Elahe Mahdavian
Louisiana State University, Shreveport
One University Place
Shreveport, LA 71115

Phone: (318) 797-5227
Fax: (318) 797-5090
Email: emahdavi@lsus.edu

Quote Valid: 12/31/2007
Terms: Net 30
F.O.B.: FOB Destination, PPD and Add
Route: B_Best Way
Delivery: Within 30 Days, ARO
Sales Rep: Keith Cockrum
(800) 876-3425 ext. 8379
keith_cockrum@bio-rad.com

Catalog No.	Qty	Description	List Price	Discount	Net Price	Extension
Quoted Item(s)						
1708722	1	iCycler System with 2 x 48 x 0.2 ml Reaction Module. Includes iTaq DNA Polymerase and, dNTP Mix - 10mM. Product warranty is 24 months parts and labor on equipment only.	$7,500.00		$7,500.00	$7,500.00
TFI0201	1	TUBE,.2ML FLAT-CAP NAT 1000/PK natural color, thin-wall polypropylene, 1,000 tubes	$50.00		$50.00	$50.00
MLP4841	1	MULTIPLATE-48,GREEN 50/BX 8 x 6 format, green, thin-wall polypropylene, pkg of 50	$90.00		$90.00	$90.00
					Total	$7,640.00

Thank you for the opportunity to submit this quotation. Please contact me if you have any additional questions.

Keith Cockrum
Phone: (800) 876-3425 ext. 8379
Email: keith_cockrum@bio-rad.com

To place an order:

Phone: 1-800-4BIORAD
Fax: 1-800-879-2289
Email: lsg.orders.us@bio-rad.com

Mail: Bio-Rad Laboratiores, Inc
2000 Alfred Nobel Drive
Hercules, CA 94547

Shipping prepaid and added to the invoice unless otherwise stated. Please see attached terms and conditions.

BIO-RAD Bio-Rad Laboratories

Life Science Group
2000 Alfred Nobel Drive
Hercules, CA 94547
Telephone: 800-4BIORAD
Fax: 1-800-879-2289
www.bio-rad.com

Price Quotation # 07-Q27144V1

Date: October 19, 2007

Elahe Mahdavian
Louisiana State University, Shreveport
One University Place
Shreveport, LA 71115

Phone: (318) 797-5227
Fax: (318) 797-5090
Email: emahdavi@lsus.edu

Quote Valid: 12/31/2007
Terms: Net 30
F.O.B.: FOB Destination, PPD and Add
Route: B_Best Way
Delivery: Within 30 Days, ARO
Sales Rep: Keith Cockrum
(800) 876-3425 ext. 8379
keith_cockrum@bio-rad.com

Catalog No.	*Qty*	*Description*	*Net Price*	*Extension*
Quoted Item(s)				
7007062	1	EXPER SYS,DELL,RNA,100/120	$15,475.00	$15,475.00
7007102	1	EXPERION PRO260 KIT, 25	$607.00	$607.00
7007104	1	EXPERION RNA STDSENS KIT, 25	$577.00	$577.00
7007108	1	Experion DNA 12K Analysis Kit	$370.00	$370.00
			Total	$17,029.00

Thank you for the opportunity to submit this quotation. Please contact me if you have any additional questions.

Keith Cockrum
Phone: (800) 876-3425 ext. 8379
Email: keith_cockrum@bio-rad.com

To place an order:

Phone: 1-800-4BIORAD
Fax: 1-800-879-2289
Email: lsg.orders.us@bio-rad.com

Mail: Bio-Rad Laboratiores, Inc
2000 Alfred Nobel Drive
Hercules, CA 94547

Shipping prepaid and added to the invoice unless otherwise stated. Please see attached terms and conditions.

BIO-RAD **Bio-Rad Laboratories**

Life Science Group
2000 Alfred Nobel Drive
Hercules, CA 94547
Telephone: 800-4BIORAD
Fax: 1-800-879-2289
www.bio-rad.com

Price Quotation # 07-Q27145V1

Date: October 19, 2007
Elahe Mahdavian
Louisiana State University, Shreveport
One University Place
Shreveport, LA 71115

Phone: (318) 797-5227
Fax: (318) 797-5090
Email: emahdavi@lsus.edu

Quote Valid: 12/31/2007
Terms: Net 30
F.O.B.: FOB Destination, PPD and Add
Route: B_Best Way
Delivery: Within 30 Days, ARO
Sales Rep: Keith Cockrum
(800) 876-3425 ext. 8379
keith_cockrum@bio-rad.com

Catalog No.	*Qty*	*Description*	*Net Price*	*Extension*
Quoted Item(s)				
7318300	1	Standard BioLogic LP System, 100/120v. Includes BioLogic LP Controller, BioLogic Rack, and accessory kit containing inject valve (MV-6), proportioning valve/mixer, UV optics, conductivity cell, tubing and fittings kit, column and conductivity cell holder, starter kit, and instructions.	$8,122.00	$8,122.00
7324104	1	Bio-Scale Mini UNO Q, 5x5ml	$372.00	$372.00
7324112	1	Bio-Scale Mini S Kit, 1 x 5ml	$107.00	$107.00
7324612	1	Bio-Scale Mini IMAC, 1x5ml	$117.00	$117.00
1523350	1	Bio-Beads S-X8, 200-400, 100g	$276.00	$276.00
7371012	1	Econo-Column, 1 x 10 cm, 2/Pack	$41.00	$41.00
1504140	1	Bio-Gel P-10, Medium, 100g.	$276.00	$276.00
			Total	$9,311.00

Thank you for the opportunity to submit this quotation. Please contact me if you have any additional questions.

Keith Cockrum
Phone: (800) 876-3425 ext. 8379
Email: keith_cockrum@bio-rad.com

To place an order:

Phone: 1-800-4BIORAD
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Appendix B -- Description of the Major Equipment

Liquid assets

BioLogic LP Low Pressure
Liquid Chromatography System

BIO-RAD

THE BIOLOGIC LP LOW PRESSURE L

A VALUABLE ASSET FOR BIOMOLECULE PURIFICATION.

Achieving separations is remarkably easy and affordable with our BioLogic LP low pressure chromatography system. Here's a workstation that offers numerous user-friendly features, making it a truly valuable tool for the lab or cold room.

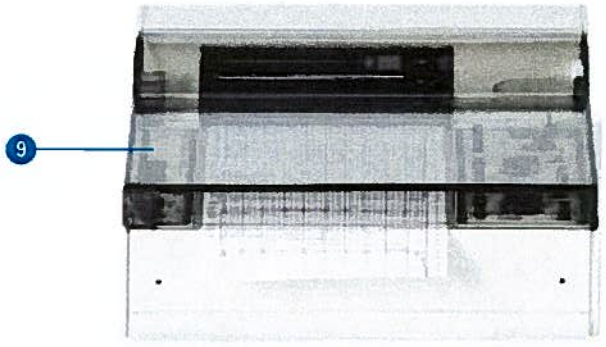
Incorporating the latest state-of-the-art amenities, the BioLogic LP System meets the needs of both novice and skilled chromatographers.

- The user-friendly programming and interface make overall operation exceptionally easy
- All-in-one compact design conserves valuable laboratory bench space
- From sample injection to fraction collection, the BioLogic LP System automates biochromatography – it frees you up to concentrate on other tasks
- The BioLogic LP System is easy and affordable to maintain

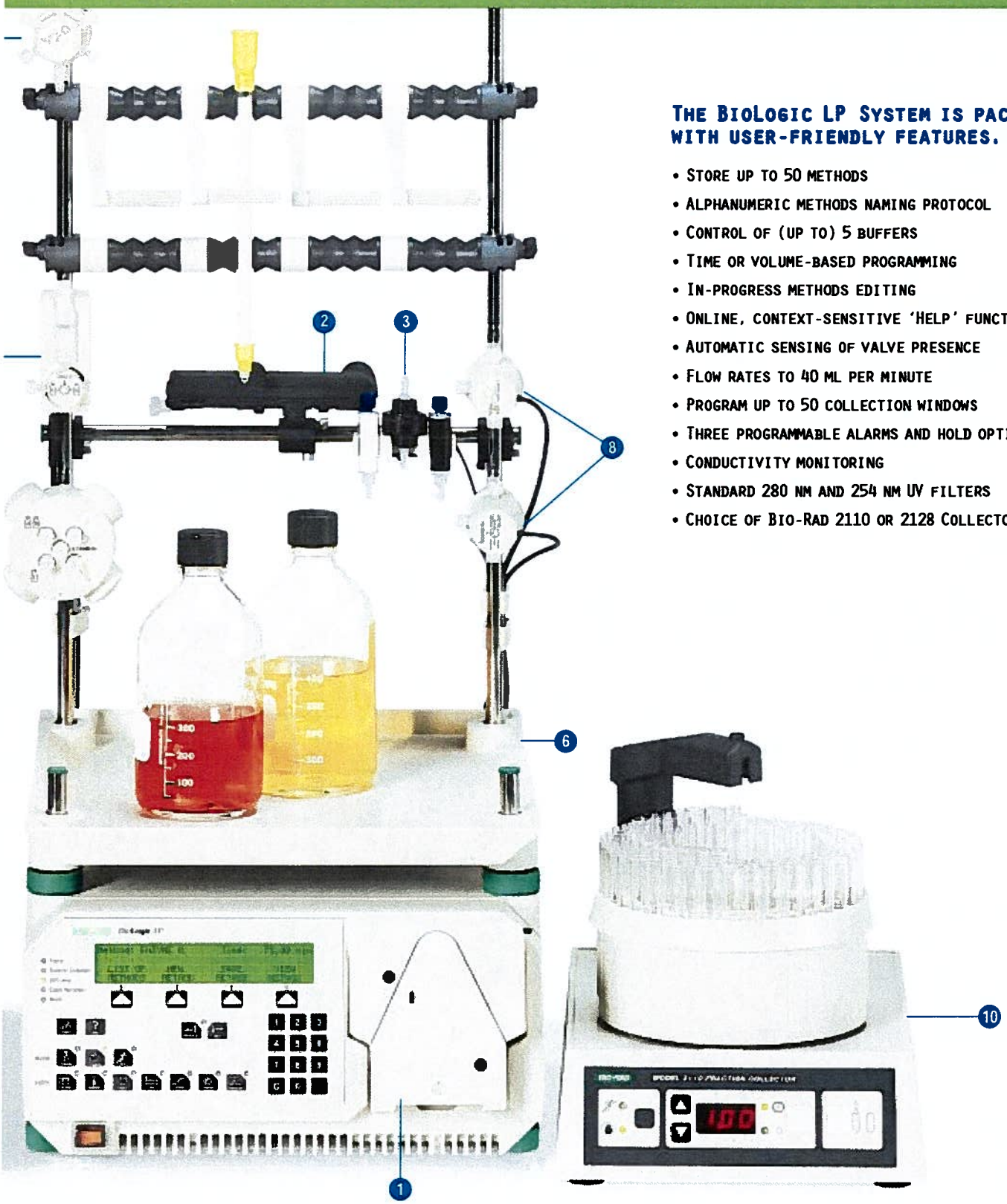
The following pages describe the BioLogic LP System in detail. Learn why it's one of the best assets you can have in your lab.

COMPONENTS OF THE BIOLOGIC LP SYSTEM:

1. Peristaltic Pump
2. UV Monitor
3. Gradient Monitor
4. Proportioning Valve/Mixer
5. Inject Valve
6. BioLogic Rack
7. Buffer Select Valve (optional)
8. Fraction Collector Divert Valve and Column Bypass Valve (both optional)
9. Dual Pen Chart Recorder (optional)
10. Model 2110 Fraction Collector (optional)



LIQUID CHROMATOGRAPHY SYSTEM.

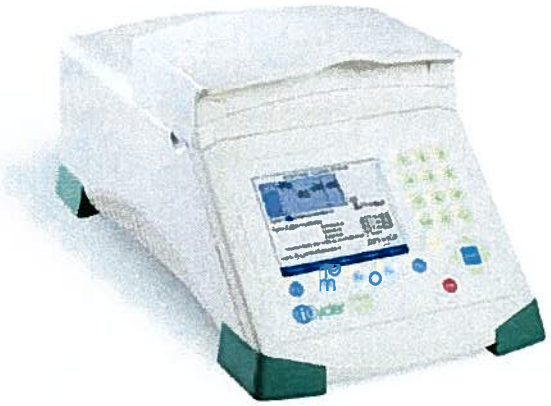


The BioLogic LP System is packed with user-friendly features.

- Store up to 50 methods
- Alphanumeric methods naming protocol
- Control of (up to) 5 buffers
- Time or volume-based programming
- In-progress methods editing
- Online, context-sensitive 'Help' function
- Automatic sensing of valve presence
- Flow rates to 40 mL per minute
- Program up to 50 collection windows
- Three programmable alarms and hold option
- Conductivity monitoring
- Standard 280 nm and 254 nm UV filters
- Choice of Bio-Rad 2110 or 2128 collectors

Superior Performance in an Easy-to-Use Package

The iCycler instrument offers everything most laboratories want in a thermal cycler — excellent thermal performance, fast ramping, intuitive programming, flexible assay formats, and an upgrade for real-time PCR. Many user-friendly features, including help screens and reference lists, will guide you through your experiments from start to finish, while the high-resolution graphical interface simplifies file and protocol management and allows you to print a variety of useful reports.



- Large 14.5 cm (5.7") VGA screen with both graphical and textual descriptions
- User-specific profiles and protocol folders to organize assays for multiple applications and large laboratories
- Multiple temperature control methods for increased assay flexibility
- 6 interchangeable reaction modules with different sample formats, including 2 for real-time PCR
- Upgradable to MyiQ and iQ5 real-time PCR systems
- Status and history of each run recorded in run and validation reports

96-well reaction module

Dual 48-well reaction module

Real-time optical module on iCycler base

384-well reaction module

60-well reaction module

Reaction Module Options

The modular design of the iCycler thermal cycler allows you to choose from a number of reaction modules, depending on your needs. If your needs vary, you can order additional modules — they easily swap in and out of the instrument.

- 96-well reaction module includes thermal gradient capability
- Dual 48-well reaction module can run 2 independently controlled protocols simultaneously
- 384-well reaction module is designed for high throughput and low volumes (5–20 µl)
- 60-well reaction module is ideal for preparative PCR — reaction volumes can be up to 200 µl
- iQ5 and MyiQ optical modules allow 5-color or 1-color real-time PCR

associated pages

Experion Automated Electrophoresis System

Experion Analysis Kits

Experion Automated Electrophoresis Station

Experion Priming Station

Experion Vortex Station

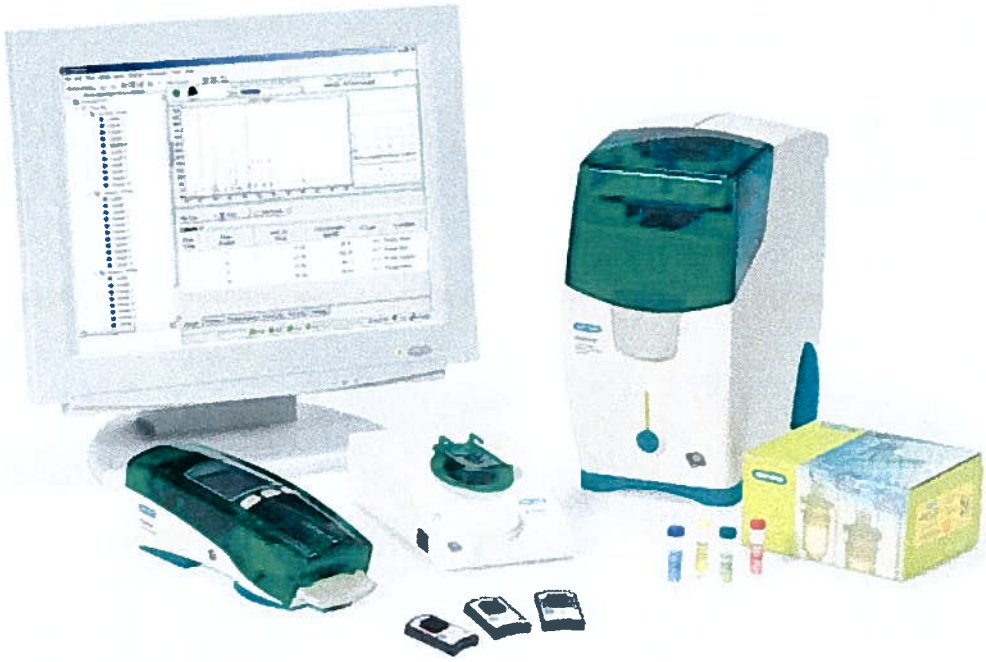
Experion Software

Experion System FAQs

Experion Training Video: Chip Loading

Experion Automated Electrophoresis System

Click for: | **Ordering Information** |
Related Information: | Literature |



The Experion automated electrophoresis system reinvents the way that you perform electrophoresis.

The Experion automated electrophoresis system combines Bio-Rad's expertise in electrophoresis with the innovation of Caliper Life Sciences' LabChip technology to deliver high-performance, affordable automation. The system produces rapid, reproducible, and reliable separation and analysis of protein and nucleic acid samples.

Focus on the Results, Not the Method

The Experion system automatically performs the multiple steps of gel-based electrophoresis: separation, staining, destaining, band detection, imaging, and data analysis. You can walk away while the Experion system produces highly reproducible separation and quantitation of protein, RNA, or DNA samples.

The Experion system provides the efficiency of microfluidics at an affordable price, making it an accessible technology for any research laboratory performing protein or nucleic acid electrophoresis, using quantitative RT-PCR analysis, or constructing DNA microarrays. The system requires very little sample or time. Routine and reproducible separation of protein and nucleic acid samples can be accomplished in as little as 30 minutes, allowing you to spend more time focusing on the results instead of the method.

Integrated System Design

The components of the Experion system provide rapid, high-quality results. Components include:

- Experion automated electrophoresis station
- Experion analysis kits
- Experion priming station
- Experion vortex station (for nucleic acid applications)
- Experion software

System Features

The Experion system offers exceptional performance and the following benefits:

- Analysis of 10–12 samples in 40 minutes
- Highly accurate nucleic acid and protein sizing and quantitation
- Minimal sample and reagent volume requirements

For added convenience, Experion software provides the following:

- Automatic calculations, including some statistical analysis
- Intuitive navigation
- Powerful data comparison tools
- Regulatory tools for US FDA 21 CFR Part 11 compliance (optional)
- IQ/OQ protocols (optional)

AUTOMATED ELECTROPHORESIS

Experion™ DNA 1K and 12K Analysis Kits

- For automated electrophoresis detection and basic analysis with the Experion system
- Accurate sizing and quantitation of DNA fragments
- Analysis of 1–11 samples in up to 40 minutes
- Innovative Caliper Life Sciences' LabChip technology

Single-Step DNA Analysis in 40 Minutes

Introduction

Experion DNA 1K and DNA 12K analysis kits combine state-of-the-art chip design with high-quality reagents to perform reproducible, quantitative, and accurate analysis of DNA fragments in minutes with the Experion system. Streamlined chip preparation methods and minimal sample requirements result in rapid experiments with minimal hands-on time.

The Experion DNA 1K and DNA 12K Advantage

Innovative chip design, chemistry, software, and hardware make DNA sizing and quantitation fast and easy.

- Analysis of 1–11 samples up to 40 minutes
- Single-step determination of DNA purity
- Accurate sizing and quantitation of DNA fragments

Experion DNA 1K and 12K Chips

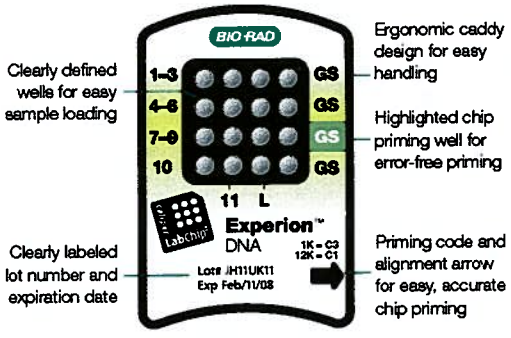
Experion DNA 1K and DNA 12K chips offer an optimized microchannel architecture within an ergonomic caddy for exceptional DNA separation, chip handling, and results. Each chip holds up to 11 samples and is clearly labeled with well number, priming code, lot number, and expiration date for easy, error-free runs.

Experion DNA 1K and 12K Reagents

Both the DNA 1K and DNA 12K assays utilize the same chips and similar protocols, which makes it easy to switch between DNA assays. The DNA assays yield good resolution over the entire separation range, either 25–1,000 bp or 100–12,000 bp, thereby allowing accurate quantitation and sizing. Experion DNA analysis kits include the following reagents and supplies:

- High-quality gel matrix for separation comparable to agarose DNA gels
- Fluorescent dye for high sensitivity and accurate detection
- Experion DNA ladder for accurate sizing and quantitation
- Optimized loading buffer for reproducible results
- Spin filters for convenient gel preparation

	Shelf Life	Storage Conditions
Experion DNA chips	9 months	Ambient
Experion DNA reagents, supplies	9 months	4°C



Approximate size
(30 x 50 x 10 mm)

BIO-RAD

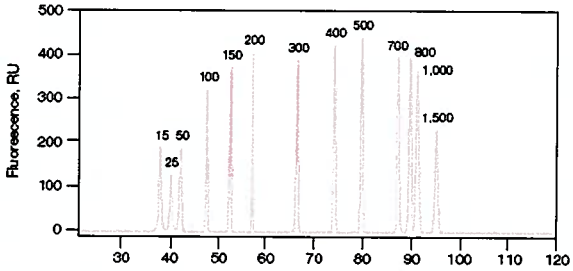
Experience Meets Innovation

Specifications

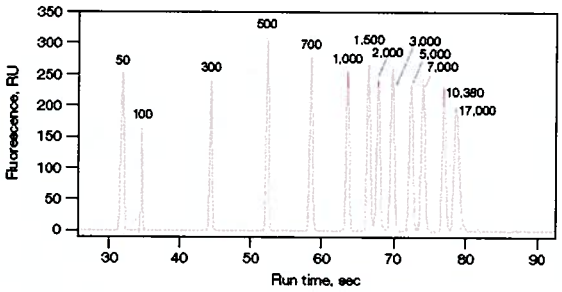
	DNA 1K Assay	DNA 12K Assay
Analytical		
Separation sizing range	25–1,000 bp	100–12,000 bp
Resolution	25–100 bp: 5 bp 100–700 bp: 5% 700–1,000 bp: 10%	100–1,500 bp: 10% 1,500–12,000 bp: 20%
Quantitation range	0.5–50 ng/µl	0.5–50 ng/µl
Limits of detection**	0.1 ng/µl	0.1 ng/µl
Sizing accuracy*	±10%	±15%
Sizing reproducibility*	CV ≤ 5%	CV ≤ 5%
Quantitation accuracy* (in TE buffer)	±25%	±20%
Quantitation reproducibility* (in TE buffer)	CV ≤ 20%	CV ≤ 20%
Maximum salt concentration in samples	200 mM KCl/NaCl 15 mM $MgCl_2$	250 mM KCl/NaCl 15 mM $MgCl_2$
Physical		
Sample volume	1 µl	1 µl
Number of samples/chip	11	11

* Applies to interchip and intrachip variation.
** Outside recommended quantitation range.

DNA 1K ladder



DNA 12K ladder



The DNA 1K and 12K ladders. The DNA fragment sizes are indicated in base pairs above the peaks.

Experion Software Requirements

The DNA 1K and DNA 12K analysis kits require Experion software version 2.1 or higher.

Ordering Information

Catalog #	Description
700-7107	Experion DNA 1K Analysis Kit for 10 Chips, includes 10 DNA chips, Experion DNA 1K reagents and supplies for 10 chips
700-7108	Experion DNA 12K Analysis Kit for 10 Chips, includes 10 DNA chips, Experion DNA 12K reagents and supplies for 10 chips
700-7050	Experion Software, version 2.1, system operation and standard data analysis tools, PC
700-7163	Experion DNA Chips, 10
700-7164	Experion DNA 1K Reagents and Supplies, for 10 chips, includes 3 x 250 µl DNA 1K gel, 40 µl DNA 1K stain, 20 µl DNA 1K ladder, 750 µl DNA 1K loading buffer, 3 spin filters
700-7165	Experion DNA 12K Reagents and Supplies, for 10 chips, includes 650 µl DNA 12K gel, 40 µl DNA 12K stain, 20 µl DNA 12K ladder, 750 µl DNA 12K loading buffer, 3 spin filters
700-7251	Experion Cleaning Chips, 10
700-7252	Experion Electrode Cleaner, 250 ml
700-7253	Experion DEPC-Treated Water, 100 ml
700-7261	Experion DNA 1K Ladder
700-7262	Experion DNA 12K Ladder

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Web site www.bio-rad.com **USA** 800 4BIORAD **Australia** 61 02 9914 2800 **Austria** 01 877 89 01 **Belgium** 09 385 55 11 **Brazil** 55 21 3237 9400 **Canada** 905 712 2771 **China** 86 21 6426 0808 **Czech Republic** 420 241 430 532 **Denmark** 44 52 10 00 **Finland** 09 804 22 00 **France** 01 47 95 69 65 **Germany** 089 318 84 0 **Greece** 30 210 777 4396 **Hong Kong** 852 2789 3300 **Hungary** 36 1 455 8800 **India** 91 124 4029300 **Israel** 03 963 6050 **Italy** 39 02 216091 **Japan** 03 5811 6270 **Korea** 82 2 3473 4460 **Mexico** 52 555 488 7670 **The Netherlands** 0318 540666 **New Zealand** 0508 805 500 **Norway** 23 38 41 30 **Poland** 48 22 331 99 99 **Portugal** 351 21 472 7700 **Russia** 7 495 721 14 04 **Singapore** 65 6415 3188 **South Africa** 27 861 246 723 **Spain** 34 91 590 5200 **Sweden** 08 555 12700 **Switzerland** 061 717 95 55 **Taiwan** 886 2 2578 7189 **United Kingdom** 020 8328 2000

Bulletin 5520 US/EG Rev A *06-0661 0107 Sig 1106*