DEPARTMENT OF MATHEMATICS, STATISTICS, AND PHYSICS

2018 SELF-STUDY REPORT

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WICHITA STATE UNIVERSITY

Program Review Self-Study Template

Academic unit: Mathematics, Statistics, and Physics

College: LAS

Date of last review 2014

Date of last accreditation report (if relevant)

List all degrees described in this report (add lines as necessary)

Degree: BS Mathematics CIP* code:

Degree: BS Physics CIP* code:

Degree: MS Mathematics CIP code:

Degree: MS Physics CIP code:

Degree: PhD Applied Mathematics CIP code:

*To look up, go to: Classification of Instructional Programs Website, http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55

Faculty of the academic unit (add lines as necessary)

Name ** Faculty signatures are on file in the department

Mark Arrasmith – Instructor/Unclass Prof

Elizabeth Behrman – Professor

Stephen Brady – Assoc. Professor

Alexander Bukhgeym – Professor

Dharam Chopra – Professor

Casey Craig – Instructor

Tinka Davis – Instructor

Thomas DeLillo – Professor

Alexandra Echart – Instructor

Jason Ferguson – Professor

Buma Fridman – Professor

Terrance Figy – Assoc. Professor

Hussein Hamdeh – Professor

John Hammond – Instructor ______________________

Rachel Heckman – Instructor ______________________

Lop-Hing Ho – Assoc. Professor ______________________

Xiaomi Hu – Professor ______________________

William Ingle – Instructor/Unclass Prof ______________________

Victor Isakov – Professor ______________________

Foudil Latioui – Instructor ______________________

Thalia Jeffres – Assoc. Professor ______________________

Zhiren Jin – Professor ______________________

Tianshi Lu – Assoc. Professor ______________________

Chunsheng Ma – Professor ______________________

Daowei Ma – Professor ______________________

Holger Meyer – Assoc. Professor ______________________

Mathew Muether – Asst. Professor ______________________

Phillip Parker – Professor ______________________

Sandra Peer – Instructor/Unclass Prof ______________________

Justin Ryan – Instructor ______________________

Paul Scheuerman – Instructor/Unclass Prof ______________________

Catherine Searle – Assoc. Professor ______________________

Nickolas Solomey – Professor ______________________

Ziqi Sun – Professor ______________________

Syed Taher – Assoc. Professor ______________________

Nathan Thompson – Instructor ______________________

Richard Traverzo – Instructor ______________________

Submitted by: Tom DeLillo, Professor & Chair Date: ________
(name and title)

Submitted by: Ziqi Sun, Professor & Graduate Coordinator Date: ________
(name and title)

1. Departmental purpose and relationship to the University mission (refer to instructions in the WSU Program Review document for more information on completing this section).

a. University Mission:

The mission of Wichita State University is to be an essential educational, cultural, and economic driver for Kansas and the greater public good.

b. Program Mission (if more than one program, list each mission):

The mission of the undergraduate program in Mathematics and Statistics is to provide a broadly based program in undergraduate level mathematics and statistics which will prepare students for either graduate study in mathematics and statistics or for mathematics-statistics related employment in academic, industrial or governmental positions. The undergraduate program is committed to providing the mathematical instruction needed by programs in business, education, engineering and health professions, as well as in the liberal arts and sciences.

The mission of the undergraduate program in Physics is to provide a broadly based, flexible program in undergraduate level physics which will prepare students for graduate study in physics or a related discipline or for physics-related employment in academic, industrial, or governmental positions. The undergraduate program is also committed to providing the physics instruction needed by programs in other sciences, engineering, education, and health professions, as well as in the liberal arts.

The mission of the M.S. program in Mathematics is to provide a broadly based, flexible program in graduate level mathematics and statistics which will prepare students for either doctoral study in mathematics and statistics; or for mathematics-statistics related employment in academic, industrial or governmental positions.

The mission of the M.S. program in Physics is to prepare students for doctoral work in physics or for STEM related jobs in research and industry. The MS degree program is flexible, allowing students to design their studies to meet their educational or career goals. Students may combine the study of physics with interest in such fields as astronomy, engineering, geology, computer science, mathematics and education.

The mission of the Ph.D. program in Applied Mathematics is to provide a high quality doctoral program in applied mathematics that will prepare students to become research mathematicians in either academia, business or industry.

c. The role of the program (s) and relationship to the University mission: Explain in 1-2 concise paragraphs.

Our department supports the university's educational commitment to the state and community by providing instruction in mathematics and statistics at all levels from pre-college mathematics through doctoral study. The need for mathematics permeates the modern technological world and workplace. Because the extent of mathematical training and expertise required varies considerably according to profession, the department provides instruction for students with a wide variety of goals and at all levels from the baccalaureate to the doctoral.

Physics is the root of all sciences and engineering. Without a broad educational base in Physics programs in other sciences and in engineering would not have the solid foundation they need, nor would local industry be provided with the leadership necessary in diverse groups of scientists and engineers.

Both baccalaureate programs and the Master's program are broadly based programs designed to prepare students for · employment in any of a wide variety of mathematics, statistics and physics based careers in science, industry and government, as well as other careers in which logical problem solving skills and precise thinking are valuable; teaching careers at the middle school, high school, junior college or college level; further study in mathematics, statistics or physics at a more advanced level.

Wichita State University is committed to providing comprehensive educational opportunities in an urban setting. Through teaching, scholarship and public service the University seeks to equip both students and the larger community with the educational and cultural tools they need to thrive in a complex world, and to achieve both individual responsibility in their own lives and effective citizenship in the local, national and global community.

The Ph.D. program in applied mathematics was developed specifically to support the state's growing technology-dependent industries. It contributes to and will continue to contribute to the economic development of the state, and the Wichita metropolitan area in particular. The Ph.D. program aims directly at building and upgrading the mathematical resources needed to sustain the technological base of the state. It is designed to provide substantive expertise in areas that are vital to industry in order to promote effective competition in commercial, governmental and international markets.

The graduate faculty in the department contributes significantly to the university's research mission. As reported in ScienceWatch.com on May 31, 2009, WSU ranks in the top 5 universities nationwide in the contribution of mathematics toward the university's total research productivity. Effective classroom teaching and continuing research activity by the faculty are equally important for the well-being and vitality of the programs offered by the department. Through their professional expertise, members of the faculty also provide service to the academic community as well as the industrial and commercial communities within the state.

d. Has the mission of the Program (s) changed since last review? Yes X No

e. Provide an overall description of your program (s) including a list of the measurable goals and objectives of the program (s) (both programmatic and learner centered). Have they changed since the last review?

Yes X No

The objectives of the undergraduate program in Mathematics and Statistics are:

- to provide students with a solid foundation in the major areas of mathematics and statistics and an understanding of the role of mathematics and statistics in applications;
- to prepare its graduates for either graduate study in mathematics and statistics, or for careers in teaching at the high school level or in any of a wide variety of mathematics and statistics based careers in science, industry and government, as well as other careers in which logical problem solving skills and precise thinking are valuable.

The objectives of the undergraduate program in Physics are:

- to provide a broadly based, flexible program in undergraduate level physics;
- to prepare its graduates for graduate study in physics or a related discipline or for physics-related employment in academic, industrial, or governmental positions.

The objectives of the MS program in Mathematics are:

- to provide students with a program of study in which they build on the knowledge acquired in an undergraduate program in mathematics and statistics by taking more advanced course work (and optionally thesis work) in certain areas of mathematics and/or statistics;
- to prepare its graduates for either further study in mathematics and statistics at the PhD level, a career in teaching at the high school or junior college level, a career in science, industry or government that requires graduate level training in mathematics or statistics.

The objectives of the MS program in Physics is:

- To provide students with a program of study in which they build on the knowledge acquired in an undergraduate program in physics by taking more advanced course work and gain practical research experience in the theory of physics and related experimental techniques.

The objectives of the PhD program in Applied Mathematics are:

- to enable students to reach the forefront of knowledge in some area of applied mathematics and to expand knowledge in this area through original research while also acquiring a broad grasp of the current state of the field;
- to prepare its graduates for either an academic career in teaching at the college or university level or a non-academic research career as an applied mathematician, statistician or scientist.

For each program, the first of the above stated goals is assessed in terms of specific learning outcomes in Section 3c of this Self-Study. A summary analysis of the results of these assessment activities is that all targets were met in at least two of the three years, and most in every year.

The Physics program has been growing steadily since 2008, has doubled over the three years of this study, and now attracts 12-15 new majors per year. We actively recruit new majors from area high schools and community colleges, and have instituted a new joint double major across colleges with the Engineering College which is very successful. During this review period the physics group has resumed teaching all of the first year calculus-based physics courses for engineering students. This transition was done smoothly, but may require additional instructional and lab support as enrollments grow.

The Physics MS program was restarted beginning in Fall 2016 with 6 enrolled students. In Spring 2018 the program has grown to 11 enrolled students and it is anticipated that it will continue to slow grow over the next several years. The program is anticipating producing 3 graduates from the program in Spring/Summer 2018. One of these students was accepted into the PhD Physics program at the Illinois Institute of Technology and a second plans to continue at Wichita State in our Applied Mathematics PHD physics track. We are actively recruiting and have had success in attracting international, domestic and local Wichita talent to the program. During this review period the program has just started but appears to be moving in a very positive direction. Additional research and faculty support may be needed in the near future in order to continue the growth of the program.

2. Describe the quality of the program as assessed by the strengths, productivity, and qualifications of the faculty in terms of SCH, majors, graduates and scholarly productivity (refer to instructions in the WSU Program Review document for more information on completing this section). Complete a separate table for each program if appropriate.

Complete the table below and utilize data tables 1-7 provided by the Office of Planning Analysis (covering SCH by FY and fall census day, instructional faculty; instructional FTE employed; program majors; and degree production).

Scholarly Productivity	Number Journal Articles		Number Presentations		Number Conference Proceedings		Performances			Number of Exhibits		Creative Work		No. Books	No. Book Chaps.	No. Grants Awarded or Submitted	$ Grant Value
	Ref	Non-Ref	Ref	Non-Ref	Ref	Non-Ref	*	**	***	Juried	****	Juried	Non-Juried				
Year 1 2015	22		14		5											7	$159,303
Year 2 2016	24		15		4											9	$340,915
Year 3 2017	18		19		5											7	$241,800

* Winning by competitive audition. **Professional attainment (e.g., commercial recording). ***Principal role in a performance. ****Commissioned or included in a collection.

Provide a brief assessment of the quality of the faculty/staff using the data from the table above and tables 1-7 from the Office of Planning Analysis as well as any additional relevant data. Programs should comment on details in regard to productivity of the faculty (i.e., some departments may have a few faculty producing the majority of the scholarship), efforts to recruit/retain faculty, departmental succession plans, course evaluation data, etc.

Provide assessment here:

In the Fall 2017 the MSP department had 24 tenure eligible faculty. All of them hold a Ph.D. and have graduate faculty status. All of our graduate courses are taught by full-time, tenure-track faculty.

The strengths of the graduate faculty consist of (i) research concentrations in areas related to the Ph.D. program in Applied Mathematics, (ii) recognized expertise in research and (iii) graduate instruction, training and mentorship.

(i) Faculty research areas include Analysis (partial differential equations, several complex variables, and calculus of variations), Differential Geometry and Mathematical Physics (pseudo-Riemannian manifolds, geometric flows, smooth topology), Numerical Analysis (numerical conformal mapping, computational fluid dynamics), Combinatorics and Statistics (spatio-temporal statistics, statistical computing, experimental design, mathematical statistics, and statistical procedures under constraints). Research interests such as inverse problems, integral geometry, free boundary problems, partial differential equations, probability and statistics overlap specific areas of Applied Mathematics with applications to the following areas:

1) Tomography and Integral Geometry. Applications to geophysics and medicine (three dimensional pictures of internal organs of a human body by CAT and MRI scans).
2) Determining obstacles and boundary conditions from scattering type data (in particular looking for size and location of cracks, say, in aging aircraft).
3) Fluid mechanics. Discovery of different physical phenomena (vorticity and turbulence, for example) through the use of the appropriate mathematical models.
4) Numerical Analysis. Solving of applied problems in various areas, such as fluid dynamics or mathematical physics, by using high speed computers.
5) Carleman estimates and uniqueness and stability of the continuation for partial differential equations and related numerical algorithms (for example, determination of vibrations of surfaces from remote acoustical measurements).
6) Survival Analysis.
7) High energy physics, astrophysics, quantum information, and materials science.
8) Smooth Geometry and Topology (for example, investigating the Hopf Conjecture, Morse functions, surgery on manifolds).

Our concentrations in partial differential equations (9 graduate faculty), geometry and topology (6 graduate faculty) and probability and statistics (4 graduate faculty) together with faculty research in several complex variables (3 graduate faculty) and numerical analysis (3 graduate faculty) allow our graduate students to obtain multiple perspectives of major areas of applied mathematics and statistics and to learn a large variety of complementary mathematical, computational and statistical techniques which will assist them in their careers.

(ii) Faculty research expertise is illustrated in many different ways:
In 2006, Victor Isakov was awarded the rank of Distinguished Professor of Mathematics. It was the first time in the (more than 100 years of) history of our department that our faculty member received such an award. We believe that this award, as well as many awards and recognitions our faculty have received year-after-year in the past 10-15 years, speaks to the quality of fundamental and applied research our department is involved in. Alan Elcrat (2000) and Victor Isakov (2001) won the WSU Excellence in Research Award. Chunsheng Ma (2005) and Christian Wolf (2007) won the WSU Young Faculty Scholar Award.

Over the past three years two faculty has been promoted to Associate Professor.

External experts have written about Mathematics & Statistics & Physics faculty in different contexts. One remark is in order. Starting 2010 we introduced the blind external evaluation for faculty applying for tenure and/or promotion. Due to confidentiality concerns we cannot exhibit these highly positive evaluation letters here. The same is true for other review letters talking of the research accomplishments of our faculty. So, we decided to include in Attachment #2 some of the previous (in years 2000-2010) letters characterizing the work of our existing faculty. So, a sample of letters from faculty at the University of Washington, University of Illinois, Oxford University, Stanford University, Rutgers University, and one Review for the Kansas NSF EPSCoR Award, and are included in Attachment #2.

Mathematics, Statistics, and Physics faculty serve on editorial boards of academic research journals. Since the Ph.D. program in Applied Mathematics was initiated in 1985, faculty have received grants from well-known and highly competitive federal, state and local agencies such as the National Science Foundation, Department of Defense, Department of Energy, Air Force, Federal Aviation Administration, National Research Council, National Geospatial-Intelligence Agency, and The Kansas Health Foundation.

Mathematics & Statistics faculty have given invited addresses at conferences and institutions throughout the world.

3. Academic Program: Analyze the quality of the program as assessed by its curriculum and impact on students. Complete this section for each program (if more than one). Attach updated program assessment plan (s) as an appendix (refer to instructions in the WSU Program Review document for more information).

a. For undergraduate programs, compare ACT scores of the majors with the University as a whole.

The mean ACT scores for students in Mathematics and Statistics and for students in Physics are significantly higher than the mean ACT scores for students in all university undergraduate programs. Undergraduate students in MSP programs are well prepared for success.

b. For graduate programs, compare graduate GPAs of the majors with University graduate GPAs.

The mean application GPA of graduate students admitted to MSP graduate programs, 3.63, exceeds the mean GPA of all admitted graduate students, 3.5. Graduate students entering a MSP graduate program are well prepared for graduate studies. The mean GPA of students admitted to the PhD program in Applied Mathematics (FY2015: 3.67; FY2016: 3.89; FY2017: 3.6) exceeded those for the college and university in FY2016; the mean GPA scores of students admitted to LAS PhD programs were FY2015: 3.74; FY2016: 3.67; FY2017: 3.67 and the mean GPA scores of students admitted to WSU PhD programs were FY2014: 3.69; FY2016: 3.65; FY2017: 3.70.

c. Identify the principal learning outcomes (i.e., what skills does your Program expect students to graduate with). Provide aggregate data on how students are meeting those outcomes. Data should relate to the goals and objectives of the program as listed in 1e. Provide an analysis and evaluation of the data by learner outcome with proposed actions based on the results.

In the following table provide program level information. You may add an appendix to provide more explanation/details. Definitions:
Learning Outcomes: Learning outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program (e.g., graduates will demonstrate advanced writing ability).
Assessment Tool: One or more tools to identify, collect, and prepare data to evaluate the achievement of learning outcomes (e.g., a writing project evaluated by a rubric).

Criterion/Target: Percentage of program students expected to achieve the desired outcome for demonstrating program effectiveness (e.g., 90% of the students will demonstrate satisfactory performance on a writing project).
Result: Actual achievement on each learning outcome measurement (e.g., 95%).
Analysis: Determines the extent to which learning outcomes are being achieved and leads to decisions and actions to improve the program. The analysis and evaluation should align with specific learning outcome and consider whether the measurement and/or criteria/target remain a valid indicator of the learning outcome as well as whether the learning outcomes need to be revised.

BS Mathematics

Learning Outcomes (most program will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exam)	Target/Criteria (desired program Level achievement)	Results	Analysis
Students should be able to communicate mathematical concepts in writing.	Assessment score (on a scale of 1 to 5) assigned by the instructor of Math 415. For each year two numbers and one percentage are recorded: # majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	70% of majors who take Math 415 have the assessment score of 3 or greater Consultant's rating B or higher	FY15: 28,22,79% FY16: 28,26,93% FY17: 27,23,85% Consultant's rating A, A, A (2015)	Target met in all 3 years: FY15: 79% FY16: 93% FY17: 85%
Student should demonstrate a good understanding of mathematical reasoning at the level of Advanced Calculus.	Assessment score (on a scale of 1 to 5) assigned by the instructor of Math 547. For each year two numbers and one percentage are recorded: # majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	70% of majors who take Math 547 have the assessment score of 3 or greater Consultant's rating B or higher on three areas	FY15: 17,13,76% FY16: 21,19,91% FY17: 14,12,86% Consultant's rating A, A, A (2015)	Target met in all 3 years: FY15: 76% FY16: 91% FY17: 86%
Students should have an adequate understanding of	Assessment score (on a scale of 1 to 5) assigned by the instructor of Math 555. For each year two numbers and one percentage are recorded:	70% of majors who take Math 555 have the assessment score of 3 or greater	FY15: 18,17,94% FY16: 12,9,75% FY17: 14,14,100% Consultant's rating	Target met in all 3 years: FY15: 94% FY16: 75% FY17: 100%

mathematical applications in physical sciences.	# majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	Consultant's rating B or higher on three areas	A, A, A (2014)	
Students should have an adequate understanding of numerical methods in mathematical computations.	Assessment score (on a scale of 1 to 5) assigned by the instructor of Math 551. For each year two numbers and one percentage are recorded: # majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	70% of majors who take Math 551 have the assessment score of 3 or greater Consultant's rating B or higher on three areas	FY15: 11,10,91% FY16: 17,13,77% FY17: 13,12,92% Consultant's rating A, A, A (2017)	Target met in all 3 years: FY15: 91% FY16: 77% FY17: 92%
Students should have an adequate understanding of diverse statistical techniques.	Assessment score (on a scale of 1 to 5) assigned by the instructor of Stat 571. For each year two numbers and one percentage are recorded: # majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	70% of majors who take Stat 571 have the assessment score of 3 or greater Consultant's rating B or higher on three areas	FY15: 9,7,78% FY16: Not offered FY17: 15,13,87% Consultant's rating A, A, A (2016)	Target met in FY15 and FY17: FY15: 78% FY16: NA FY17: 87%

BS Physics

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students acquire proficiency in physics	GRE Exam in Physics taken by all Physics majors – OR - Acceptance into a graduate program in Physics	Meet target: >50th percentile Exceed target: >70th percentile or accepted into graduate program in physics	FY15-17: not all GRE exam scores have been reported. Of those reported 1 meets target 1 exceeds target	Met the goal of the maintaining a 50% or higher rate of meeting expectations (5 of 10).
Remark: Of the five students who did not report Physics GRE scores or get accepted into physics graduate programs some started graduate studies in other fields such as mathematics and some pursued careers outside academia.				

MS Mathematics

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students should acquire knowledge of mathematical and statistical theory and methods.taught in at least 8 graduate courses at 700+ level	Grade Point Average. For each year 4 numbers are recorded: total # students enrolled Number with gpa>=3.0; gpa>=3.5; gpa>=3.9	90% of students enrolled in program have gpa>=3.0; gpa>=3.5 and >=3.9 indicate grade distribution.	FY15: 16, 16, 12, 2, FY16: 21, 20, 12, 4 FY17: 17, 16, 12, 1	Target met in each of last three years. FY15: 3+100% FY16: 3+95% FY17: 3+94%
Students should master, in depth, 3 areas in mathematics and/or statistics chosen by the students.	Oral Comprehensive Exam. At least three examiners rate student's performance on these three areas on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	FY15:3+:100%, 5:20% FY16:3+:100%, 5:9% FY17:3+:100%, 5:50%	Target met in each of last three years. FY15:3+:100% FY16:3+:100% FY17:3+:100%
Students are able to communicate mathematical concepts effectively and accurately in writing.	Comprehensive Exam. Three examiners rate student's written work on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	FY15:3+:100%,5:20% FY16:3+:100%,5:9% FY17:3+:100%,5:50%	Target met in each of last three years. FY15:3+:100% FY16:3+:100% FY17:3+:100%
Students are able to orally communicate mathematical concepts.effectively and accurately.	Comprehensive Exam. Three examiners rate student's on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	FY15:3+:100%,5:20% FY16:3+:100%,5:9% FY17:3+:100%,5:50%	Target met in each of last three years. FY15:3+:100% FY16:3+:100% FY17:3+:100%

MS Physics

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students should	Grade Point Average.	90% of students	FY17: 5, 4, 3, 1	Within

acquire knowledge of physics theory and experimental methods taught in at least 8 graduate courses at 700+ level	For each year 4 numbers are recorded: total # students enrolled Number with gpa>=3.0; gpa>=3.5; gpa>=3.9	enrolled in program have gpa>=3.0; gpa>=3.5 and >=3.9 indicate grade distribution.	(First Physics MS students enrolled in Fall 16)	acceptable range given initial class size. FY17: 3+80%
Students should choose and demonstrate mastery of subfield physics.	Oral Comprehensive Exam. At least three examiners rate student's performance on these three areas on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	The first 2 physics MS students are scheduled to complete final comprehensive exams (defensed thesis) in Spring '18 with a third anticipated in Summer '18.	
Students are able to communicate physics concepts effectively and accurately in writing.	Comprehensive Exam. Three examiners rate student's written work on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%+		
Students are able to orally communicate physics concepts. Effectively and accurately.	Comprehensive Exam. Three examiners rate student's on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%+		

PhD Applied Mathematics

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Mastery of core subjects	Qualifying Exam: Each examiner rates each student on a scale of 1 to 5 (high) on each subject.	80% of scores are 3 or higher.	FY15, FY16 and FY17 83% of scores are 3 or higher	Target exceeded; 83% rate
Mastery of research specialization area	Preliminary Exam: Each examiner rates each student on a scale of 1 to 5 (high)	90% of scores are 3 or higher.	FY15, FY16 and FY17 100% of scores are 3 or higher	Three year rate, 100%, exceeds target
Acquire knowledge in a research area and engage in current research	Progress in Program	75% of students who pass Qualifying Exam should finish dissertation within 6 years	Beginning with FY15, 13 of 15 students finished the PhD within 6 years of passing Qualifying Exam	Three year rate, 87%, exceeds target
Student should be able to orally communicate mathematical concepts	Preliminary and Final Exam: Each examiner rates each student on a scale of 1 to 5 (high)	90% of scores are 3 or higher.	FY15, FY16 and FY17 100% of scores are 3 or higher	Three year rate, 100%, exceeds target
Complete significant publishable research	Dissertation Defense: Each examiner rates each student on a scale of 1 to 5 (high)	100% of scores are 3 or higher.	FY15, FY16 and FY17 100% of scores are 3 or higher	Three year rate, 100%, meets target
Complete significant publishable research	Post graduation publication record	60% of doctoral graduates should publish the results of dissertation within 4 years	5/7 graduates from FY15 to FY17 published within 4 years	Three year rate, 71%, exceeds target

d. Provide aggregate data on student majors satisfaction (e.g., exit surveys), capstone results, licensing or certification examination results, employer surveys or other such data that indicate student satisfaction with the program and whether students are learning the curriculum (for learner outcomes, data should relate to the goals and objectives of the program as listed in 1e).

Evaluate table 10 from the Office of Planning and Analysis regarding student satisfaction data.

Student satisfaction with MSP undergraduate programs was generally higher than student satisfaction with LAS or with WSU programs in general. Student satisfaction with MSP graduate programs was 100% every year while student satisfaction with LAS and WSU graduate programs varied from 74% to 83%

Learner Outcomes (e.g., capstone, licensing/certification exam pass-rates) by year, for the last three years				
Year	N	Name of Exam	Program Result	National Comparison±
1		NA		
2		NA		
3		NA		

e. Provide aggregate data on how the goals of the *WSU General Education Program* and *KBOR 2020 Foundation Skills* are assessed in undergraduate programs (optional for graduate programs).

Outcomes: o Have acquired knowledge in the arts, humanities, and natural and social sciences o Think critically and independently o Write and speak effectively o Employ analytical reasoning and problem solving techniques	Results	
	Majors	Non-Majors

Note: Not all programs evaluate every goal/skill. Programs may choose to use assessment rubrics for this purpose. Sample forms available at: http://www.aacu.org/value/rubrics/

f. For programs/departments with concurrent enrollment courses (per KBOR policy), provide the assessment of such courses over the last three years (disaggregated by each year) that assures grading standards (e.g., papers, portfolios, quizzes, labs, etc.) course management, instructional delivery, and content meet or exceed those in regular on-campus sections.

Provide information here:

We had concurrent enrollment in the three years under review: the last such enrollment was in the Spring 2014. There is no concurrent enrollment in 2015FY (per WSU Administration decision). In the Attachment

#1e we have put the corresponding Assessment Plan. As one can see we are in full compliance with KBOR policy.

g. Indicate whether the program is accredited by a specialty accrediting body including the next review date and concerns from the last review.

Provide information here: Not accredited.

h. Provide the process the department uses to assure assignment of credit hours (per WSU policy 2.18) to all courses has been reviewed over the last three years.

Provide information here:

The process the department has used to assign credit hours to every course that has been offered in the past three years (either new offering or a previous course reviewed for any reason) has been in full compliance with WSU policy 2.18 (http://webs.wichita.edu/inaudit/ch2_18.htm). The procedure we have followed is identical to the one described in item 3. of Policy 2.18.

i. Provide a brief assessment of the overall quality of the academic program using the data from 3a – 3f and other information you may collect, including outstanding student work (e.g., outstanding scholarship, inductions into honor organizations, publications, special awards, academic scholarships, student recruitment and retention).

The academic programs for the MSP department are very strong. Students in these programs are well prepared, as demonstrated by ACT scores and entering GPA scores. The assessment targets for the undergraduate and graduate programs are met or exceeded for almost every Learning Outcome. Enrollment in the PhD program is strong and about twenty (20) new graduates of the PhD program are anticipated by July, 2020. Student satisfaction with the MSP programs is high, including 100% satisfaction with the MSP graduate programs.

4. Analyze the student need and employer demand for the program. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

a. Evaluate tables 11-15 from the Office of Planning Analysis for number of applicants, admits, and enrollments and percent URM students by student level and degrees conferred.

<u>For the BS (Math) program</u>: Students are applying to the Math program (FY2015: 31; FY2016: 32; FY2017: 46), being admitted (FY2015: 30; FY2016: 32; FY2017: 46), and enrolling (FY2015: 16; FY2016: 10; FY2017: 16).

<u>For the BS (Physics) program</u>: Students are applying to the Physics program (FY2015: 37; FY2016: 28; FY2017: 41, being admitted (FY2015: 36; FY2016: 27; FY2017: 40), and enrolling (FY2015: 19; FY2016: 14; FY2017: 24) in sufficient numbers for the sustainability of the program.

<u>For the MS program</u>: Students are applying to the MSP graduate programs (FY2015: 41; FY2016: 29; FY2017: 45), being admitted (FY2015: 29; FY2016: 21; FY2017: 35), and enrolling (FY2015: 21; FY2016: 12;

FY2017: 20) in sufficient numbers for the sustainability of the programs. (The data in Table 11 is not broken down by graduate program.) Enrollment in the MS program is appropriate (FY2015: 21; FY2016: 12; FY2017: 20) and above the KBOR minimum of 20 in FY2015 and FY2017. Approximately 64% of enrolled MS students are white non-hispanic (FY2015: 14/21; FY2016: 12/21; FY2017: 15/22), 11% are foreign (2/21; 3/21; 4/22) and other groups include asian (3/21, 2/21, 1/22), hispanic (1/21; 0/21; 1/22) and black non-hispanic (1/21; 0/21; 1/22) according to Table 13; however, between 0% and 15.4% of the MS graduates are under-represented minorities according to Table 14 (FY2015: 0%; FY2016: 15.4%; FY2017: 0%). It would be desirable if the numbers of under-represented minorities in the MS program increased; however, with essentially no funding at the department level for advertising and recruiting, MSP is at the mercy of the college and university with respect to attractive under-represented minorities to the MS program.

<u>For the PhD program</u>: Students are applying to the MSP graduate programs (FY2015: 41; FY2016: 29; FY2017: 45), being admitted (FY2015: 29; FY2016: 21; FY2017: 35), and enrolling (FY2015: 21; FY2016: 12; FY2017: 20) in sufficient numbers for the sustainability of the programs. (The data in Table 11 is not broken down by graduate program.). Approximately 17% of enrolled PhD students are white non-hispanic (FY2015: 3/16; FY2016: 4/21; FY2017: 3/20), 54% are foreign (9/16; 11/21; 11/20), and other groups include asian non-hispanic (3/16; 3/21; 3/20), hispanic (0/16; 2/21; 2/20) and black non-hispanic (0/16; 0/21; 1/20) according to Table 13. There were no students in the PhD program who were classified as american indian/alaskan native, hawaiian or multiple race. However these groups do not seem to choose to enter PhD programs in MSP in large numbers; for example, according to the 2016 American Mathematical Society "Report on New Doctorial Recipients", of 1921 PhDs in mathematics granted in 2015-16, black non-hispanic students earned 3% (53) of these degrees, hispanic students earned 5% (92) of these degrees, american indian/alaskan native students earned 0% (2) of these degrees, asian non-hispanic (domestic or foreign) students earned 41% (790) of these degrees and white non-hispanic students earned 49% (942) of these degrees. It would be desirable if the numbers of under-represented minorities in the PhD program increased; however, with essentially no funding at the department level for advertising and recruiting, MSP is at the mercy of the college and university with respect to attracting under-represented minorities to the PhD program.

b. Utilize the table below to provide data that demonstrates student need and demand for the program.

BS Math

Employment of Majors*							
	Average Salary	Employ-ment % in state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS** Current year only.
Year 1	NA	100%				4	
Year 2	$41,000	100%				0	
Year 3	$37,000	100%				2	NA (Data for MS and PhD only)

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

BS Physics

Employment of Majors*							
	Average Salary	Employ-ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS** Current year only.
Year 1	NA					1	
Year 2	NA					0	
Year 3	NA					0	NA (Data for MS and PhD only)

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

MS Math

Employment of Majors*							
	Average Salary	Employ-ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS** Current year only.
Year 1	$43,000	80%	100%			1	
Year 2	$43,000	71%	100%			3	
Year 3	$43,000	60%	90%		10%	4	23% (salary $101,360)

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

MS Physics

Employment of Majors*							
	Average Salary	Employ-ment % In state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or profes-sional educa-tion	Projected growth from BLS** Current year only.
Year 1	NA						
Year 2	NA						
Year 3	NA						

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

PhD Math

Employment of Majors*

	Average Salary	Employment % in state	Employment % in the field	Employment: % related to the field	Employment: % outside the field	No. pursuing graduate or professional education	Projected growth from BLS** Current year only.
Year 1	$50,000	33%	100%			0	
Year 2	$63,000	50%	100%			0	
Year 3	$45,000	0%	100%			0	23% (salary $101,360)

* May not be collected every year

** Go to the U.S. Bureau of Labor Statistics Website: http://www.bls.gov/oco/ and view job outlook data and salary information (if the Program has information available from professional associations or alumni surveys, enter that data)

Provide a brief assessment of student need and demand using the data from tables 11-15 from the Office of Planning and Analysis and from the table above. Include the most common types of positions, in terms of employment graduates can expect to find.

Provide assessment here:

Since the 2015 review of the PhD program, seven (7) students have earned PhD degrees in Applied Mathematics. Of these recent graduates, four have gone into academic careers and three have started non-academic careers. Two of these graduates following academic careers are instructors in foreign nations and the other two are instructors in the MSP program. Another two graduates of our PhD program started career as data analysts: Patrick Rinker became a senior analyst in Capital One and Li Liang works as a Big Data analyst in Beijing, China.

International students make up 50%-60% of our student population. It is noted that the vast majority of our international graduates have obtained highly productive jobs in the U.S. and many are now U.S. citizens.

5.Analyze the service the Program provides to the discipline, other programs at the University, and beyond. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

Evaluate table 16 from the Office of Planning Analysis for SCH by student department affiliation on fall census day.

In the Department of Mathematics, Statistics and Physics, most of our classes offered are services classes to student in other majors and general education fulfillment requirement classes. This causes a large burden of introductory classes to be taught. Many of these classes are taught by short term lecturers many of which are our MS and PhD students taking their first job, adjunct or guest professors and, where possible graduate students. While all of the regular tenured and tenured-track faculty have active funded research activities, the lecturers and adjuncts simply fulfill the teaching roll assigned to them. In many cases this results in simply servicing the classes without any research funded accompanying activity, and in some cases the use of these temporary lecturers and guest faculty results in less experienced instruction, especially for the evening classes. There are many ways to get around this problem with a slight increase in funding that would provide a high payback to the University on the research funded activities, that has been suggested in the past; we highly encourage the administration to sit down and listen to these arguments again and study the funding enhancement return charts that it could possibly provide in the long term. We have seen in the 5 year enrollment averages a 1.3% and 1.2% jumps in Student Credit Hours for Mathematics, Statistics, and Physics classes from 2011-2015 to 2012-2016 and 2012-2016 to 2013-2017 academic years. With the continued enrollment of Freshmen at Wichita State University projected to be 20% over the next four years this will certainly result in a continued growth of Student Credit Hours for Mathematics and Physics; however, continued growth in class instruction by simply hiring more graduate students or lectures without supporting an increase in tenure tracked faculty will not be able to satisfy this growth because the number of graduate students is limited by the research active faculty, which continues to drop due to faculty departures, retirements and deaths that are not being quickly replaced. This will result in a crisis of not being able to provide adequate instruction for the growing Mathematics and Physics demand unless action is started this coming academic year to properly address these faculty and lecturer needs.

a. Provide a brief assessment of the service the Program provides. Comment on percentage of SCH taken by majors and non-majors, nature of Program in terms of the service it provides to other University programs, faculty service to the institution, and beyond.

Provide assessment here:

As a consequence of the mission of our department, most of our SCH is produced by non-majors. This is (especially in the graduate programs) dictated by very limited funds (stipends, assistantships, etc.) to support our students.

The Department of Mathematics, Statistics, and Physics is larger in student credit hours production than three WSU colleges (Education, Fine Arts, and Engineering). We however are the most inexpensive in terms of the expenditure of university resources.

6. Report on the Program's goal (s) from the last review. List the goal (s), data that may have been collected to support the goal, and the outcome. Complete for each program if appropriate (refer to instructions in the WSU Program Review document for more information on completing this section).

(For Last 3 FYs)	Goal (s)	Assessment Data Analyzed	Outcome
Review of Triggered Programs; Strategic Plan	Recruit 3 new students each year	Data reported above for FY15, FY16 and FY17.	FY15: 5; FY16: 4; FY17: 6
	Maintain minimum of 10 students in program each year	ditto	FY15: 20; FY16:23; FY17:26
	Graduate a minimum of 2 students each year	ditto	FY15: 2; FY16:2; FY17:3

The PhD program currently has 20 students working toward completion. Of these, we anticipate five (5) graduates in SP18, one (1) in SU18, at least one in FL18 and at least six more by SP19. Between April 2018 and

July 2020, we anticipate (20) students to earn PhD degrees in Applied Mathematics. Student demand for the PhD program has increased recently and some students with strong academic records who previously would have been admitted and supported may not be offered graduate assistant support in the future. This raises some concerns about the number of PhD graduates after 2020; however, we gained strong new PhD students in 2017-18, have highly talented applicants for FL18 and the only barrier to maintaining strong PhD classes in the future is the level of GTA/GRA/GSA support from WSU.

7. Summary and Recommendations

a. Set forth a summary of the report including an overview evaluating the strengths and concerns. List recommendations for improvement of each Program (for departments with multiple programs) that have resulted from this report (relate recommendations back to information provided in any of the categories and to the goals and objectives of the program as listed in 1e). Identify three year goal (s) for the Program to be accomplished in time for the next review.

Provide assessment here:

In terms of credit hours production, our department is highly cost effective. We also are highly productive in publishing papers in refereed journals, applying for grants, etc. To maintain our excellent reputation in research, we need to return our faculty numbers to those in the previous decade. This preserves programs and overall stability, departments usually replace personnel when departures or retirements occur because it affords an opportunity to lower the average age of faculty in order to strengthen the department for the future.

To continue the educational effectiveness in our graduate programs, we have to constantly keep attracting talented students. At this time the stipends we have for our GTAs are not competitive with those at peer institutions; a serious increase in funding of these stipends is necessary. As enrollment at the university increases, we need to increase the number of graduate assistantships; for a research university of our size, we have relatively few graduate assistants.

Enrollments in first year physics for scientists and engineers are steady with class sizes capped at 35 students to insure quality instruction. This situation has put increasing demands on instructional staff, classroom space, labs, and student lab assistants. Requests to KBOR for labs fees are being considered.

To further increase efficiency and the productivity of our faculty and GTAs we need to continue being on the forefront of the computer revolution which is rapidly changing the way we teach and do research. The use of state-of–the-art technology already benefits us and our students tremendously. To continue utilizing the currently available technology we need to be aware of the latest developments in educational software. One critical need is more computer equipped classrooms. LAS provided us with one such facility years ago. It is being constantly used and provides us with obvious opportunities for computer use in teaching mathematics and statistics classes. However, it holds only 32 students at a time and at least one more such classroom is needed. An even more severe need is the replacement, as soon as possible, of our full-time UPS information systems manager, Tom Wallis, who passed away in spring 2018. We offer over 100 math and stat courses and over 50 physics courses (including labs with computers) each semester, in addition to individual reading, thesis, and dissertation courses. Our Fall 2017 enrollments were 3979 students taking 13,837 credit hours. We use hundreds of electronic and computational devices requiring frequent software updates. Currently Tom Wallis's supervisor, Mark Arrasmith, is shouldering most of the department's heavy computer and software maintenance responsibilities, but this cannot continue, since Arrasmith also teaches. This is an immediate and nonnegotiable need, if we are to continue to operate and bring ever-more-sophisticated software and computing capabilities into the classroom and meet the research needs of our faculty.

The three goals from our last review were I) increase in faculty positions, II) increase in support of our graduate programs, and III) restart the Physics MS degree and outreach to the Innovation Campus. Goals I and II have been largely beyond our control. On Goal I, we have fallen farther short on goals having lost more tenure-eligible faculty than we have been able to hire (see below). On Goal II, total GTA funding has been cut, in spite of our arguments for an increase. On Goal III, the Physics MS was successfully restarted in 2016 and will have its first graduates in May 2018. There have been several efforts to reach out to the Innovation Campus after its start in 2017. These and related ideas along with plans to expand these efforts will be outlined in the revised Goal III, below.

In light of the above observations, we are setting the following goals for the next 3 years.

I. FACULTY POSITIONS.

We represent three major STEM disciplines. We are essentially three departments under one roof: Statistics, Mathematics, and Physics. In terms of faculty structure we are stressed in all three departments.

(a) Mathematics.

The number of tenure-eligible faculty in mathematics and statistics has decreased by 1/3 over the last few years from an average of about 25 to 16; see the attached plot. Seven positions have been lost since 2014 without replacement due to budget shortages and other priorities. Of the 16 remaining faculty, 8 are 69 (soon to be 70) or over and several of those are in poor health. Two of the senior faculty have missed 2 or more semesters each due to health problems in the Review period and one remains on FMLA. Publication rates have decreased with the loss and aging of the faculty, as the plot in the Appendix shows. The situation puts the undergraduate and especially the graduate programs in a very precarious situation. The WSU administration has been repeatedly warned about this in annual reports and also in the last Program review. Unfortunately, our needs have not been addressed. Two assistant professors were hired for fall 2018 – one mathematician and one statistician. However, one senior faculty member (under 69) retires in Spring 2018, so Math/Stat will only have increased to 17 faculty. Hiring at least 3 assistant professors for 2019 and adding postdocs and replacing any retirements or other losses in the future would be about the minimum needed to insure the stability of the department and carry out our research mission and commitments as a major service department. While our strengths in analysis and core areas of mathematics should be maintained by replacing retirements, the next 2 or 3 new hires will be in applied and computational mathematics. Preferred areas may be targeted, but top candidates in unanticipated fields will be seriously considered. The Alan Elcrat Professorship in Applied Mathematics will be fully funded in 2019 and should be used to help hire new faculty. Most of the potential efforts described below to increase enrollments and contribute to the Innovation Campus will be impossible without more faculty.

The losses we suffered not only hurt our graduate program, it also severely limited our abilities to apply for outside grants. We have lost faculty in Analysis (e.g. fluid dynamics, inverse problems, numerical analysis, partial differential equations), which was and is our strongest research concentration and the principal area for which our research is known nationally; these areas attracted many of our graduate students. This area was also our major contact with the engineering community and also our major source for grant support. The main Fluid Dynamics people are gone. We have only two trained Numerical Analysts, one of whom is very busy as Department chair, and numerical analysis is an important part of our graduate education. We are also missing out on applying for the abundant grant possibilities in these areas (in the past we received over a million dollars of grants by faculty in these areas).

(b) Statistics.

We hired an assistant professor of statistics for Fall 2018. We will then have 4 statisticians which will just allow us to continue covering required statistics courses. Adding one more statistician would help insure continuity in the event of loss of senior faculty. Also, statistics will be required for any future efforts at WSU in areas such as data analytics or biostatistics. We also need a professor to oversee the large number of stat classes taken by students of various colleges (26 sections per year with 35 students in each; mostly taught by Instructors, Lecturers, and GTAs).

(c) Physics.

Physics currently has 8 tenure-eligible faculty. Recruitment is ramping up in the restarted (in 2016) Physics MS program, which will have its first 2 graduates in May 2018. The high energy group is strong and productive, as described below. Other physics faculty are active in materials science, quantum computing, and astrophysics, publishing and seeking external funding. Professor Elizabeth Behrman has an ongoing collaboration with Prof. James Steck in our Aerospace Dept on quantum neural networks and control and they are very active in submitting grant proposals and guiding grad students. Prof. Hussein Hamdeh maintains a very active publication output, in spite of less-than-adequate lab facilities. His area of condensed matter physics provides the physics basis for much of materials science and would be the next logical area to grow the physics group, if positions for them became available. WSU used to be strong in this area (e.g. when Dist. Prof James Ho was here) and MS degrees in this field are in demand in industry.

II. RECRUITMENT

Various efforts are planned to increase enrollments in all of our programs. This is a key goal of the university as a whole. Prof. Catherine Searle, a geometer, has been very active in seeking ways to recruit women and underrepresented minorities into our mathematics program. Our new mathematics hire, Dr. Yueh-Ju Lin, is a woman geometer. The geometry group will then include three women professors: Prof. Jeffres, Lin, and Searle. We hope to add other faculty from underrepresented minorities in other research areas, if we are able to hire in the future. We have met recently with Kaye Morgan-Monk, who has a great deal of experience with attracting students in the local community into STEM. We are also connecting with national organizations concerned with these issues. Efforts are planned to recruit locally from the nearby African-American and Latino neighborhoods into (first) our undergraduate program. In recent years, several of our graduate students are local students who have come through our undergraduate programs. We will also continue to recruit nationally and internationally into our graduate programs. However, decreases in GTA funding have caused us to occasionally loose or not be able to offer support to strong applicants. Our Math Circle has attracted middle school students with an interest in mathematics to campus for activities in mathematical games, programming, and presentations by our faculty.

The new Physics MS will provide increased opportunities for students in STEM fields. A physics option was introduced into the Applied Mathematics PhD program in 2012, in addition to the existing mathematics and statistics options. The Physics MS will potentially feed into this new option, providing even more possibilities for students and increasing chances for physics faculty to bring in external funding, as they did previously when their MS program was active.

Growing our Math and Statistics MS programs will also be a goal. Often strong undergraduates wish to continue with us for more advanced training. It is hoped that future efforts below in areas such as data analytics and computational and mathematical modeling will attract students at the graduate and undergraduate levels to our programs to learn the foundations of computational, statistical, and applied techniques increasingly in demand by business and industry.

III. OUTREACH TO THE INNOVATION CAMPUS, EXTERNAL FUNDING, AND INTERDISCIPLINARY EFFORTS

The Math/Stat/Physics Department will explore the possibilities of joint work across a broad spectrum of applied science, technology, and engineering, as the Innovation Campus unfolds. Since the start of the Applied Mathematics PhD program in the 1980s there have been a number of collaborative efforts involving our research faculty and PhD students. Joint projects have been undertaken in fluid dynamics, computational mechanics for the crash sled, scientific computing, inverse problems in cabin acoustics for business jets, computational electro-magnetics for lightening strike research, and statistical analysis. External funding supporting these projects has come from the NSF and NSF EPSCoR, the FAA, the Air Force Office of Scientific Research, and Admark grants. At least two former PhD students (Clarkson, Harder) and one faculty member (Hrycak) have been on the staff of NIAR. We anticipate involvement in more joint projects in the future, in areas related to the proposed WSU research clusters. Rebuilding our research faculty to former levels will enhance such opportunities greatly. There are a number of areas where mathematics could contribute. Acoustic properties of certain materials is one example of interest to some of our engineers. Optimization and control methods are in frequent use in engineering and business. Techniques in geometry and numerics are needed by companies like Dassault specializing in computer assisted design software.

There have been several efforts to reach out to the Innovation Campus after its start in 2017, including meetings with technical leadership at Airbus, discussions with technical staff at Dassault about joint projects with students, a meeting with Andy Schlapp to try to understand how we might fit in with the Kansas regional industry clusters (BREGSCK), various individual faculty interactions with Engineering and NIAR, participation in plans for cluster hires in data analytic and materials. However, few of these efforts has paid off significantly yet or even met with much response from the WSU administration.

Some efforts on environmental issues are starting to be taken more seriously on campus. Prof. Holger Meyer has been particularly active in promoting teaching and research (with Prof. Solomey) on clean energy and environmental issues, including cross-listing of ME Depts sustainability course with Physics. Prof. DeLillo has taught Math 657 Optimization for EE grad students doing research on the smart grid. Many other informal discussions have taken place and Prof. Meyer has recently been involved, with members of the Faculty Senate and others, in a proposal to form a President's Innovation Advisory Council to address issues of innovation and sustainability.

If productive relations can be formed with industry on campus, we hope to establish a math modeling clinic where student teams from math and other majors, guided by faculty and industry representatives, could address problems posed by industry in a workshop setting. The applied math socities have been sponsoring such workshops for decades now.

A certificate in data analytics will be developed within the department. Profs. Muether and Figy have already been involved in the planning of a cluster hire in this area. Their experience with the very large data sets from high energy physics could provide a solid training ground. Hiring a math postdoc in this area and pitching some of our computational, statistics, and modeling or special topics courses toward data analysis could provide the basis for such a certificate. Many jobs for our students are predicted in data science.

Although the restart of the Physics MS is being formulated to work with existing resources and staff, one part of the plan is to explore possibilities for joint hires with Engineering or other science departments in areas of mutual interest. For instance, materials science is an active area in both the physics group and Mechanical Engineering and a joint hire could share research labs and teaching duties. Other areas of cooperation include or have included chemical physics, quantum information, improvement of WSU high performance computational facilities, and development of space satellites for solar physics observations. Prof. Solomey has had success recently in securing NASA funds for his idea to design neutrino detector for solar orbit. There is also interest in Engineering, Human factors, and NIAR and, among young students, in various aspects of space flight which is worth investigating.

Significant progress on any of the ideas above will be difficult without more research faculty.

DEPARTMENT OF MATHEMATICS, STATISTICS, AND PHYSICS

2018 SELF-STUDY REPORT

ATTACHMENT #1

UNDERGRADUATE ASSESSMENT PLAN

Mathematics and Statistics (BS)

Department: Mathematics, Statistics, Physics

Program: Mathematics and Statistics (BS)

Contact Person: Ziqi Sun, ext 3964, ziqi.sun@wichita.edu

Date of revision: April 30, 2016

I. Program Mission

The mission of the undergraduate program in Mathematics and Statistics is to provide a broadly based program in undergraduate level mathematics and statistics which will prepare students either for graduate study in mathematics and statistics; or for mathematics-statistics related employment in academic, industrial or governmental positions.

II. Program Goals

1. To provide students with a broadly based program of study in which they acquire knowledge of mathematics and statistics in the undergraduate level.

2. To prepare students for
   - graduate study in mathematics or statistics.
   - graduate study in engineering or other physical sciences.
   - a career in teaching at middle or high schools.
   - a career in business or industry.

III. Learner Outcomes

1. Students should be able to communicate mathematical concepts in writing.
2. Student should demonstrate a good understanding of mathematical reasoning at the level of Advanced Calculus.
3. Students should have an adequate understanding of mathematical applications in physical sciences.
4. Students should have an adequate understanding of numerical methods in mathematical computations.
5. Students should have an adequate understanding of diverse statistical techniques.

IV. Assessment of Learner Outcomes

Each learner outcome listed above is associated with an assessment course listed in the following table.

Learner Outcome	Assessment Course
Learner Outcome 1	Math 415, Introduction of Advanced Mathematics

Learner Outcome 2	Math 547, Advanced Calculus I
Learner Outcome 3	Math 555, Differential Equations I
Learner Outcome 4	Math 551, Numerical Methods
Learner Outcome 5	Stat 571, Statistical Methods I

The assessment of each learner outcome is conducted through the corresponding assessment course in the following procedure. The same procedure applies to all the learner outcomes.

1. The student's knowledge of certain topics will be used in assessing the learner outcome 1-5 through the assessment courses.

2. The department will maintain a list of problems which are representative of problems/questions that the instructors of assessment courses should include on tests, quizzes, and/or the final exam during the semester in order to assess the student's knowledge of these topics.

3. The instructors will keep data on the performance of each math majors on those problems being used for assessment purposes.

4. At the end of the semester, the instructors will evaluate each math major's performance in each of the topics covered in the assessment courses. Base on student's performance on the assessment problems, the instructors will assign, for each math major enrolled, a numerical score (1-5, with 5= excellent, 4=good, 3=satisfactory, 2=less than satisfactory, and 1=poor) on each topic covered, and then calculate the average score of these assigned scores, which is considered as his/her assessment score for the assessment course.

5. The instructors will report the scores on report forms. The instructors will then return the forms to the departmental assessment committee. The forms will be kept on file for five years.

6. For each fiscal year and for each learner outcome, the assessment committee will calculate the percentage of math majors whose assessment score is 3 or greater.

V. Assessment Target

For each fiscal year and for each learner outcome, 70% of the math majors who take the assessment course have an assessment score of 3 or greater.

In case where the above target is not satisfied for a particular learner outcome in two consecutive years, the assessment committee will have a special meeting with the instructors of the assessment course and the course committee to discuss plans to improve the teaching outcome. The assessment reports from the external consultants (see below) will also be used to in the possible revision the course plan.

VI. Assessment by External Consultants

In addition to the above assessment process, we hire external consultants from prestigious universities outside Kansas to assess assessment courses (one or two each year).

At the end of each semester, the department will collect from each instructor of each assessment course the following materials:

- The syllabus.
- Copies of the tests given.
- Copies of representative graded examples of student work on each test.
- The graded Final Comprehensive Examinations for all students.

This material will constitute the basic file of information on the assessment course.

This file will be reviewed annually in a form which maintains student anonymity by an external consultant, who will visit the department for a period of two days to examine the file and form a complete and first-hand impression of the program being assessed. This consultant will evaluate the program and mail a brief written report to the department.

VII. Feedback Loop Used by the Faculty

The department has an Undergraduate Assessment Committee composed of three faculty members appointed by the department chairperson. Each year, the committee meets to review assessment result as well as the consultant's report on the assessment courses. An assessment report will be generated and submitted to the chairperson. The assessment committee will, based on the comments from the external consultant, recommend revisions on the course design for the assessment courses assessed by the consultant.

BS Mathematics

Learning Outcomes (most program will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exam)	Target/Criteria (desired program Level achievement)	Results	Analysis
Students should be able to communicate mathematical concepts in writing.	Assessment score assigned by the instructor of Math 415 that is based on student's performance on assessment problems	70% of majors who take Math 415 have the assessment score of 3 or greater		
Student should demonstrate a good understanding of mathematical reasoning at the level of Advanced Calculus.	Assessment score assigned by the instructor of Math 547 that is based on student's performance on assessment problems	70% of majors who take Math 547 have the assessment score of 3 or greater		
Students should have an adequate understanding of mathematical applications in physical sciences.	Assessment score assigned by the instructor of Math 555 that is based on student's performance on assessment problems	70% of majors who take Math 555 have the assessment score of 3 or greater		
Students should have an adequate understanding of numerical methods in mathematical computations.	Assessment score assigned by the instructor of Math 551 that is based on student's performance on assessment problems	70% of majors who take Math 551 have the assessment score of 3 or greater		
Students should have an adequate understanding of diverse statistical techniques.	Assessment score assigned by the instructor of Stat 572 that is based on student's performance on assessment problems	70% of majors who take Stat 572 have the assessment score of 3 or greater		

BS Mathematics – Assessment Report – Fiscal Year 2015-2017

Learning Outcomes (most program will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exam)	Target/Criteria (desired program Level achievement)	Results	Analysis
Students should be able to communicate mathematical concepts in writing.	Assessment score (on a scale of 1 to 5) assigned by the instructor of Math 415. For each year two numbers and one percentage are recorded: # majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	70% of majors who take Math 415 have the assessment score of 3 or greater Consultant's rating B or higher	FY15: 28,22,79% FY16: 28,26,93% FY17: 27,23,85% Consultant's rating A, A, A (2015)	Target met in all 3 years: FY15: 79% FY16: 93% FY17: 85%
Student should demonstrate a good understanding of mathematical reasoning at the level of Advanced Calculus.	Assessment score (on a scale of 1 to 5) assigned by the instructor of Math 547. For each year two numbers and one percentage are recorded: # majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	70% of majors who take Math 547 have the assessment score of 3 or greater Consultant's rating B or higher on three areas	FY15: 17,13,76% FY16: 21,19,91% FY17: 14,12,86% Consultant's rating A, A, A (2015)	Target met in all 3 years: FY15: 76% FY16: 91% FY17: 86%
Students should have an adequate understanding of mathematical applications in physical sciences.	Assessment score (on a scale of 1 to 5) assigned by the instructor of Math 555. For each year two numbers and one percentage are recorded: # majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	70% of majors who take Math 555 have the assessment score of 3 or greater Consultant's rating B or higher on three areas	FY15: 18,17,94% FY16: 12,9,75% FY17: 14,14,100% Consultant's rating A, A, A (2014)	Target met in all 3 years: FY15: 94% FY16: 75% FY17: 100%
Students should have an adequate understanding of numerical methods in mathematical computations.	Assessment score (on a scale of 1 to 5) assigned by the instructor of Math 551. For each year two numbers and one percentage are recorded: # majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	70% of majors who take Math 551 have the assessment score of 3 or greater Consultant's rating B or higher on three areas	FY15: 11,10,91% FY16: 17,13,77% FY17: 13,12,92% Consultant's rating A, A, A (2017)	Target met in all 3 years: FY15: 91% FY16: 77% FY17: 92%
Students should have an adequate understanding of diverse statistical techniques.	Assessment score (on a scale of 1 to 5) assigned by the instructor of Stat 571. For each year two numbers and one percentage are recorded: # majors enrolled # with grades>=3 % of majors with grades >=3. Consultant report: Every 4 year	70% of majors who take Stat 571 have the assessment score of 3 or greater Consultant's rating B or higher on three areas	FY15: 9,7,78% FY16: Not offered FY17: 15,13,87% Consultant's rating A, A, A (2016)	Target met in FY15 and FY17: FY15: 78% FY16: NA FY17: 87%

History of Consultant Visits

BS Math Assessment

Year	Courses	Consultant	University	Consultant Ratings
1998	415-547	G. Uhlmann	U. Washington	AAA
1999	555	G. Eskin	UCLA	AAA
2000	415-547	J. Sylvester	U. Washington	AAA
2001	551	B. Fornberg	U. Colorado	AAB
2002	571	S. Hedayat	U. Illinois	AAB
2003	415-547	P. Stefanov	Purdue U	AAA
2004	551	V. Wickerhauser	Washington U	AAA
2005	555	C. Shu	Brown U	AAA
2006	571	J. Srivatstava	Colorado State	AAA
2007	415-547	K. Zhu	SUNY Albany	AAA
2008	551	L. Reichel	Kent State	AAA
2009	571	C. Cheng	UC Berkeley	AAA
2010	555	L. Cummings	U Waterloo	AAA
2011	415-547	D. Blackmore	NJIT	AAA
2012	551	X. Jiao	SUNY at SB	AAA
2013	571	M. Puri	Indiana U	AAA
2014	555	J. McCuan	Georgia Tech	AAA
2015	415-547	J. Sylvester	U Washington	AAA
2016	571	R. Gupta	U Maine	AAA
2017	551	L. Reichel	Kent State	AAA

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DEPARTMENT OF MATHEMATICS
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Professor Ziqi Sun
Department of Mathematics
The Wichita State University
Wichita, Kansas 67260-0033

Professor John Sylvester
Tel.: 206–543–1158
E-mail: sylvest@uw.edu

April 1, 2007 15

Dear Professor Sun:

I have reviewed the materials, objectives, and student exams for Math 547- Advanced Calculus 1, in both Spring and in Fall. Many of my impressions are very much the same as they were when I reviewed the course 15 years ago. The course syllabus indicates that the course covers the required topics, but it is the exams that tell the true tale of what the students are required to achieve. The exams show that this course is a demanding one. There is at least one problem on the Spring final exam that no student did completely correctly. Overall, the final exams are well-balanced. The problems vary in difficulty from straightforward to very difficult. They also vary from abstract to concrete; some require the students to construct a rigorous proof of a stated fact, and others to decide what is correct and what is not. Maybe the most important aspect is that those students who did very well on the exam (between 1/3 and 1/2), have clearly exhibited substantial analytical and mathematical accomplishment. In my opinion, the work that the students showed on these exams gives a very strong assessment of their mathematical skills and accomplishments, and their potential for further study in mathematics. I would find reading these exams a much more insightful than most of the information on a graduate school application.

Additionally, the textbook is a good one. It is both rigorous and simple enough that students can learn by reading it. I believe that this is a benefit in a time when it seems that students are losing the ability to learn from books, relying instead on lectures and videos.

The two sections of math 415 that I reviewed were very different. Both used the same textbook, but apparently emphasized very different aspects of the subject. The autumn section (taught by the same instructor as the Math 547, featured a syllabus that referred to the textbook and exams similar to those of 547 (but covering different material and at lower difficulty level). The students answers to exam questions were what I would expect: proofs and calculations were often a little rough, as one would expect when they are confronted with a problem for the first time on an exam. The work they did seemed to give a good indication of their ability to do mathematical proofs and use mathematical induction and recursion.

I didn't see a syllabus for the spring section, but the exams tested different kinds of mathematics. Since the objective is to teach students to understand and write proofs, and that can be accomplished in many ways, there doesn't seem to be any reason to object to individual instructors' focusing on different mathematical topics. Raw scores on the final exam for the second course were much higher and students' proofs were much more polished. It appears that students in this course were given a list of problems to study for the final exam, and, for that reason, were expected to give more polished answers. I see no reason to object to this variation in style, as long as the grade distributions are comparable. In fact, it very strongly emphasizes the ability to write mathematics, which is the stated goal for this course. In this class, 50% of the students grade was based on homework (versus 5% in the other class). This worries me a little, because, with so many resources on the web (e.g. mathoverflow.net), I suspect it is very difficult to ensure that students are solving these problems themselves. On the other hand, this approach makes it very clear to the students what is expected of them, and gives each student, independent of ability, the opportunity to earn a good grade.

In summary, I feel that both Math 457 and Math 415 serve your students well. Students who successfully complete them can be proud of a substantial achievement. I don't see any reason to make major changes to any of them.

Sincerely,

John Sylvester
Professor of Mathematics

UNDERGRADUATE ASSESSMENT PLAN
FOR THE DEPARTMENT OF MATHEMATICS AND STATISTICS

The stated objectives are:

1. Students should be able to communicate mathematical concepts in writing.
2. Students should demonstrate a good understanding of mathematical reasoning at the level of Advanced Calculus.

1. Assuming all went as planned and the students diligently completed the syllabus, assign a grade (A-F) to the syllabus indicating how well studying these topics would help students satisfy the objectives

1. A

2. Now look at the tests given and grade them (as a single entity) according to how well achieving good scores on them would indicate that students have satisfied the objective.

2. A

3. Finally, consider the graded examples of student work (again, as a single entity) and assign a grade indicating how well their performances demonstrate that students have satisfied the objective.

3. A

[signature] 4/2/2015

SIUE Undergraduate Assessment and Program Review

Department of _Math & Stat________________ 2014-15

Program-initiated Goal of Objective	Where, When, and How Monitored	Expectation for Satisfactory Performance	Decision Point	Observations of Student Performance	When and By Whom Were Results Analyzed?	Outcome of Analysis	Dept. or Program Follow-up
The student will: **1. Communicate mathematical concepts in writing.** **2. Demonstrate mathematical reasoning at the level of Advanced Calculus.** .	**Course work Math 415 (Introduction to Advanced Mathematics) and Math 547 (Advanced Calculus I)**	**Grades and performance on final examination and other tests.**	**Grade of C or better in Math 415 and Math 547 completed and judged satisfactory by faculty members.**	How many students _42_exceeded _11_met _18_did not meet expectations? _0_exempted _71_Total	Dept. meeting date ________ or Individual analysis (describe)? **Performed by external consultant Prof. John Sylvester of the University of Washington.**	□ **Objective wholly satisfied** □ Objective not wholly satisfied. Follow-up strategy is __________ __________ __________	**Not required** □ Follow-up completion on date __________ □Will re-examine by date

Other Observations? None

Department of Mathematics
and Statistics

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May 10, 2016

Professor Ziqi Sun
Department of Mathematics and Statistics
Wichita State University
Wichita, KS 67260

Subject: Evaluation of STAT 571

Dear Professor Sun:

It was very nice visiting your department last week. It gave me an opportunity to talk to various members of your department on several issues of academic importance. More specifically, I had some very fruitful discussions with Professor Chopra regarding your statistics program. In particular, we discussed about the structure of your STAT 571. Let me now provide my comments

Structure of the course: The course is based on a standard book " Statistical Concepts and Methods", by Bhattacharya and Johnson, John Wiley & Sons. This course is required by Math. Majors, having no statistics background. All the basic topics, based on the normality assumption, are covered. Four exams. and home work assignments are given. Some credit is given for attendance.

Home work assignments and exams: I looked at the exams.and home work assignments. I found them well representative of the topics covered in the class. They also help the students in developing critical thinking.

Text book: The text book, which is being used, is an excellent book covering all the basic statistical methods at this level. It has been widely used over the years and it explains the basic ideas very clearly.

In addition to the above observations, I noticed that service courses in Statistics are taught by their respective departments. For example, Engineering and Business Schools teach statistics courses in their own department. I find this inefficient because the students are deprived of the knowledge of the faculty members who have been specifically trained to teach Statistics courses.

In summary, this is a good introductory course and is taught well. Such a course should be very helpful to undergraduate students at this level.

If I can be of further assistance to you, please do not hesitate to contact me.

Sincerely yours,

Ramesh C.Gupta
Professor of Statistics
University of Maine
Fellow, American Statistical association
rcgupta@maine.edu
207-581-3913

UNDERGRADUATE ASSESSMENT PLAN
FOR THE DEPARTMENT OF MATHEMATICS AND STATISTICS

The stated objectives are:

> "Students who wish to teach mathematics should have an adequate understanding of Advanced Calculus, Ordinary Differential Equations, and Statistics."
>
> "Students who wish to pursue a career in business or industry should possess knowledge of diverse statistical techniques."

1. Assuming all went as planned and the students diligently completed the syllabus, assign a grade (A-F) to the syllabus indicating how well studying these topics would help students satisfy the objectives

1. A

2. Now look at the tests given and grade them (as a single entity) according to how well achieving good scores on them would indicate that students have satisfied the objective.

2. A

3. Finally, consider the graded examples of student work (again, as a single entity) and assign a grade indicating how well their performances demonstrate that students have satisfied the objective.

3. A

SIUE Undergraduate Assessment and Program Review

Department of _Math & Stat_____________ 2015-16

Program-initiated Goal of Objective	Where, When, and How Monitored	Expectation for Satisfactory Performance	Decision Point	Observations of Student Performance	When and By Whom Were Results Analyzed?	Outcome of Analysis	Dept. or Program Follow-up
Students should have an adequate understanding of diverse statistical techniques .	**Course work Stat 571 (Statistical Methods I)**	**Grades and performance on final examination and other tests.**	**Grade of C or better in Stat 571 completed and judged satisfactory by faculty members.**	How many students _8_exceeded _2_met _4_did not meet expectations? _0_exempted _14_Total	Dept. meeting date ________ or Individual analysis (describe)? **Performed by external consultant Prof. Remash Gupta of the University of Maine.**	☐ **Objective wholly satisfied** ☐ Objective not wholly satisfied. Follow-up strategy is __________ __________ __________	**Not required** ☐ Follow-up completion on date __________ ☐Will re-examine by date

Other Observations? None

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May 6, 2017

Professor Tom DeLillo
Department of Mathematics
Wichita State University
1845 N. Fairmount
Wichita, KS 67260

Dear Tom:

Thank you for giving me an opportunity to visit your department and examine the content of your course Numerical Methods, Math 551! I have carefully reviewed the course material, including the textbook, syllabus, and homework.

Most students who take the course are juniors or seniors. They are required to have taken Calculus III and know MATLAB before starting the course. Students also are recommended to have taken courses in linear algebra and differential equations. In view of the material covered in Math 551, students clearly would benefit from having the background recommended.

The course Math 551 is well designed and quite ambitious. It introduces students to numerical methods for the solution of problems that arise in science and engineering. Many important topics are covered and the course is very useful to all students who in other courses or after graduating will solve problems with a computer.

The course covers Chapters 4-11 of the textbook

A. Greenbaum and T. P. Chartier, Numerical Methods: Design, Analysis, and Computer Implementation of Algorithms, Princeton University Press, Princeton, 2012.

This book is complemented by material on Fourier analysis, the discrete Fourier transform, the fast Fourier transform, and convolution.

The textbook is an excellent choice. There are many introductory textbooks on numerical methods written by authors who do not have a solid background in computational mathematics. This shows in the way the material is presented and in the numerical illustrations provided. Greenbaum is a well established numerical analyst

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who has written a very nice textbook. The book is rigorous, without using cumbersome notation. It helps the student think about computations in a proper way. The sensitivity of the computed results to round-off errors and errors in the data are discussed and illustrated. Computational complexity is treated and algorithms are compared in terms of accuracy and complexity.

The course covers a lot of material. All of it is very useful, but I would think that many students consider the course fairly difficult. This is likely to be the first course in which students have to think about different ways to solve problems, and then choose the one(s) that give the most accurate result as fast as possible.

The textbook is complemented by homework that is assigned every lecture. It is most valuable for the students to get hands-on experience of the methods discussed in class by doing this homework. In addition, students have to carry out larger computing projects in which they have to solve problems using MATLAB.

Math 551 is a very well-designed course. Students will benefit from this course long after the final exam whenever they will have to use a numerical method to solve a problem.

Sincerely,

Lothar Reichel
Professor of Mathematics

UNDERGRADUATE ASSESSMENT PLAN
FOR THE DEPARTMENT OF MATHEMATICS AND STATISTICS

The stated objectives is:

> "Students who wish to do graduate work in engineering or one of the mathematical sciences, should have an adequate understanding of Calculus, Ordinary Differential Equations, and Numerical Methods"

1. Assuming all went as planned and the students diligently completed the syllabus, assign a grade (A-F) to the syllabus indicating how well studying these topics would help students satisfy the objectives

1. A

2. Now look at the tests given and grade them (as a single entity) according to how well achieving good scores on them would indicate that students have satisfied the objective.

2. A

3. Finally, consider the graded examples of student work (again, as a single entity) and assign a grade indicating how well their performances demonstrate that students have satisfied the objective.

3. A

SIUE Undergraduate Assessment and Program Review

Department of _Math & Stat________________ 2016-17

Program-initiated Goal of Objective	Where, When, and How Monitored	Expectation for Satisfactory Performance	Decision Point	Observations of Student Performance	When and By Whom Were Results Analyzed?	Outcome of Analysis	Dept. or Program Follow-up
Students should have an adequate understanding of numerical methods in mathematical computations. .	**Course work Math 551 (Numerical Methods)**	**Grades and performance on final examination and other tests.**	**Grade of C or better in Math 551 completed and judged satisfactory by faculty members.**	How many students _16_exceeded _3_met _1_did not meet expectations? _1_exempted _21_Total	Dept. meeting date ________ or Individual analysis (describe)? **Performed by external consultant Prof. Lothar Reichel of the Kent State University**	□ **Objective wholly satisfied** □ Objective not wholly satisfied Follow-up strategy is __________ __________ __________	**Not required** □ Follow-up completion on date __________ □Will re-examine by date

Other Observations? None

1b. UNDERGRADUATE ASSESSMENT PLAN

Department: Mathematics, Statistics, Physics

Program: Physics (BS)

I. Program Mission

The mission of the undergraduate program in Physics is to provide a broadly based, flexible degree program in undergraduate level physics and also to provide the Physics instruction needed by programs in other sciences, engineering, education, and health professions, as well as in the liberal arts.

II. Program Goals

- To provide students with a high quality program of undergraduate study in Physics.
- To prepare students for graduate study in physics or a related discipline or for physics-related employment in academic, industrial, or governmental positions.

III. Learner Outcomes

Students will demonstrate and apply knowledge of the following core areas in Physics:

6. Mechanics
7. Electricity-Magnetism
8. Optics
9. Thermodynamics
10. Quantum Mechanics
11. Relativity
12. Advanced Lab

IV. Assessment of Learner Outcomes

Physics majors will be assessed in their final year before graduation with the Sigma Pi Sigma (the USA National Physics fraternity) entrance test, which is a comprehensive test evaluating the knowledge of students in the areas listed above. Using this standardized test learner outcomes for our students will be assessed at the national level. A comparison to other schools and their students will be known.

7. **Assessment Target**

Our overall goal is to maintain a 50% or higher acceptance rate for membership into Sigma Pi Sigma. (NOTE: In 2012 we graduated 7 Physics majors. They took the SPS exam and 6 were admitted into Sigma Pi Sigma). This acceptance rate will be recorded on an annual basis.

VI. Feedback Loop Used by the Faculty

Every few years our performance will be evaluated by the Physics faculty to assure that we are maintaining high learner standards in Physics and course content and the amount of time students spend studying specific subject in Physics via credit hours will be evaluated to make any adjustments to assure the best possible performance of our students. We feel that we can then best serve our students and the many employment job opportunities they get or prepare the students for further studies in graduate school through this evaluation procedure.

(old) Physics Department[*] Undergraduate Assessment Plan

University Mission

Wichita State University is committed to providing comprehensive educational opportunities in an urban setting. Through teaching, scholarship, and public service, the University seeks to equip both students and the larger community with the educational and cultural tools they need to thrive in a complex world, and to achieve both individual responsibility in their own lives and effective citizenship in the local, national, and global community.

High quality teaching and learning are fundamental goals in all undergraduate, graduate, and continuing education programs. Building on a strong tradition in the arts and science, the University offers programs in business, education, engineering, fine arts, and health professions, as well as in the liberal arts and sciences. Wichita State has 113 degree programs that range from the associate to the doctoral level; non-degree programs are designed to meet the specialized educational and training needs of individuals and organizations in south central Kansas.

Scholarship, including research, creative activity, and artistic performance, is designed to advance the University's goals of providing high quality instruction, making original contributions to knowledge and human understanding, and serving as an agent of community service. This activity is a basic expectation of all faculty members at Wichita State University.

Public and community service activities seek to foster the cultural, economic, and social development of a diverse metropolitan community and of the state of Kansas. The University's service constituency includes artistic and cultural agencies, business and industry, and community educational, governmental, health, and labor organizations. Wichita State University pursues its mission utilizing the human diversity of Wichita, the state's largest metropolitan community, and its many cultural, economic, and social resources. The University faculty and professional staff are committed to the highest ideals of teaching, scholarship, and public service, as the University strives to be a comprehensive, metropolitan university of national stature.

Program Mission

The mission of Wichita State University is not merely that of a trade school, but to provide "comprehensive" education. A good university education teaches students to think critically, and to use the wisdom of the past to understand the present and to develop a vision for the future. Physics is an essential part of this goal. Physics can be defined as the attempt to understand the behavior of matter and energy in terms of a few general laws or principles. Physicists try to understand the cosmos, all the way from stars and galaxies down to the elementary particles that make up nuclei and atoms. The laws

[*] In 2008, 2009 and 2010 there was an independent department of Physics.

(Old assessment)

of physics underlie the electronic intricacies of computers as well as the biological complexities of the human brain. Understanding the cosmos and the human brain are perhaps the boldest goals of 21st century physics, but of course there are also more down-to-earth problems being tackled by physicists today. In fact, the creative processes used in physics – the logic, the discipline, the approach to analyzing the single tree without being overwhelmed by the forest – also have important applications in many other areas if not in all.

Physics is the fundamental science and forms the core of every discipline in one way or another. The physics department provides the following service courses to the general education program of the university and for the science, health professions, and engineering majors: Physics 111, 131, 195, 213, 214, 313, 314, 315, 316, 320, and 395.

For Physics majors we offer two Bachelor's degrees, the BA and the BS. In addition to the basic courses which are a part of every physics major's preparation, we take pride in offering our students unique opportunities to be involved in fundamental original research as a significant part of their degrees. Physics degrees from WSU prepare our students with the tools necessary either to carry on their education in graduate studies or to seek careers in industry, government service or education. WSU Physics graduates are currently well employed in industry as engineers, in software development companies, and in the teaching profession as educators.

As part of the University's goal of making original contributions to knowledge and human understanding, the Physics Department faculty are expected to have nationally competitive research programs, seek external funding, and attend national and international conferences.

The department as a significant part of the metropolitan advantage takes pride in serving the community and region via public education activities such as presentations and speeches. Lake Afton Public Observatory and the Fairmount Center of Science and Mathematics Education were both started and nurtured in our department. Every year our faculty members play a disproportionately large role in Science Olympiad and the Kansas Junior Academy of Science, and we are proud to do so. More recently we have been collaborating significantly with the College of Education as well.

Program Goals and Objectives

1. To provide high quality introductory physics courses for other program's majors, and for WSU's general education program.
2. To provide high quality instruction, a solid undergraduate program, and research mentoring for physics majors.
3. To produce high quality fundamental physics research, as measured by published articles and books, presentations, and external funding; involvement in current areas of physics and collaborations with researchers in other fields and at other institutions; and national and international recognition.
4. To engage in educational outreach.

(Old assessment)

Learner Outcomes

Students who have taken introductory physics courses from WSU should be a) well prepared for the next course, if taking another physics course; b) well-prepared in the physics background they need to succeed in their chosen major, if not taking another physics course; and c) well-grounded in the basic understanding that physics provides of the universe as a whole. Students graduating with a physics degree from WSU should be well-prepared for graduate school, professional school, or for entering the work force, based on their knowledge of physics and their technical skills in problem solving, modeling, computers, and electronics.

Assessment of Program Goals

1. Scientific productivity: number of articles, quality of articles, number of presentations, quality of venues, number of citations, quality of citations.
2. Number of external and internal grants and dollar amount of grants.
3. Number and breadth of collaborations, number and quality of external invitations for talks, panel service, grant refereeing, paper refereeing.
4. Number, size, and quality of educational outreach activities.

Assessment of Learner Outcomes

Introductory Courses:
The Physics Department plans to integrate its assessment plan into the fabric of our larger goals as a department. We are primarily a service department: Most of our credit hours, and a majority of our faculty's time, is spent in teaching majors from other departments. Our work is none the less vital for that fact, however. Instruction in physics is fundamental for all of engineering, physical and life sciences. Accrediting agencies from ABET to ACS all require that students learn the basics, which in most cases requires a year of introductory physics at either the algebra or the calculus level. The Physics Department therefore offers Physics 213-214 and Physics 313-314-315-316 for the two respective levels. Each sequence is a total of 10 credit hours, including labs. The first semester (213 or 313-315) covers classical mechanics, heat, and wave motion; the second (214 or 314-316) covers electricity, magnetism, and light. In addition, 214 covers the small amount of modern physics that life sciences students need (especially to pass the MCAT.)

One of the major problems we (like most physics departments) face is a very high dropout rate in these basic courses. We have tried to address this problem in two ways: we have created a second-half-of-the-semester course, Physics 151, for students who find that their preparation is less than adequate; and we have instituted a Physics Help Lab (at the moment inadequately staffed by volunteers) to assist students having trouble. Unfortunately both are underutilized. Professors estimate that something like a third of the students enrolling in 213 or 313 (amounting to dozens in total) are underprepared, but

(old assessment)

enrollment in 151 this semester was only 3. Many are probably deciding to take the easier course at a community college, which experience teaches will probably only set them up for failure in the next course. But even if they did all enroll in 151 after dropping out of 213 or 313, it would be much better if we could direct him/her to the correct course in the first place.

We therefore propose that we set up a system similar to that the Mathematics Department has followed for years: a placement examination to determine the readiness of students for entering 213 or 313, and an exit exam for each course which can also serve as a placement exam for 214 or 314. Students demonstrating insufficient preparation for 213 or 313 could be directed to take the preparatory problem-solving course, 151, or the conceptual physics course, 111. Students with low but passing scores would be forewarned that their preparation was somewhat weak, and would know ahead of time to expect to have to work harder or to need Help Lab assistance.

In addition to going a long way towards solving our dropout problem, these exams can also serve the purpose of assessment – of the bulk, if not the whole, of our program. Collecting the data over only a couple of semesters will give us respectable numbers, enough for reliable statistics. One suggestion has been to use a nationally available, and normed, qualitative test (like Force Concept Inventory) for the conceptual physics part of the placement exam; this would have the advantage that we could then compare our results with those from physics departments across the country. In addition, by comparing averages for exit exams of large sections taught by different methods we could also objectively evaluate those methods' efficacy.

A committee of four faculty members (Drs. Axmann, Behrman (chair), Ferguson (undergraduate coordinator), and Foster) has been set up to construct the five examinations (placement, 213 exit, 313 exit, 214 exit, and 314 exit.) We hope to have these worked out and ready for Fall Semester, 2005. For Spring Semester 2005 we will gather preliminary data using the Force Concept Inventory as pre- and post-test for 111, and as pre-test for both 213 and 313 classes; for post-tests we plan to use (part of) the AP Physics tests at the appropriate levels.

Upper Division Courses:

The major as a whole also needs to be objectively evaluated. The major difficulty here is that we have so few majors – only a handful graduate every year – that it will take many years before statistics of any worth can be generated. However that is no reason not to start. We propose that graduating seniors take the Graduate Record Exam in Physics. This is a well-known, respected, and nationally normed examination that covers the entire undergraduate physics curriculum. There are parts of the exam that cover subjects a small department like ours cannot teach, like elementary particles or general relativity; however, these sections are small and in analyzing the results we can make allowances for these omissions.

Unfortunately this exam does cost almost $200 to take, and this may well be an expense

(old assessment)

many who were not planning on going to graduate school immediately cannot afford. If we cannot find the money to cover this for our students we can construct a number of similar exams from preparation books, and administer it ourselves.

Results

See the following tables for 2008, 2009 and 2010.

Feedback Loop

Since this process is new to us, we have not yet finalized either the assessment instrument or its method or standards of analysis. For the coming semester we will administer, as both pre- and post-test for 111, and as pre-test for the 200 and 300 level, the Force Concept Inventory. Our committee will construct preliminary versions of the post-tests for the 200- and 300-level courses from AP Physics tests. In May of 2005 we will meet as a faculty to discuss the results. Our analysis will provide important data for the committee of four, which will have been working on the design of the five examinations and the databases we will need for their administration. It will also, we hope, provide us with important information about how we can better teach our courses.[1]

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1 [1]Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. American Journal of Physics, 66, 64-74.

Can be accessed from:
http://scitation.aip.org/dbt/dbt.jsp?KEY=AJPIAS&Volume=66&Issue=1

Department of ___Physics___________________

Program-initiated [illegible]al of Objective	Where, When, and How Monitored	Expectation for Satisfactory Performance	Decision Point	Observations of Student Performance	When and By Whom Were Results Analyzed?	Outcome of Analysis	Dept. or Program Follow-up
Physics 111 students will demonstrate significant learning of conceptual	***Pre- and post-testing using Force Concept Inventory***	***Performance on nationally normed exam***	***Each student demonstrates a gain g = (posttest-pretest)/(100-pretest) of at least 0.3 and/or final***	How many students 15 exceeded 8 _ met and 0_ did not meet expectations	Dept. meeting date __ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement	None required □ Follow-up completion on date ______ xWill re-examine by date end of fall
Physics 213 students will demonstrate significant learning of algebra-level mechanics, heat, and waves	***AP level B Physics exam (half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	_How many students 30 exceeded 29 met 146 did not meet expectations? 0 exempted 205 Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods, to introduce a math placement test , and to begin to	None required □ Follow-up completion on date ______ xWill re-examine by end of fall semester and each semester thereafter
Physics 214 students will demonstrate significant learning of algebra-level electricity, magetism, llight, and modern	***AP level B Physics exam (the other half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students 12 exceeded 35 met 92 did not meet expectations? 0 exempted 139 Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective satisfaction unknown at this point. No students took the test.	None required □ Follow-up completion on date ______ xWill examine by end of fall semester and each semester thereafter
Physics 313 [illegible]ents will [illegible]onstrate significant learning of calculus-level mechanics, heat, and wave motion	***AP level C Mechanics exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students 43 exceeded 92 met 265 did not meet expectations? 0 exempted 400 Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required □ Follow-up completion on date ______ xWill re-examine by end of fall semester and each semester thereafter
Physics 314 students will demonstrate significant learning of calculus-level electricity, magnetism, and light	***AP level C Electricity and Magnetism exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students 59 exceeded 113 met 205 did not meet expectations? 0 exempted 377 Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required □ Follow-up completion on date ______ xWill re-examine by end of fall semester and each semester thereafter
Graduating seniors in Physics will demonstrate significant learning of the standard Physics curriculum	***Graduate Record Examination in Physics***	***Performance on nationally normed exam***	***Each student scores at least 50%***	How many students __ exceeded __met __did not meet expectations? __exempted __Total	Undergraduate advisor is accumulating data on averages in each subfield	Objective satisfaction unknown at this point. Follow-up strategy is to ensure curriculum in each advanced class covers essentials, and to introduce a problem-solving	None required □ Follow-up completion on date ______ xWill examine each student as s/he graduates

Department of ___Physics___

Program-initiated ...al of Objective	Where, When, and How Monitored	Expectation for Satisfactory Performance	Decision Point	Observations of Student Performance	When and By Whom Were Results Analyzed?	Outcome of Analysis	Dept. or Program Follow-up
Physics 111 students will demonstrate significant learning of conceptual	***Pre- and post-testing using Force Concept Inventory***	***Performance on nationally normed exam***	***Each student demonstrates a gain g = (posttest-pretest)/(100-pretest) of at least 0.3 and/or final***	_How many students 17_ exceeded 7_ met and 0_ did not meet expectations	Dept. meeting date __ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement	None required ☐ Follow-up completion on date ________ xWill re-examine by date end of fall
Physics 213 students will demonstrate significant learning of algebra-level mechanics, heat, and waves	***AP level B Physics exam (half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	_How many students 78 exceeded 51 met 76 did not meet expectations? _0_exempted 205 Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods, to introduce a math placement test , and to begin to	None required ☐ Follow-up completion on date ________ xWill re-examine by end of fall semester and each semester thereafter
Physics 214 students will demonstrate significant learning of algebra-level electricity, magetism, llight, and modern	***AP level B Physics exam (the other half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students 42 exceeded 31 met 55 did not meet expectations? 0 exempted 128 Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective satisfaction unknown at this point. No students took the test.	None required ☐ Follow-up completion on date ________ xWill examine by end of fall semester and each semester thereafter
Physics 313 ...ents will ...monstrate significant learning of calculus-level mechanics, heat, and wave motion	***AP level C Mechanics exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students 46 exceeded 68 met 301 did not meet expectations? 0 exempted 415 Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required ☐ Follow-up completion on date ________ xWill re-examine by end of fall semester and each semester thereafter
Physics 314 students will demonstrate significant learning of calculus-level electricity, magnetism, and light	***AP level C Electricity and Magnetism exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students 13 exceeded 58 met 220 did not meet expectations? 0 exempted 291 Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required ☐ Follow-up completion on date ________ xWill re-examine by end of fall semester and each semester thereafter
Graduating seniors in Physics will demonstrate significant learning of the standard Physics curriculum	***Graduate Record Examination in Physics***	***Performance on nationally normed exam***	***Each student scores at least 50%***	How many students __exceeded __met __did not meet expectations? __exempted __Total	Undergraduate advisor is accumulating data on averages in each subfield	Objective satisfaction unknown at this point. Follow-up strategy is to ensure curriculum in each advanced class covers essentials, and to introduce a problem-solving	None required ☐ Follow-up completion on date ________ xWill examine each student as s/he graduates

Department of ___Physics___________________

Program-initiated ...al of Objective	Where, When, and How Monitored	Expectation for Satisfactory Performance	Decision Point	Observations of Student Performance	When and By Whom Were Results Analyzed?	Outcome of Analysis	Dept. or Program Follow-up
Physics 111 students will demonstrate significant learning of conceptual	***Pre- and post-testing using Force Concept Inventory***	***Performance on nationally normed exam***	***Each student demonstrates a gain g = (posttest-pretest)/(100-pretest) of at least 0.3 and/or final***	_How many students 14_ exceeded 5_ met and 0_ did not meet expectations	Dept. meeting date __ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement	None required □ Follow-up completion on date ________ xWill re-examine by date end of fall
Physics 213 students will demonstrate significant learning of algebra-level mechanics, heat, and waves	***AP level B Physics exam (half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	_How many students 43 exceeded 52 met 109 did not meet expectations? _0_exempted 204_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods, to introduce a math placement test , and to begin to	None required □ Follow-up completion on date ________ xWill re-examine by end of fall semester and each semester thereafter
Physics 214 students will demonstrate significant learning of algebra-level electricity, magetism, llight, and modern	***AP level B Physics exam (the other half of it)***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students 21 exceeded 28 met 64 did not meet expectations? _0_exempted 113_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective satisfaction unknown at this point. No students took the test.	None required □ Follow-up completion on date ________ xWill examine by end of fall semester and each semester thereafter
Physics 313 ...ents will ...onstrate significant learning of calculus-level mechanics, heat, and wave motion	***AP level C Mechanics exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students 38 exceeded 68 met 248 did not meet expectations? _0_exempted 354_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required □ Follow-up completion on date ________ xWill re-examine by end of fall semester and each semester thereafter
Physics 314 students will demonstrate significant learning of calculus-level electricity, magnetism, and light	***AP level C Electricity and Magnetism exam***	***Performance on nationally normed exam***	***Each student scores at least 40%, and students earning an A score at least 60%.***	How many students 21 exceeded 47 met 250 did not meet expectations? 0 exempted 318_Total	Dept. meeting date ___ or Individual analysis (describe)? Based on previous report	Objective not wholly satisfied. Follow-up strategy is to introduce interactive engagement methods and to introduce a math placement test.	None required □ Follow-up completion on date ________ xWill re-examine by end of fall semester and each semester thereafter
Graduating seniors in Physics will demonstrate significant learning of the standard Physics curriculum	***Graduate Record Examination in Physics***	***Performance on nationally normed exam***	***Each student scores at least 50%***	How many students __ exceeded __met __did not meet expectations? __exempted __Total	Undergraduate advisor is accumulating data on averages in each subfield	Objective satisfaction unknown at this point. Follow-up strategy is to ensure curriculum in each advanced class covers essentials, and to introduce a problem-solving	None required □ Follow-up completion on date ________ xWill examine each student as s/he graduates

GRADUATE ASSESSMENT PLAN

Mathematics (MS)

Department: Mathematics, Statistics, Physics

Program Name: Mathematics (M.S.)

Contact person: Ziqi Sun, ext 3964, ziqi.sun@wichita.edu

Date of revision: March 12, 2012

I. Program Mission:

The mission of the M.S. program in Mathematics is to provide a broadly based, flexible program in graduate level mathematics and statistics which will prepare students either for doctoral study in mathematics and statistics; or for mathematics-statistics related employment in academic, industrial or governmental positions.

II. Program Constituents:

The students in the M. S. Degree program in Mathematics are the program constituents.

III. Program Objectives:

1. To provide students with a program of study in which they build on the knowledge acquired in an undergraduate program in mathematics and statistics by taking more advanced course work (and optionally research work) in certain areas of mathematics and/or statistics.

2. To prepare its graduates for either
   - further study in mathematics and statistics at the PhD level,
   - a career in teaching at the high school or junior college level,
   - a career in science, industry or government that requires graduate level training in mathematics or statistics.

IV. Assessment of Program Objectives:

1. This objective is assessed through the learner outcomes given below.

2. We maintain files containing information concerning what each graduate does upon graduation: employment obtained or further education pursued. The MS program expects at least 85% of the graduates of the program to obtain mathematics-statistics related employment or admission to a doctoral program within one year of graduation.

V. Student Learner Outcomes:

1. The student should acquire knowledge of mathematical and statistical theory and methods taught in at least 8 graduate courses (24 credit hours) at the 700 level or above

in Mathematics or Statistics. Students have flexibility in choosing which areas to learn, but must maintain a 3.0 gpa in all courses used toward the degree.

2. The student should master, in depth, three knowledge areas in mathematics and/or statistics. The three knowledge areas are chosen by the student, in consultation with an advisor, from among the nine areas: Algebra, Topology, Real Analysis, Complex Analysis, Partial Differential Equations, Numerical Analysis, Regression Analysis/Analysis of Variance, Theory of Statistics, Applied Statistics.

3. The student should be able to communicate mathematical concepts effectively and accurately in writing.

4. The student should be able to orally communicate mathematical concepts effectively and accurately.

VI. Assessment of (Student) Learner Outcomes:

1. Final assessment of whether the student has taken the required coursework is done when the student applies for the degree. Preliminary assessment is done when the student files a Plan of Study, usually in the second semester of study. Grade point averages are monitored for all students, each semester. At the end of each Spring semester a record is maintained of the g.p.a. of every student who has been enrolled in the program (taking at least one class) during the Fiscal year. Each year 4 numbers are reported: the total number of students enrolled in the program; the number of those students with a g.p.a. greater than or equal to 3.0; the number with a g.p.a. greater than or equal to 3.5; and the number with a g.p.a. greater than or equal to 3.9.

2. Student's mastery of knowledge of subject areas at the conclusion of the program will be assessed via the oral Comprehensive Exam. Faculty on the examining committee will evaluate, for assessment purposes, the student's performance in answering questions from each of the three knowledge areas the student has chosen to master.

3. and 4. The student's ability to communicate mathematical concepts will be assessed during the Comprehensive Exam. Each faculty member on the examining committee will assess, using a numerical scale, both the student's written work and oral presentation during the exam.

5. Records will be maintained of outstanding achievement by students in the program, including awards, such as Graduate School awards, or other forms of recognition.

The graduate coordinator is responsible for collecting the data for these assessment activities.

VII. Feedback Loop Used by the Faculty.

The department has a Graduate Assessment Committee composed of the graduate coordinator and three other members appointed by the department chairperson. This committee meets annually to review the results of the assessment. The same committee reviews the department's assessment process periodically. The committee will make recommendations to the graduate faculty based on assessment results.

MS Mathematics – Assessment Report – Fiscal Year 2015-2017

Learning Outcomes (most programs will have multiple outcomes)	**Assessment Tool (e.g., portfolios, rubrics, exams)**	**Target/Criteria (desired program level achievement)**	**Results**	**Analysis**
Students should acquire knowledge of mathematical and statistical theory and methods.taught in at least 8 graduate courses at 700+ level	Grade Point Average. For each year 4 numbers are recorded: total # students enrolled Number with gpa>=3.0; gpa>=3.5; gpa>=3.9	90% of students enrolled in program have gpa>=3.0; gpa>=3.5 and >=3.9 indicate grade distribution.	FY15: 16, 16, 12, 2, FY16: 21, 20, 12, 4 FY17: 17, 16, 12, 1	Target met in each of last three years. FY15: 3+100% FY16: 3+95% FY17: 3+94%
Students should master, in depth, 3 areas in mathematics and/or statistics chosen by the students.	Oral Comprehensive Exam. At least three examiners rate student's performance on these three areas on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	FY10:3+:100%, 5:20% FY11:3+:100%, 5:9% FY12:3+:100%, 5:50%	Target met in each of last three years. FY10:3+:100% FY11:3+:100% FY12:3+:100%
Students are able to communicate mathematical concepts effectively and accurately in writing.	Comprehensive Exam. Three examiners rate student's written work on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	FY10:3+:100%,5:20% FY11:3+:100%,5:9% FY12:3+:100%,5:50%	Target met in each of last three years. FY10:3+:100% FY11:3+:100% FY12:3+:100%
Students are able to orally communicate mathematical concepts.effectively and accurately.	Comprehensive Exam. Three examiners rate student's on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	FY10:3+:100%,5:20% FY11:3+:100%,5:9% FY12:3+:100%,5:50%	Target met in each of last three years. FY10:3+:100% FY11:3+:100% FY12:3+:100%

GRADUATE ASSESSMENT PLAN

Physics (MS)

Department: Mathematics, Statistics, Physics

Program Name: Physics (M.S.)

Contact person: Mathew Muether, ext 8347, mathew.muether@wichita.edu

Date of revision: April 4, 2018

I. Program Mission:

The mission of the M.S. program in Physics is to prepare students for doctoral work in physics or for STEM related jobs in research and industry. The MS degree program is flexible, allowing students to design their studies to meet their educational or career goals. Students may combine the study of physics with interest in such fields as astronomy, engineering, geology, computer science, mathematics and education.

II. Program Constituents:

The students in the M. S. Degree program in Physics are the program constituents.

III. Program Objectives:

1. To provide students with a program of study in which they build on the knowledge acquired in an undergraduate program in physics by taking more advanced course work and gain practical research experience in the theory of physics and related experimental techniques .

2. To prepare its graduates for either
   - further study in physics at the PhD level,
   - a career in teaching at the high school or junior college level,
   - a career in science, industry or government that requires graduate level training in physics.

IV. Assessment of Program Objectives:

1. This objective is assessed through the learner outcomes given below.

2. We maintain files containing information concerning what each graduate does upon graduation: employment obtained or further education pursued. The MS program expects at least 85% of the graduates of the program to obtain physics related employment or admission to a doctoral program within one year of graduation.

V. Student Learner Outcomes:

1. The student should acquire knowledge of physics theory and experimental methods taught in at least 8 graduate courses (24 credit hours) at the 700 level or above in Physics. Students must maintain a 3.0 gpa in all courses used toward the degree.

2. Students should choose and demonstrate mastery of a subfield physics in consultation with an advisor. Recommend subfields include but are not limited to Particles and Fields, Condensed Matter Physics, Quantum Information, Astrophysics.

3. The student should be able to communicate Physics concepts effectively and accurately in writing.

4. The student should be able to orally communicate physics concepts effectively and accurately.

VI. Assessment of (Student) Learner Outcomes:

1. Final assessment of whether the student has taken the required coursework is done when the student applies for the degree. Preliminary assessment is done when the student files a Plan of Study, usually in the second semester of study. Grade point averages are monitored for all students, each semester. At the end of each Spring semester a record is maintained of the g.p.a. of every student who has been enrolled in the program (taking at least one class) during the Fiscal year. Each year 4 numbers are reported: the total number of students enrolled in the program; the number of those students with a g.p.a. greater than or equal to 3.0; the number with a g.p.a. greater than or equal to 3.5; and the number with a g.p.a. greater than or equal to 3.9.

2. Student's mastery of knowledge of subject areas at the conclusion of the program will be assessed via the oral Comprehensive Exam. Faculty on the examining committee will evaluate, for assessment purposes, the student's performance in answering questions related to the students chosen subfield.

3. and 4. The student's ability to communicate physics concepts will be assessed during the Comprehensive Exam. Each faculty member on the examining committee will assess, using a numerical scale, both the student's written work and oral presentation during the exam.

5. Records will be maintained of outstanding achievement by students in the program, including awards, such as Graduate School awards, or other forms of recognition.

The graduate coordinator is responsible for collecting the data for these assessment activities.

VII. Feedback Loop Used by the Faculty.

The results of the assessment will be reported to the Physics graduate faculty annually along with recommendations to the graduate faculty based on assessment results.

MS Physics – Assessment Report – Fiscal Year 2015-2017

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Students should acquire knowledge of physics theory and experimental methods taught in at least 8 graduate courses at 700+ level	Grade Point Average. For each year 4 numbers are recorded: total # students enrolled Number with gpa>=3.0; gpa>=3.5; gpa>=3.9	90% of students enrolled in program have gpa>=3.0; gpa>=3.5 and >=3.9 indicate grade distribution.	FY17: 5, 4, 3, 1 (First Physics MS students enrolled in Fall 16)	Within acceptable range given initial class size. FY17: 3+80%
Students should choose and demonstrate mastery of subfield physics.	Oral Comprehensive Exam. At least three examiners rate student's performance on these three areas on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%	The first 2 physics MS students are scheduled to complete final comprehensive exams (defensed thesis) in Spring '18 with a third anticipated in Summer '18.	
Students are able to communicate physics concepts effectively and accurately in writing.	Comprehensive Exam. Three examiners rate student's written work on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%+		
Students are able to orally communicate physics concepts. Effectively and accurately.	Comprehensive Exam. Three examiners rate student's on a scale of 1 to 5 (high)	Two percentages are given: scores of 3 or above; scores of 5. Target: 3+: 95%+		

GRADUATE ASSESSMENT PLAN

Applied Mathematics (PhD)

Department: Mathematics, Statistics, Physics

Program Name: Applied Mathematics (PhD)

Contact person: Ziqi Sun, ext 3964, ziqi.sun@wichita.edu

Date of revision: June 12, 2012

I. Program Mission:

The mission of the Ph.D. program in Applied Mathematics is to provide a high quality doctoral program in applied mathematics that will prepare students as research mathematicians for employment in either academic, industrial or governmental positions.

II. Program Constituents:

The students in the Ph.D. Degree program in Applied Mathematics are the program constituents.

III. Program Objectives:

1. To enable students to reach the forefront of knowledge in some area of applied mathematics and to expand knowledge in this area through original research while also acquiring a broad grasp of the current state of the field.

2. To prepare its graduates for either an academic career in teaching at the college or university level or a non-academic research career as an applied mathematician, statistician or scientist.

IV. Assessment of Program Objectives:

1. This objective is assessed through the learner outcomes given in Section V.

2. We maintain files containing information concerning each graduate's employment upon graduation. It is expected that at least 85% of program graduates will obtain employment in either academia, business or industry.

V. Student Learner Outcomes:

1. Students shall demonstrate mastery of the core subjects of Real Analysis, Linear Algebra and Numerical Linear Algebra.

2. Students shall demonstrate mastery of their particular area of research specialization.

3. Students shall master some area of specialization and engage in current research.

4. Students shall demonstrate the ability to present their research orally.

5. Each student shall complete a significant research project that contributes to the knowledge base in the field. The results of this research are presented in the Ph.D. dissertation.

VI. Assessment of (Student) Learner Outcomes:

1. Mastery of the core topics is assessed through the written Qualifying Exam given after approximately one year in the program. The student's knowledge of each core subject will be evaluated separately on a scale of 1 to 5 by two members of the examining committee. Summary results of the level of student achievement will be reported annually.

2. Mastery of the area of specialization is assessed during the oral Preliminary Exam. Each member of the student's PhD committee will evaluate the student's mastery of the subject on a scale of 1 to 5.

3. Studying an area of specialization and engaging in research is a program requirement. This learner outcome is assessed by student progress through the program. Records will be maintained to keep track of the proportion of students reaching each stage in the program. In particular: a) How many of students admitted (and enrolled) later pass the Qualifying Exam; b) How many students who pass the Qualifying Exam later pass the Preliminary Exam; c) How many students who pass the Preliminary Exam later complete the degree.

4. Ability to present research orally is assessed by the student's PhD committee both at the time of the Preliminary Exam and the Final Exam. Each member of the student's PhD committee will evaluate the student on a scale of 1 to 5.

5. The dissertation is assessed by the student's PhD committee during the dissertation defense. Each member of the student's PhD committee will evaluate the student's research work on a scale of 1 to 5.

b) To further assess the quality of research conducted by students in the program the graduate coordinator will maintain information indicating whether each graduate a) has presented a paper at a regional, national or international meeting prior to graduation, and b) has had a paper accepted for publication in a refereed journal within four years of graduation.

6. Records will be maintained of outstanding achievement by students in the program, including awards, such as Graduate School awards, or other forms of recognition.

VII. Feedback Loop Used by the Faculty.

The department had a Graduate Assessment Committee composed of the graduate coordinator and three other members appointed by the department chairperson. This committee meets annually to review the results of the assessment. The same committee reviews the department's assessment process periodically. The committee will make recommendations to the graduate faculty based on assessment results.

PhD Applied Mathematics – Assessment Report – Fiscal Year 2015-2017

Learning Outcomes (most programs will have multiple outcomes)	Assessment Tool (e.g., portfolios, rubrics, exams)	Target/Criteria (desired program level achievement)	Results	Analysis
Mastery of core subjects	Qualifying Exam: Each examiner rates each student on a scale of 1 to 5 (high) on each subject.	80% of scores are 3 or higher.	FY15, FY16 and FY17 83% of scores are 3 or higher	Target exceeded; 83% rate
Mastery of research specialization area	Preliminary Exam: Each examiner rates each student on a scale of 1 to 5 (high)	90% of scores are 3 or higher.	FY15, FY16 and FY17 100% of scores are 3 or higher	Three year rate, 100%, exceeds target
Acquire knowledge in a research area and engage in current research	Progress in Program	75% of students who pass Qualifying Exam should finish dissertation within 6 years	Beginning with FY09, 13 of 15 students finished the PhD within 6 years of passing Qualifying Exam	Three year rate, 87%, exceeds target
Student should be able to orally communicate mathematical concepts	Preliminary and Final Exam: Each examiner rates each student on a scale of 1 to 5 (high)	90% of scores are 3 or higher.	FY15, FY16 and FY17 100% of scores are 3 or higher	Three year rate, 100%, exceeds target
Complete significant publishable research	Dissertation Defense: Each examiner rates each student on a scale of 1 to 5 (high)	100% of scores are 3 or higher.	FY15, FY16 and FY17 100% of scores are 3 or higher	Three year rate, 100%, meets target
Complete significant publishable research	Post graduation publication record	60% of doctoral graduates should publish the results of dissertation within 4 years	5/7 graduates from FY11 to FY13 published within 4 years	Three year rate, 71%, exceeds target

Concurrent Enrollment Assessment Plan (For 2018)

Prepared by:
Stephen W. Brady
Associate Professor of Mathematics and Statistics and
Director, College Algebra Program

Universities recommend that any high school student who wishes to attend any university or college should take four years of mathematics in high school. Three years of mathematics should be minimal preparation. The first college level course in mathematics at any university in the world is Calculus. All other courses before Calculus are remedial whether or not credit is given for those courses. Wichita State University's general education requirements in mathematics for graduation came from the realization that most of our students did not enroll initially with enough prior training in mathematics. Due to our previous open admission policy many were admitted with less than adequate mathematics background to be successful in college. The idea was to raise them to a college entry level of mathematics before they graduated from WSU by requiring knowledge of College Algebra (or higher level mathematics) as part of the general education program. Although this goal has been made much easier to attain due to the rule that the basic skills must be achieved in the first forty-eight hours of coursework, it is much better if the skills are achieved before entering college. Concurrent enrollment classes in mathematics in College Algebra, Trigonometry, and Pre-calculus using the "carrot" of college credit have encouraged students to take more mathematics while still in high school in order to raise their mathematical knowledge level closer to where it should be for college entry.

College Algebra

For the last twenty-six years the comprehensive departmental final for Math 111, College Algebra has been used as part of an overall assessment of the course. The final is worth at least 30% of the course grade for each section of M111. A student successfully satisfies the final assessment by scoring at least 50% on the final together with a C- or better for the semester overall. The weight of 30% for the final brings the course grade down (in most cases) to the D or F level for anyone not achieving a score of at least 50% on the final exam. For courses taught as concurrent enrollment the same weight (30%) for the course grade will be used. If a high school has any mathematics concurrent enrollment class taught by a teacher who does not have a master's degree, all sections in the school use the same department final as that given by the university. In such cases, the assessment criteria are identical. When periodic overall assessments of the university courses are done, the concurrent enrollment classes will be included. Comparisons will be easy to draw concerning student learning outcomes in both environments and how closely concurrent enrollment classes mirror the university classes. In a high school whose mathematical concurrent enrollment classes are taught by teachers with master's degrees, the final does not have to be the same as the university final but the assessment and grading weight are the same. Finals that are different from the one given by the university are approved by the College Algebra Program Director. These classes will be included in any overall assessment of college algebra courses. Comparisons will be made between these classes, university classes, and those concurrent enrollment classes using the university final. The university's SPTE assessment is used to assess each concurrent enrollment class to evaluate student perception of the instructor and course. In addition, any high school assessment of student learning outcomes that is part of a concurrent enrollment course will be requested from the school and compared with our own assessments.

The prerequisites for university College Algebra classes are two years of high school algebra or equivalent and a satisfactory score on the department placement exam or math ACT exam or math SAT exam. Satisfactory scores have been determined to be 15 of 32 on the department placement exam, 20 for math ACT, and 520 for math SAT. The department placement exam, while not a post-assessment tool for College Algebra is an assessment tool for our remedial courses and for a student's previous mathematical preparation. Part of the way we can affect student learning outcomes in College Algebra is to make sure the student is (mathematically) ready to enroll in the course. The department feels that our remedial courses themselves have been excellent preparation. The placement exam is also working well. Most high school mathematics concurrent enrollment courses involve the second semester of a two-semester sequence. In order to qualify for concurrent enrollment in such a course, an A or B is required in the first semester. So, a concurrent enrollment student shows they are ready for college credit by above average achievement in previous semesters.

College Algebra has the following overall course outcomes.
The student will understand the body of mathematical knowledge identified as
College Algebra in order to:

1. Build a foundation for mathematical problem solving.
2. Apply problem-solving techniques to model both mathematical and real-world contexts.
3. Use mathematical language and symbols as a means of communication while reading, writing, speaking, and

listening.

4. Apply critical thinking and analytical reasoning skills in mathematical settings.
5. Retrieve and utilize mathematical skills as opportunities arise.
6. Make connections between mathematical problem solving and its application in other settings.

These outcomes are part of a Course Syllabus that spells out in detail the sections to be covered in College Algebra, the time to be spent on each text section, and the outcomes for each text section. The university final exam is closely tied to these outcomes. Each university class section in College Algebra uses the same book and materials. Each concurrent enrollment section in each school district uses the same text. Although textbooks may be different from ours and differ from district to district, this is not a problem since texts used in the high schools are standard college level texts acceptable for our courses and cover the same material. The university course syllabus for College Algebra (together with the goals and outcomes) are distributed to the high school concurrent enrollment teachers as well as both sample finals and previous university course finals. Concurrent enrollment teachers are encouraged to utilize as much of this material as is possible. Meetings have been held with all the mathematics concurrent enrollment teachers. Course procedures, final exams, assessments, and curricula have been discussed at these meetings with the goal of tying the concurrent enrollment experience as closely as possible with the university course. Concurrent enrollment instructors ask to sit in on a summer university courses for the purpose of gaining additional training and experience. We encourage such training experiences.

A standing committee composed of experienced faculty oversees the university course contents, the textbook, the length of time to be spent on topics, etc. The mathematics portion of the basic skills requirement is overseen by a professor in the department of Mathematics, Statistics, and Physics who carries the title of College Algebra Director. Concurrent enrollment mathematics courses and assessment will be overseen by the same Director. The overall rules governing College Algebra as concurrent enrollment will be the same as those for the university equivalent.

Trigonometry, Math 123 and Math 112, Pre-Calculus

The College Algebra portion of Pre-calculus (a combination of Algebra and Trigonometry), M112, is considered to be equivalent to M111 and is an alternate path that can be used to satisfy the basic skills requirement. It is usually taken by those who have a need or desire to take higher level mathematics but who do not feel ready to take Calculus. Trigonometry at our university has College Algebra as a prerequisite. Both courses have course syllabi with similar outcomes as those stated above for College Algebra. The classes are taught mostly by regular faculty with some classes taught occasionally by our more senior graduate teaching assistants. Each instructor gives their own final and is responsible for all aspects of the course. Finals for concurrent enrollment classes are submitted and approved by the College Algebra Program Director. Historically, the only assessment done is by the faculty teaching the course and by grade distributions. With respect to concurrent enrollment, all rules and goals governing the College Algebra course discussed above are the same for Trigonometry and Pre-calculus. Concurrent enrollment class assessments will be compared to our Instructor's assessments of their courses.

DEPARTMENT OF MATHEMATICS, STATISTICS, AND PHYSICS

2018 SELF-STUDY REPORT

ATTACHMENT #2

WSU TENURE-ELIGIBLE MATH/STAT FACULTY

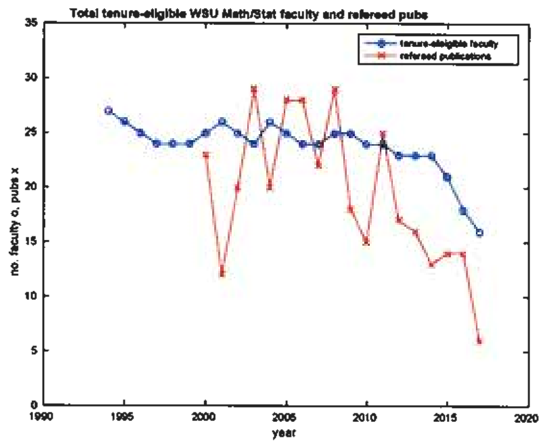

FIG. 0.1. *Plot of total tenure-eligible Math/Stat faculty 1994-2017 and refereed publications (joint publications counted only once) from 2000-2017. Of the 16 faculty in 2017-18 half of us (8) are 69 (soon to be 70) or over (and 7 of those reportedly have health problems). The decline in publications is a function of both the decrease in number of faculty and the aging of the faculty. This endangers both our undergraduate and our graduate programs.*

Math-Stat tenure-eligible Faculty and years at WSU

Acker, Andrew 1987-2012
Bajaj, Prem 1968-2002
Boneh, Shahar 1989-1997
Brady, Steve 1967-present
Bukhgueym, Alexander 2002-present
Chopra, Dharam 1967-present
Crown, Gary 1962-1999
DeLillo, Thomas 1988-present
Elcrat, Alan 1967-2013
Fridman, Buma 1982-present
Ho, Lop-Hing 1989-present
Hrycak, Tomasz 1999-2005
Hu, Xiaomi 1994-present
Hutchinson, John 1976-2015
Isakov, Victor 1988-present
Jeffres, Thalia 2004-present
Jin, Zhirin 1994-2018
Johns, Buddy 1964-2016
Kuchment, Peter 1990-2002
Lancaster, Kirk 1980-2017
Lu, Tianshi 2008-present
Ma, Chunsheng 1999-present
Ma, Daowei 1993-present
Mendieta, Gonzalo 1987-1995
Miller, Kenneth 1981-2016

Mukerjee, Hari 1988-2016
Papanicolaou, Vassilis 1993-2005
Parker, Phil 1983-present
Qian, Jianliang 2005-2008
Richardson, Bill 1962-2014
Robertson, John 2004-2009
Searle, Catherine 2014-present
Sun, Ziqi 1990-present
Tamraz, Abdullah 1987-1992
Walsh, Mark 2012-2017
Wang, Han-Kun 1987-1999
Wherritt, Robert 1962-1996
Wolf, Christian 2002-2010

Professional quality of faculty

In addition to our strong publication record and continuing success in external funding, during the period of this self-study our faculty have given invited lectures at University of Linkoping, Sweden, Vanderbilt University, CUNY Graduate Center, University of British Columbia, Oregon State, and other well-know institutions. Prof. Lancaster gave an invited lecture at the Albert Einstein Institute for Gravitational Physics (MIP-AEI) in May of 2014. Faculty have been co-organizers of several meetings such as workshops at the Banff International Research Station, Canada (twice: Searle and Elcrat, a co-organizer of the Jan 2015 complex analysis workshop. Prof. Elcrat passed away in Dec 2013 and that workshop was dedicated to him with talks given on his work by his coauthors Prof DeLillo of WSU in complex analysis and Prof Protas of Macalaster in fluid mechanics) and the BEACH international conference on high energy physics (Meyer and Solomey in 2012 in Wichita and 2014 in Manchester, UK where Prof. Solomey gave the public lecture on the 50th anniversary of the prediction of quarks.) Prof. Searle is currently (March 2015) hosting a conference here on research in geometry which was funded by the NSF in 2014 and in which half of the speakers are women mathematicians. In addition to their regular duties as referees and reviewers, faculty also serve on the editorial boards of professional journals such as Inverse Problems, and Electronic Transactions on Numerical Analysis.

Distinguished Prof. Isakov has had continual NSF support as an individual investigator since he arrive here in 1988 and joint Cessna, NSF, and NGA support at various times with the WSU inverse problems group, Bukhgeym, DeLillo, and Elcrat with total funding of over $2 million.

External experts have written about Mathematics & Statistics & Physics faculty in different contexts. One remark is in order. Starting 2010 we introduced the blind external evaluation for faculty applying for tenure and/or promotion. Due to confidentiality concerns we cannot exhibit these highly positive evaluation letters here. The same is true for other review letters talking of the research accomplishments of our faculty. So, we decided to include in Attachment #2 some of the previous (in years 2000-2010) letters characterizing the work of our existing faculty. So, a sample of letters from faculty at the University of Washington, University of Illinois, Oxford University, Stanford University, Rutgers University, and one Review for the Kansas NSF EPSCoR Award, and are included in this attachment.

List of External Reviews

1. Professor Gunther Uhlmann — University of Washington
2. Professor John D'Angelo — University of Illinois
3. Professor Nick Trefethen — Oxford University
4. Professor Rafe Mazzeo — Stanford University
5. Review for the Kansas NSF EPSCoR Award
6. John E. Kolassa — Rutgers University
7. Robert Finn — Stanford University
8. NSF Proposals Reviews

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195
(206) 543-1150

Department of Mathematics, Box 354350
C138 Padelford Hall

December 16, 2002

Dr. Robert Kindrick
Vice President, Academic Affairs and Research
109 Morrison Hall
Wichita State University
Wichita, KS 67260

Dear Dr. Kindrick:

This letter is in support of Professor Ziqi Sun's incentive review. I have known professor Sun for many years. He held a postdoctoral position at the University of Washington in 1987-1990. Moreover, we have collaborated in several papers which I consider among my best works.

During the last five years or so Sun has embarked in an ambitious project to understand inverse boundary problems for quasilinear anisotropic elliptic equations. This is a very important field arising in several applications. I thought, however, that this was an impossible project. I am well aware of the major difficulties that one would encounter in such a pursuit. In my own work with Sun we considered a particular case in which the coefficients of the quasilinear equation are independent of the gradient of the solution. This was already quite difficult. The level of difficulty of Sun's project represents a quantum jump over our joint work.

Sun and his student Hervas surprised everyone with his recent paper accepted in Communications in Partial Differential Equations. This is a very deep article which will be the subject of study of researchers in the field of inverse problems for several years to come. I found very striking the connection made between geometry and analysis which was made clear in a beautiful geometric Lemma proved by Sun in another recent article. These works are the product of several years of effort.

Sun is one of the best researchers working in the mathematical theory of inverse problems. He has chosen to work in some the most difficult problems in the area. He has proven significant results that displayed imagination and creativity and masterful command of techniques of partial differential equations and differential geometry. Major advances in Mathematics and other fields are often accomplished after sometime years of silent work. The recent articles of Sun represent such an advance. I very much hope that your University can find the resources to reward Sun for his recent accomplishments.

Sincerely,

Gunther Uhlmann
Professor of Mathematics

cc. Dr. Buma Fridman, Chairman Department of Mathematics and Statistics

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Mathematics
273 Altgeld Hall, MC-382
1409 West Green Street
Urbana, IL 61801

August 12, 2003

William D. Bischoff, Dean
Fairmount College of Liberal Arts and Sciences
Wichita State University
Wichita, Kansas 67260-0005

Dean Dean Bischoff:

Thank you for asking me to review the scholarship of Dr. Daowei Ma.

Ma is an excellent and original geometer. Most of his papers deal with geometric issues arising in function theory in several complex variables. Recently he has also published several joint papers of a more applied nature, and I am not knowledgeable to comment on these applied papers.

Perhaps Ma's most impressive paper in recent years is paper (30) from his publication list. Earlier many authors had noted some version of what seemed to be a basic principle in geometry. Small changes can destroy symmetry, but cannot create symmetry. Greene and Krantz, for example, had formulated this idea precisely, and had proved an upper semicontinuity result for automorphism groups of strongly pseudoconvex domains around 1985. A flurry of activity occurred in this area. In 1994, Fridman and Poletsky showed that the principle failed as stated. Their result holds for any bounded domain. Small changes can indeed create symmetries. In (30), however, Ma joined Fridman and Poletsky and the three authors provided a decisive explanation. The principle needed a reformulation, they provided it, and this reformulated principle works. They showed that the dimension of the automorphism group does depend upper semicontinuously on parameters, and it follows that a domain cannot be approximated by a sequence of domains for which the automorphism group has larger dimension. This paper appeared in the American Journal of Math, one of the top journals. The techniques are a beautiful blend of complex analysis and differential geometry. In particular the Caratheodory extremal mappings arise.

Ma has used these extremal mappings in several papers. His 1991 paper (number 10) in the Duke Math Journal, also a top journal, used these mappings as part of a systematic study of estimates for invariant metrics (including the Kobayashi and Caratheodory metrics) on strongly pseudoconvex domains. The results in (10) improve and generalize a well known result of I. Graham. Perhaps (10) is Ma's best early paper.Since then (1997) he (21) had studied these extremal mappings for complex ellipsoids. In (17) he proved a smoothness result for the Kobayashi metric on ellipsoids, and in (16) he studied estimates for the Cauchy-Riemann operator on ellipsoids. (This paper appeared in the strong journal Communications in PDE.) Papers (12) and (13) also involve ellipsoids.I think, of all people who have ever studied complex ellipsoids, Ma's work is the most broad. It reveals his command of analytic methods as well as the geometric methods mentioned above.

Looking at his publication list it seems that Ma's activity waned a bit in the late 1990's, but it has certainly revived since. In the last four years he has published ten papers, three of them in applied math, and the other seven in geometric complex function theory. He even got involved in joint work with Kim on infinite dimensional complex analysis; they characterized the unit ball in a Hilbert space via automorphism groups.

Ma has made several significant contributions to geometric complex analysis. He has published many good papers in good journals. Although many of Ma's papers are joint, he is certainly an independent scholar; his imaginative geometric insights surely play a big role in these joint papers.

Sincerely yours,

John P. D'Angelo
Professor of Mathematics

-----Original Message-----
From: Nick Trefethen [mailto:LNT@comlab.ox.ac.uk]
Sent: Monday, August 23, 2004 10:48 AM
To: cheryl.miller@wichita.edu
Cc: lnt
Subject: Thomas DeLillo

William D. Bischoff, Dean
Fairmount College of Liberal Arts and Sciences
Wichita State University
Wichita, KS 67260-0005

Dear Dean Bischoff,

You have asked me to review the scholarship of Prof. Thomas Delillo, currently Associate Professor in the Dept. of Mathematics and Statistics. I hope this letter will be helpful. Your request comes during my travels on sabbatical, and I hope it will not be a problem that it is sent by email rather than on Oxford letterhead.

I have known Prof. DeLillo since he was a graduate student at New York University in the 1980s, when I was a post-doc there. We had a common interest in the subject of numerical conformal mapping, and this remains the area in which DeLillo has made most of his contributions and is best known. Numerical conformal mapping is a rather small subject, in which it is not hard to list most of the main players of the past few decades: Henrici, Gaier, Opfer, Gutknecht, Wegmann, Fornberg, Marshall, Driscoll, Reichel, Papamichael, Stylianopoulos, Elcrat, Berrut, Trummer, Floryan, Davis, Pfaltzgraff, myself, and DeLillo... that list is a pretty good approximation already. In this area DeLillo is certainly well known and well regarded for his contributions to Schwarz-Christoffel mapping, Wegmann- and Fornberg-type methods, multiply-connected domains, development of inequalities and other estimates, and applications. He is a "player" in this field, and when mathematical scientists in later decades consider what was done with conformal mapping in the half-century after the invention of computers, DeLillo's name will be among those that will be part of the answer.

I was particularly impressed with DeLillo's recent papers on doubly- and multiply-connected Schwarz-Christoffel formulas, joint work with Elcrat and Pfaltzgraff, the second paper not yet in print. This seems a significant advance on a fundamental problem that has been with us since about 1870.

From his base in conformal mapping DeLillo has turned also to other related topics, notably inverse problems and associated problems of convergence of matrix iterations such as conjugate gradients. As far as I can tell he has made worthwhile contributions in these areas. Here as in conformal mapping, the number of his publications is not especially large for somebody at his stage of a career, but the journals involved are for the most part the leading ones. Similarly on other measures of academic activity such as editorial work and involvement in conferences DeLillo does not appear as internationally outstanding, but as solid and active in his field. Certainly I value him as a colleague.

Yours sincerely,

Lloyd N. Trefethen
Professor of Numerical Analysis, Oxford University

--

L. N. Trefethen
Professor of Numerical Analysis and
Fellow of Balliol College, Oxford University

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STANFORD UNIVERSITY
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Department of Mathematics
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mazzeo@math.stanford.edu

September 2, 2004

Dean William Bischoff
Office of the Dean
Fairmount College of Liberal
Arts and Sciences
Wichita State University
Wichita, Kansas 67260-0005

Dear Dean Bischoff,

I am writing in response to your solicitation, earlier this summer, for my evaluation of the scholarship of Prof. Zhiren Jin, an Associate Professor in the Department of Mathematics at Wichita State. I understand that this evaluation is to be used in the current case for promoting him to the position of Professor in this department.

Dr. Jin's research is in the area of partial differential equations; this is a vast area in mathematics with many contacts to other sciences. Jin's particular specialty concerns semilinear and quasilinear elliptic equations, which again has many important applications, both in mathematics and elsewhere. In his career he has been quite productive and has written a significant number of important and difficult papers. He has without doubt established himself as a real authority in this field.

You ask me to comment on various aspects of his work, specifically its originality, significance, level of activity and appropriateness of journals in which he has published.

Jin's earliest work is quite closely tied to geometry, as is natural given the predilections of his advisor. He began to make significant contributions very early, amongst which I should point out his paper [3], which stimulated a fair amount of work by other researchers. He moved on and began to work on problems concerning solutions of more general semilinear, and later, quasilinear, elliptic equations. This class of equations is really fundamental in the field and so any new progress here is likely to have real significance. Some of this work has been done in a long and fruitful collaboration with Kirk Lancaster, but much has been done on his own too. Looking carefully at these papers, I feel that Jin exhibits technical mastery in a very difficult subject, and it is nice to see how the scope of his interests continues to widen. He has definitely displayed independence and originality in his work.

To be even more specific, much of Jin's work in the mid to late '90's concerns pushing the limits on the applicability of various comparison theorems for broad classes of quasilinear elliptic equations on noncompact domains. While formulated purely analytically, these results apply to a lot of very important and well studied problems in geometry, including the prescribed mean curvature equation, the capillarity equation, etc. Closely related to these ideas are estimates for solutions of such equations at infinity. He has kept on pushing on these difficult problems and I think his papers with Lancaster, [17], [19], [21], [26], are particularly incisive. More recently he has been working somewhat different questions related to solvability; I think [23] is particularly interesting.

He has published in a range of very reputable journals; I should point out that his papers [19], [20] appeared in a journal for which I am the managing editor and I encouraged their submission to this journal and was happy to have them appear there. His rate of production has been on the average quite good, and it is clear to me that he will continue with his record of contributing very sound scholarship.

Altogether, my opinion is that the work of Zhiren Jin is very solid, and his record definitely exhibits all the qualities you are looking for. I also look very favourably on his extended collaboration with Lancaster, the fact that these two are in the same department and able to interact so well together is a real plus.

Sincerely,

Rafe Mazzeo

Rafe Mazzeo
Professor of Mathematics

Kansas NSF EPSCoR

First Award Review – Due January 10, 2005

Name of Principal Investigator: Thalia D. Jeffres
Title of Proposal: Special Metrics and PDE's on Singular Manifolds

Instructions: Before writing your review, please read: 1) NSF Merit Review Criteria, and 2) the Kansas NSF EPSCoR *Request for Proposals*.

Following each criterion below are potential considerations that you may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Please address only those considerations that are relevant to the proposal and for which you feel qualified to make judgments. In responding to Criterion 2, please place special emphasis on the likelihood that the proposed S&T infrastructure improvements "will result in lasting improvements to the state's STEM research and educational infrastructure and thereby, increased national R&D competitiveness" (NSF 04-564).

After providing a qualitative judgment of the proposal's merits against the criteria, please make quantitative judgments in Section 3.

Then, in Section 4, please provide suggestions that will help improve this proposal. For example; are there specific suggestions that will help this investigator become competitive for federal funds? Is the trajectory of the research appropriate and well thought-out relative to the discipline? Is the education and human resources component well thought-out? Are there well-developed procedures to implement the project plan? These are suggestions and not all will apply to any given proposal.

Criterion 2: What are the broader impacts of the proposed activity?

- How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
- How well does the proposed activity broaden the participation of underrepresented groups?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?
- Will the results be disseminated broadly to enhance scientific and technological understanding?
- Does this proposal contain research in an area that is a priority to Kansas? (Priority will be given to proposals for research in biology, chemistry, physics, geology, mathematics, computer science and engineering. However, proposals in the area of **Living Systems** will receive priority for First Award funding. **Living Systems** includes research related to environmental quality, the basic biological sciences, biochemistry, bioengineering, biophysics, biotechnology, and bioinformatics.)
- How likely is it that a First Award will significantly improve the PI's ability to become competitive and develop a self-sustaining research program?
  How likely is it that the proposed research will have an impact on economic development in Kansas in the next five to ten years?

The broader impacts of the proposed activity are well documented. Jeffres worked in Mexico before moving to Kansas, and has mentored several students there. As she points out, this experience should make her more effective training students from different cultures. The proposal indicates a commitment to training students, including under-represented groups, at the High School level.

She brings to a heavily application-oriented department a more modern component. In the twentieth century, powerful ideas such as coordinate-invariance, local exploitation of symmetry, and global
topology of abstract spaces led to foundational breakthroughs in our understanding in the twentieth century. These advances have fundamentally impacted even the most application-oriented mathematics.

Kansas NSF EPSCoR

First Award Review – Due January 10, 2005

Name of Principal Investigator: Thalia Jeffres

Title of Proposal: Special Metrics and Differential Equations on Singular Spaces

Instructions: Before writing your review, please read: 1) NSF Merit Review Criteria, and 2) the Kansas NSF EPSCoR *Request for Proposals*.

Following each criterion below are potential considerations that you may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Please address only those considerations that are relevant to the proposal and for which you feel qualified to make judgments. In responding to Criterion 2, please place special emphasis on the likelihood that the proposed S&T infrastructure improvements "will result in lasting improvements to the state's STEM research and educational infrastructure and thereby, increased national R&D competitiveness" (NSF 04-564).

After providing a qualitative judgment of the proposal's merits against the criteria, please make quantitative judgments in Section 3.

Then, in Section 4, please provide suggestions that will help improve this proposal. For example, are there specific suggestions that will help this investigator become competitive for federal funds? Is the trajectory of the research appropriate and well thought-out relative to the discipline? Is the education and human resources component well thought-out? Are there well-developed procedures to implement the project plan? These are suggestions and not all will apply to any given proposal.

Criterion 2: What are the broader impacts of the proposed activity?

- How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
- How well does the proposed activity broaden the participation of underrepresented groups?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?
- Will the results be disseminated broadly to enhance scientific and technological understanding?
- Does this proposal contain research in an area that is a priority to Kansas? (Priority will be given to proposals for research in biology, chemistry, physics, geology, mathematics, computer science and engineering. However, proposals in the area of Living Systems will receive priority for First Award funding. Living Systems includes research related to environmental quality, the basic biological sciences, biochemistry, bioengineering, biophysics, biotechnology, and bioinformatics.)
- How likely is it that a First Award will significantly improve the PI's ability to become competitive and develop a self-sustaining research program?
- How likely is it that the proposed research will have an impact on economic development in Kansas in the next five to ten years?

I have seen the proposer lecture in professional seminars (e.g. Rutgers University). Her style is clear and informative. I have no doubt that she will attract and motivate young people interested in mathematics. Clearly, the proposer's experience as a faculty member in Mexico will be a unique advantage. Her knowledge of Spanish will be useful in attracting Latin-American students in the area.

She has already begun projects with two collaborators at least (Loya and Mazzeo). This should attract mathematicians to the growing department at Wichita.

The work proposed here is of a world class nature. It should be published in significant research journals. Jeffres's record already shows this.

A first award will give the project a significant boost. Travel funds are probably the most significant item here. The proposer (like all serious researchers) needs to meet with collaborators and attend conferences. It is very difficult to do this kind of work in isolation.

THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

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1 Aug 2008

Dean William D. Bischoff
Fairmount College of Liberal Arts
Wichita State University
Wichita, Kansas 67260-0005

Dear Dean Bischoff,

This letter is in response to your request for an evaluation of Chunsheng Ma's research record, to be used to determine whether he will be promoted to professor.

Dr. Ma's record of publication reveals that he is a very productive researcher, both in terms of volume and quality of work. His work has appeared in a variety of statistical and other journals; thise range from top-tier journals to middle-tier journals. This record compares favorably with other scholars receiving promotion to the rank of professor at major research universities.

The large number of successful research projects listing Dr. Ma as the sole author indicate that he is clearly established as an independent scholar. His published articles represent a contribution to the field of statistics typical for a senior academic. He is certainly appropriately active in our field. Since most of his sole--author research relates to time series, and I don't know the time series literature, I must trust the judgement of the journal referees when attesting to its originality.

I will illustrate the importance of Dr. Ma's work by commenting on two of his manuscripts involving multivariate survival functions (Metrika, 1998, and Journal of Multivariate Analysis, 2000). I choose these not because they are Dr. Ma's best papers, but because they are the ones that I feel most excited about reading. Survival analysis involves the study of times until an event occurs; these models are routinely used to describe the superiority of one treatment over another treatment at delaying patient death. Trying to account for multiple types of events simultaneously (for example, time until consecuitive recurrences of a disease, or time until two family members die) is much more difficult than accounting for times until events separately, since generally we assume that these event times are dependent, and typically univariate survival models do not have natural correlated extensions, as do, say, univariate normal models. The Metrika paper investigates the logical conclusions of some assumptions about multivariate survival models, and the Journal of Multivariate Analysis paper introduces a new class of survival models. This work is very important, and is likely to have a large impact.

Dr. Ma has an admirable research record for a university faculty member being considered for promotion to professor; this record displays all of the requirements listed in your letter of 2[illegible] June. I note that your letter explicitly requests that I do not make a recommendation for or against promition. The lack of such a statement in my letter should not be interpreted as a reticence on my part.

Sincerely,

John E. Kolassa
Professor and Graduate Program Director
Statistics and Biostatistics
Rutgers University

STANFORD UNIVERSITY
STANFORD CALIFORNIA 94305-2125

DEPARTMENT OF MATHEMATICS
Robert Finn (650) 723-2605, FAX 725-4066
finn@math.stanford.edu

August 9, 2010

Burna Fridman, Chairperson
Department of Mathematics and Statistics
Wichita State University
1845 Fairmount St.
Wichita, Kansas 67260-0033

Dear Professor Fridman,

Kirk Lancaster transmitted to me your request for evaluation of his scientific contributions.

I've had contacts with Kirk over many years, and I've refereed some of his papers. There has been no occasion in which I was not impressed by the quality and originality of the new contribution. I did once or twice have to request rewriting for clearer exposition.

I've come now to view Kirk as an outstanding mathematician of world stature. He has proved deep and beautiful theorems, some of which will certainly become building blocks for major developments of the future, and I expect his scientific influence will be felt long after all of us are gone. His methods have been original and ingenious, requiring active working conversance with subtle points of modern theory, and displaying strikingly deep insight and comprehension. He has suffered for being a "non-smooth" expositor whose papers tend to focus on technical detail and can be difficult to read. When I look at some of his papers, the pervading thought that comes to mind is that he tacitly assumed the reader to share his detailed familiarity with fine points of modern theory.

Kirk has produced a considerable range of original work; I'll focus here on things that have major meaning for me. The paper that first put his unusual talents into perspective for me was his spectacular joint work with David Siegel in the Pacific Journal 176 (1996) 165—194; 179 (1997) 397-402. Using very original methods in conjunction with boundary regularity estimates due to E. Heinz, those authors established quite remarkable and certainly unexpected restrictions in kinds of behavior of a capillary surface at a re-entrant corner. Specifically they demonstrated the presence of "fan domains" attaching to the corner, in which the radial limits of the surface height are constant in angle of approach. They showed also that in some cases a "central fan" of angular width π can appear. As corollary of the method, they obtained a very elegant proof of continuity of solutions of "$\mathcal{R}$-type" at a protruding corner. This result had first been shown by Leon Simon, based on delicate reasoning from geometrical analysis, in the special case of constant data and under some restrictions; the restrictions were later removed by Luen-Fai Tam, using similar methods. The L&S proof gives a best possible result for general data, in a clear conceptual context and under no restrictions.

The problem was taken up later by Danzhu Shi in an impressive work that appeared in a special volume on capillarity of the Pacific Journal (vol. 224, 2006). Shi gave the first formal characterization of conditions determining the individual kinds of behavior at a re-entrant corner. Her results had a sense of being "right", however they were based on validity of a conjecture Paul Concus and I had made about 1970, on discontinuity of certain solutions in protruding corners. Sophisticated computer calculations had supported the conjecture (just barely!), however attempts by a number of people (myself included) to prove it had led to naught.

Several months ago I accepted Kirk's proof of the conjecture for publication in the Pacific Journal, and it should appear shortly. I was very uneasy about this paper, as it is long and hard, and embraces a number of individually delicate steps, each requiring difficult and delicate techniques. I found a tough referee who took a long time and produced challenging questions on sensitive points, but Kirk was able to hold his ground. This paper effectively closes a remarkable chapter of a basically new theory with striking and deep results that have no parallel in classical theory in my experience. I think there may also be important applications of Kirk's discoveries, on matters such as insulating coatings on computer chips with rectangular sections.

I have no idea as to the context in which Kirk's request to me arose. The papers I have indicated are on topics of direct interest for me, and my experience with the problems has I think given me some perspective as to their difficulty and their continuing importance. I am convinced that Kirk's contributions have a permanence in the scientific scheme of things that very few professional mathematicians can match.

Sincerely,

R Finn

Robert Finn

Proposal Status | MAIN

Organization: Wichita State University

Review #1

Proposal Number:	1411375
NSF Program:	Applied Mathematics
Principal Investigator:	Isakov, Victor M
Proposal Title:	Some Inverse Problems: increasing stability, drift-diffusion and elasticity systems
Rating:	Excellent

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

1. What is the potential for the proposed activity to advance knowledge
and understanding within its own field or across different fields?

The PI proposes a broad investigation with focii on
(P1) Increasing stability in inverse problems for PDEs,
(P2) Drift-diffusion equations and systems, and
(P3) Inverse problems for some anisotropic systems in elasticity.
Given the PI's track record and the proposal's degree of specificity
the potential for advancement of the mathematical approach to Inverse
Problems is high.

2. To what extent do the proposed activities suggest and explore creative,
original, or potentially transformative concepts?

3. Is the plan for carrying out the proposed activities well-reasoned,
well-organized, and based on a sound rationale? Does the plan incorporate
a mechanism to assess success?

The proposal is well motivated, reasoned, organized and articulated.
Class (P1) examines continuous dependence in Cauchy and scattering problems
by supporting arguments in favor of new inequalities and careful estimation
of the associated constants for special domains.
Class (P2) continues the PI's study of numerical and analytical issues
arising from Black-Scholes-like equations and extends his work on
semiconductor models to recent inverse problems for ion channels.
Class (P3) presents several line of attack on the identification of
the 5 coefficients of a transversely isotropic body from boundary data.

4. How well qualified is the individual to conduct the proposed activities?

The proposed activities are natural continuations of the PI's long running research program. That said, much of the space devoted to summary of prior results could have been devoted to even finer plans for the proposed projects.

In the context of the five review elements, please evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

The proposed work will strengthen the PI's already broad impact on the applications of analysis to inverse problems for PDEs. Notably, for example, by weakening geometric hypotheses in the Cauchy problem and by advancing our understanding of models for ion channels.
The PI is also building an applied math group at his institution, with attention to students and engineers and scientists.
This proposal will support 1 graduate student.

Please evaluate the strengths and weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Summary Statement

This is an ambitious proposal to advance our mathematical understanding of Inverse Problems on several independent fronts. The PI has made significant contributions to these, or closely allied, areas and the proposal offers several promising avenues for refinement and improvement of the state of the art.

◂ **Back to Proposal Status Detail**

National Science Foundation
4201 Wilson Boulevard, Arlington, Virginia 22230, USA
Tel: 703-292-5111, FIRS: 800-877-8339 | TDD: 703-292-5090

Λf: Award Id : 1207597, PI: Jeffres

: "Kania-Bartoszynska, Joanna" <jkaniaba@nsf.gov>
o: "Thalia Jeffres" <jeffres@math.wichita.edu>
ate: 05/17/12 09:55 AM

ar Thalia,
e award letter came this morning! Your award is now official, here is a copy of the email.
ngratulations and all the best,
inna

--Original Message-----
om: Martin, Denise M.
nt: Thursday, May 17, 2012 8:23 AM
proposals@wichita.edu
: BFA DGA Awards; Alston, Sharon J.; Kania-Bartoszynska, Joanna
bject: Award Id : 1207597, PI: Jeffres

ard Date:	May 17, 2012
ard No.	DMS-1207597
oposal No.	DMS-1207597

. J. David McDonald
sociate Vice President for Research
chita State University
45 Fairmount
chita, KS 67260-0007

r. McDonald:

e National Science Foundation hereby awards a grant of $178,010 to Wichita State University for support of the project scribed in the proposal referenced above .

is project, entitled "Differential Equations on Singular Spaces and Asymptotic Methods," is under the direction

alia D. Jeffres.

is award is effective July 1 , 2012 and expires June 30, 2015.

is grant is awarded pursuant to the authority of the National Science Foundation Act of 1950, as amended (42 U.S.C. 361-75) and is subject to Research Terms and Conditions (RTC), dated June 2011, and NSF RTC Agency Specific equirements, dated February 1, 2012, available at http://www.nsf.gov/awards/managing/rtc.jsp .

is award is subject to the Federal Funding Accountability and Transparency Act (FFATA) award term entitled, Reporting ubawards and Executive Compensation, which has been incorporated into the NSF Terms and Conditions referenced bove.

the awardee has any questions related to the pre-populated data associated with this award in the FFATA Subaward eporting System, such questions should be submitted to: FFATAReporting@nsf.gov or by phone to: (800) 73-6188.

accordance with sections 1869a and 1869b of title 42 of the United States Code, the awardee will do the llowing:

Obtain from the school board or comparable authority responsible for the schools considering participation in the oject, written approval prior to involvement of pre-college students in pre-college education research and development, esting, evaluation, and revision of experimental and innovative pre-college curriculum.

Include in every publication, testing, or distribution agreement involving instructional materials developed under this ant (including, but not limited to, teachers' manuals, textbooks, films, tapes, or other supplementary material) a equirement that such material be made available within the school district using it for inspection by parents or guardians children engaged in educational programs or projects using such material of that school district.

ne attached budget indicates the amounts, by categories, on which NSF has based its support

Please understand that reviewers address their comments chiefly to NSF, not to Principal Investigators. Reviews containing irrelevant, non-substantive, or erroneous statements are not used in evaluating the merits of proposals. The panel was instructed to assess proposals based on the two main NSF review criteria, namely, "Intellectual Merit" and "Broader Impacts." The panel produced a ranking that placed each proposal into one of three categories: (i) highly recommended for funding (roughly the top 10% of the proposals under consideration), (ii) recommended for funding (the next 30%), or (iii) not recommended for funding (the remaining 60%).

My recommendation is based on the following analysis of the reviews and panel summary:

Three mathematicians reviewed this proposal and returned comments headed by ratings of G, G, and G. The Geometric PDE panel placed the proposal in the Not Recommended for Funding category.

Intellectual Merit: Reviewers liked the proposal, the topics, and acknowledged that the PI has already made significant contributions to some of the problems. However, during the meeting, panelists were not in agreement about the ranking of the proposal in comparison to other submissions. While a particular panelist, who did not write a review, thought that computations of some specific examples made the proposal very concrete and hence increasing its chances to lead to interesting applications, others thought that they narrowed the scope of the proposal.

Broader Impacts: The panel considered this part of the proposal to be extremely strong. The PI is involved middle school outreach, working especially with disadvantaged students.

Summary: Quoting from one of the reviewers "A strong research proposal with exceptional broader impact." During the panel meeting, this proposal stayed among the ones recommended for funding until the end of the panel. Because panelists were asked to place at least 60% of the proposals in the Not Recommended for Funding category, the panel reluctantly moved this proposal to the non recommended group. This reflects the intense competition for grants at DSM, and in particular in Geometric Analysis. Regretfully, I have to recommend that this proposal be declined and strongly recommend that the PI reapply in the near future.

I hope that the reviews and the panel summary, together with the comments above will assist you in the preparation of future proposals. I also hope that your research efforts will be productive.

Please feel free to contact me should you have any questions.

Sincerely,

Maria Helena Noronha, Program Director
Geometric Analysis and Topology
Division of Mathematical Sciences
Tel (703) 292-4868
Fax (703) 292-9032
Email: mnoronha@nsf.gov

Reviews

All of the reviews of your proposal that have been released to you by your NSF program officer can be viewed below. Please note that the Sponsored Project Office (or equivalent) at your organization is NOT given the capability to view your reviews.

Document:	**Release Date:**
Panel Summary #1	Apr 25 2011 11:10AM
Review #1	Apr 25 2011 11:07AM
Review #2	Apr 25 2011 11:07AM
Review #3	Apr 25 2011 11:07AM

Proposal Status | MAIN

Organization: Wichita State University

Review #1

Proposal Number:	1406007
NSF Program:	TOPOLOGY
Principal Investigator:	Walsh, Mark
Proposal Title:	The Space of Positive Scaler Curvature Metrics
Rating:	Very Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

The PI's research is roughly in the area of positive scalar curvature and topology; he wishes to construct new PSC metrics on some manifolds, explore obstructions to PSC metrics on others, explore a number of questions related to cobordism, and explore the topology of spaces of PSC metrics. He lays out 3 general aims, 5 specific questions, and 3 "family projects" (which are basically more general or less well-defined questions). The research area itself is an important and historically very fruitful one, and there is a lot of current research interest. The PI has had a number of significant result in this area, and he is likely to have more.

There is good potential to advance knowledge. There is also some potential for a real breakthrough, but this is difficult to evaluate (this reviewer is skeptical of the PI's claims that he can, in a few years time, come to fully understand certain moduli spaces).

Many of the PI's claims and avenues of investigation use some original techniques. Much of this work is "filling in the details" of an expected kind, but some of it would produce real advances.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts

The broader impact of the PI's work appears to be in the form of expanding educational opportunities at Wichita State University, in the form of support for graduate students and the hiring of a postdoc. The PI has specific plans for activities for these hires. He has a sub-goal of expanding the representation of differential geometry at his university. The PI also mentions some synergistic activities, which would be at best indirectly supported by NSF funding. The PI also mentions several areas of mathematics that would benefit from his research, giving his work some cross-disciplinary appeal.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if
applicable

Summary Statement

The PI has a sound intellectual basis for his research; altogether, this reviewer rates it "very good" in comparison to other proposals. His broader impact merits, which are limited to bringing graduate students and a postdoc onto his research team, as well as implied indirect merits, are rated "good".

A final note about the budget. The PI is requesting $800,163, which is high.

◄ Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Wichita State University

Review #2

Proposal Number:	1406007
NSF Program:	TOPOLOGY
Principal Investigator:	Walsh, Mark
Proposal Title:	The Space of Positive Scaler Curvature Metrics
Rating:	Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

This proposal is concerned with the structure of the moduli space of Riemannian metrics with positive sectional curvature (when it is nonempty!) on a prescribed manifold. Using impressive techniques from parametrized Morse theory, the author has given a nice proof of the (known) theorem that the homotopy type of the space of such metrics is a cobordism invariant of the underlying manifold, and in recent work [arXiv:1301.5670] he has argued that the space of such metrics, on the standard n-sphere, is an n-fold loopspace. He seems to have found some fruitful lines of inquiry on an interesting subject that has perhaps been stuck for a while.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

This seems to be the first progress in an interesting classical subject
in a while.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if
applicable

Summary Statement

Back to Proposal Status Detail

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Proposal Status | MAIN

Organization: Wichita State University

Review #3

Proposal Number:	1406007
NSF Program:	TOPOLOGY
Principal Investigator:	Walsh, Mark
Proposal Title:	The Space of Positive Scaler Curvature Metrics
Rating:	Very Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

This is a proposal to study spaces of positive scalar curvature metrics on a compact manifold. The PI has put forward a number of concrete questions and problems built on recent results in the area. A key point is to use deep results on pseudo-isotopy and families of Morse functions to understand the corresponding structures in the context of positive scalar curvature metrics. The proposal is well reasoned and the PI is likely to make good progress. Indeed, over the past few years the PI has established a number of very good results in this area, and his proposal is to continue that work. Some of these results are considered to be major breakthroughs by people working in the field. This is a case where I believe the NSF should stand up and recognize the achievements of someone who has not been previously supported.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

The nature of the subject ties together deep areas of topology and interesting areas of differential geometry. Progress here should have synergistic effects.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if
applicable

Summary Statement

This is a well-conceived proposal aimed at understanding the structure of families of positive scalar curvature metrics on a compact manifold. I both reflects and is built upon deep results in topology.
It represents an extension of some outstanding recent results of the PI, and is very highly deserving of support.

◄ Back to Proposal Status Detail

Proposal Status | MAIN ▸

Organization: Wichita State University

Review #4

Proposal Number:	1406007
NSF Program:	TOPOLOGY
Principal Investigator:	Walsh, Mark
Proposal Title:	The Space of Positive Scaler Curvature Metrics
Rating:	Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

The PI proposes to study several questions at the interface of topology and geometry. In particular, these questions involve positive scalar curvature (psc) metrics on manifolds. Proposed projects involve the moduli spaces of such metrics, issues concerning concordance and isotopy classes of such metrics, and techniques for constructing interesting families of psc metrics. The PI is a young researcher (2009 Ph.D.) who has already established a solid publication record and has acquired several higher profile collaborators. The proposal itself is very well written and accessible, and it is a good indicator that such a young PI has such a well-defined research plan laid out for himself. The only downside to this proposal is its specificity. It is not unusual for a young researcher to have a narrow focus, but other young researchers in this group (for example [Material redacted per PAM Chapter XI G.2]) nonetheless seem to have more ambitious proposed projects. No doubt this PI's proposals will become even stronger as his interests naturally broaden with time.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

The PI is attempting to establish a research group in his field at his home institution, including graduate students and postdocs, though this group has not been firmly established yet. The PI has given expository talks on topology to audiences consisting of elementary, middle and high school students and their parents. He has written and distributed lecture notes, and he is working with a computer scientist on a geometric problem arising from her work. Overall, the PI's broader impact is quite reasonable for a young PI.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation specific review criteria, if
applicable

Summary Statement

While I consider this a good proposal in and of itself, unfortunately it suffers in comparison with many of the other proposals I have reviewed, largely due to its specificity of scope compared to the other proposals. The PI has established several solid research goals within his area of specialization and appears to be a very promising mathematician, but too many other proposals contain multiple streams of research across a variety of disciplines. Thus I reluctantly have to give this proposal a relatively lower rank compared to the other proposals reviewed.

◂ Back to Proposal Status Detail

Proposal Status | MAIN ▶

Organization: Wichita State University

Review #5

Proposal Number:	1406007
NSF Program:	TOPOLOGY
Principal Investigator:	Walsh, Mark
Proposal Title:	The Space of Positive Scaler Curvature Metrics
Rating:	Very Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

Intellectual Merit: âseems quite high as this proposal lies at the intersection of geometry, topology and analysis and has potential impact in a variety of settings. Furthermore the breadth makes this a very worthwhile project

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

Broader Impacts: âthese are Ok but not spectacular, obviously mentoring students in geometry and topology and hosting high level speakers are worthy goals, and as a faculty member at Wichita State the PI will have some local impact.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if
applicable

Summary Statement

Walsh proposes to continue his work on developing methods for constructing topologically significant families of psc-metrics. These constructions will aid in addressing questions concerning positive scalar curvature. In particular, this project aims to establish a correspondence between a space of geometric objects (psc-metrics) and a space of smooth topological ones (generalized Morse functions). More specifically, the PI outlines a program to

--further develop techniques for constructing interesting families of psc-metrics on a smooth compact manifold X
--address key questions about the metrics constructed by these tools, with regard in particular to psc-concordance and psc-isotopy
--apply these techniques to further understanding on the topology of the space of psc-metrics, Riem+(X), and its various moduli spaces

Review: âquestions about the existence or non-existence of various curvature types, positive Ricci curvature or non-negative sectional curvature for example, are of considerable interest. The classification of manifolds which admit metrics of positive scalar curvature (psc-metrics) has made lots of progress. A related problem is that of understanding the topology of the space of all psc-metrics on a smooth manifold. This problem underlies Walsh's proposal, which is extremely well written. He has a strong publication record (including a paper in Geometry and Topology and an AMS Memoir) and thus is a young researcher who shows great promise. He deserves to be supported
(note however that the budget is unrealistic and should be drastically cut)

Grade: VG+

◀ Back to Proposal Status Detail

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Proposal Status | MAIN

Organization: Wichita State University

Panel Summary #1

Proposal Number: 1406007

Panel Summary:
Panel Summary

Intellectual merit: this is a nice proposal in geometric topology. The PI is an expert in parameterized Morse theory and proposes to use that expertise to study questions about the space of positive curvature metrics. The panel liked the PI's new proof of the cobordism-invariance of homotopy types of these spaces. The proposal was considered to be one of the best-written, and the pictures were great. Some of the proposed research seems to present some good new ideas in a classical field.

Postdoc mentoring plan: the panel felt like the postdoc mentoring plan did not include any planned mentoring.

Broader impact: the PI would like to develop a research group at Wichita State. The panel did not find this to be a realistic goal at this point. In general, we found the previous broader impacts to be acceptable for the career-level of the PI.

The panel thought that the amount requested for travel support was completely unreasonable.

The PI has not had previous support from the NSF.

This was a solid proposal, but not one of the best. Due to the presence of many excellent applications, the panel placed the proposal in the not recommended for funding category.

The summary was read by/to the panel and the panel concurred that the summary accurately reflects the panel discussion.

Panel Recommendation: Not Recommended

◀ Back to Proposal Status Detail

National Science Foundation
4201 Wilson Boulevard, Arlington, Virginia 22230, USA
Tel: 703-292-5111, FIRS: 800-877-8339 | TDD: 703-292-5090

Proposal Status | MAIN

Organization: Wichita State University

Panel Summary #2

Proposal Number: 1406007

Panel Summary:
Panel Summary

Intellectual Merit This project is concerned with understanding positive scalar curvature metrics. The PI has already obtained interesting results in this direction. In particular, one member of the panel was very impressed by the PI's recent work on the homotopy type of the space of positive scalar curvature metrics on the sphere. Another member of the panel described this as a solid middle-of-the-road proposal, which seemed not as strong as the competition.

Broad Impact: The PI plans to build up a geometry group at his institution, and he has specific plans to supervise graduate students.

Results from prior NSF support: N/A

The panel places the proposal in the "Recommended for funding if possible" category.

The summary was read by/to the panel and the panel concurred that the summary accurately reflects the panel discussion.

Panel Recommendation: Fund If Possible

Back to Proposal Status Detail

Gmail by Google

Catherine Searle <searle.catherine@gmail.com>

FW: your conference proposal 1518937

1 message

Searle, Catherine <Catherine.Searle@wichita.edu> Fri, Mar 13, 2015 at 1:53 PM
To: "searle.catherine@gmail.com" <searle.catherine@gmail.com>

From: Kania-Bartoszynska, Joanna [jkaniaba@nsf.gov]
Sent: Wednesday, February 04, 2015 3:52 PM
To: Searle, Catherine; 'cplaut@math.utk.edu'; Walsh, Mark; leonard.wilkins@uncp.edu
Cc: Castano-Bernard, Ricardo; Stark, Christopher; Wang, Shuguang; Kania-Bartoszynska, Joanna
Subject: your conference proposal 1518937

Dear Catherine at al,
Thank you very much for providing an updated version of the project description for your conference proposal DMS 1518937 " Smoky Great Plains Geometry Conference".
We discussed it at length and decided to recommend an award for one year of funding, with the budget as requested for the first year.

We felt that the potential broader impacts of this activity would be strong. We had some issues with the writing of the proposal - we found the paragraph comparing the speaking engagements of Brendle and Mirzakhani to be questionable, since lots of factors go into who the speakers are, including having the invited person agree to speak. We also debated the method of having a specific quota of speakers of any gender. Nevertheless, the goal of showcasing female geometers is laudable.

The conference series still seems to be a pilot activity, and we would like to see the results of prior conferences before committing to several years of support. We recommend that the potential future proposals devote more place to the scientific description of the proposed meetings.

In order to proceed with the recommendation I need a revised budget from you for one year of support and an abstract. The budget should be provided by your Sponsored Research Office, and an abstract should be included as plain text inside an email message from you.

Regarding an abstract, the following is a quote from NSF documents:

Abstracts are a public record of active and expired awards and are an important source of information on NSF activities. The purpose of the Abstract is to describe the project and justify the expenditure of Federal funds. Abstracts must not contain inappropriate or confidential information, and because they are available to such a wide audience, high standards of quality must be maintained in preparing them.

The NSF award abstract has two parts, which should appear in the following order:

-Part 1: A nontechnical description of the project, which explains the project's significance and importance. This description also serves as a public justification for NSF funding by articulating how the project serves the national interest, as stated by NSF's mission: to promote the progress of science; to advance the national health, prosperity and welfare; or to secure the national defense. This part of the abstract should describe the fundamental issues the project seeks to address, as well as other potential benefits, such as how the project advances the field, supports education and diversity, or benefits society. This part should be understandable by a broad audience.

-Part 2: A technical description of the project that states its goals and scope, the methods and approaches to be used, and its potential contribution. In many cases, the technical project description may be a modified version of the project summary that is submitted with the proposal. However, the technical description should reflect any changes in the project's goals made after the review process.

Upon award of a proposal, the Abstract is available in the Award Search application and via FastLane.

We ask that you include the name, place and dates of the conference as the first sentence of the abstract and that you include a webpage listing at the end.

I should add that this is not an official announcement of an award. We can only recommend that an award be made. The official award itself is made by the Division of Grants and Agreements.

As soon as I receive an abstract and a revised budget from you I will initiate the paperwork that will result in an official award announcement.
It will take an additional four to six weeks for the processing to be completed.

With best regards,
Joanna

Dr. Joanna Kania-Bartoszynska
Program Director
Geometric Analysis and Topology
Division of Mathematical Sciences
National Science Foundation

Gmail by Google

Catherine Searle <searle.catherine@gmail.com>

your conference proposal DMS - 1408592

18 messages

Kania-Bartoszynska, Joanna <jkaniaba@nsf.gov> Mon, Jan 27, 2014 at 4:55 PM
To: "searleca@onid.orst.edu" <searleca@onid.orst.edu>, "cplaut@math.utk.edu" <cplaut@math.utk.edu>, "leonard.wilkins@uconn.edu" <leonard.wilkins@uconn.edu>
Cc: "Kania-Bartoszynska, Joanna" <jkaniaba@nsf.gov>, "Wang, Shuguang" <SWANG@nsf.gov>, "Castano-Bernard, Ricardo" <RCASTANO@nsf.gov>, "Stark, Christopher" <cstark@nsf.gov>

Dear Professors Searle, Plaut and Wilkins
We have discussed your conference proposal DMS - 1408592 "Smoky Cascade Geometry Conference" requesting three years of funding for a series of meetings.
I am pleased to let you know that we intend to recommend an award that provides funding for the first meeting in the series.

We liked the scientific prospects and likely broader impacts laid out for the first year. Since this is a new conference series, in keeping with past program's practices, we are willing to make a pilot investment at the level of the first year budget, and to welcome a follow up in FY 2015 if the 2014 meeting works well.

In order to proceed with the award recommendation we need a revised budget for one year of funding, at the level requested for the first year. It should be submitted by your Sponsored Research Office.

I also need an abstract. The abstract should have two parts: -a technical description of the project and -a non-technical explanation of the project's broader significance and importance. Please include the title, location and dates of the conference as the first sentence of the abstract, and please provide the http for the current conference website at the end of the abstract.

Abstracts are a public record of active and expired awards and are an important source of information on NSF activities. The purpose of the Abstract is to describe the project and justify the expenditure of Federal funds. Abstracts must not contain inappropriate or confidential information, and because they are available to such a wide audience, high standards of quality must be maintained in preparing them. Upon award of a proposal, the Abstract is available in the Award Search application and via FastLane.

Please, send me your abstract pasted inside a simple email message.

I should add that this is not an official announcement of an award. We can only recommend that an award be made. The official award itself is made by the Division of Grants and Agreements.

As soon as I receive an abstract from you and the revised budget from the Sponsored Research Office I will initiate the paperwork that will result in an official award announcement. It will take an additional four to six weeks for the processing to be completed.

With best wishes and congratulations,
Joanna

Dr. Joanna Kania-Bartoszynska
Program Director
Geometric Analysis and Topology
Division of Mathematical Sciences
National Science Foundation

Subject: Fwd: DOE review and comments
From: Nickolas Solomey <nsolomey@gmail.com>
Date: 03/20/2015 01:49 PM
To: Tom DeLillo <delillo@math.wichita.edu>

Here are the 4 reviewers comments, there are lots of nice things to cut out if you want.

---------- Forwarded message ----------
From: **Nickolas Solomey** <nsolomey@gmail.com>
Date: Thursday, February 26, 2015
Subject: DOE review and comments
To: "Meyer, Holger" <holger.meyer@wichita.edu>, "Muether, Mathew" <Mathew.Muether@wichita.edu>

Skip to Main Content

Title ImageView Reviews

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0000215097: Wichita State University, Wichita, Kansas

PI: Solomey, Nick
Proposal Title: Experimental Neutrino Particle Physics Program
Solicitation: DE-FOA-0001140 - FY 2015 Research Opportunities in High Energy Physics
Reviewer Category: Primary

- By Reviewer - Current Tab

Collapse All

Collapse

Reviewer 1

Criteria

1. Scientific and/or Technical Merit of the proposed effort

What is the scientific innovation of proposed research?

How does the proposed research compare with other research in its field, both in terms of scientific and/or technical merit and originality?

How might the results of the proposed research impact the direction, progress, and thinking in relevant scientific fields of research?

What is the likelihood of achieving influential results?

I am somewhat surprised that nobody in the group appears to be directly involved in the oscillation analyses themselves as this is clearly the most exciting part of Nova. That being said, these analyses obviously require good understanding of beam and detector to be successful, so the group's research still impacts Nova's results (and by proxy perhaps neutrino mass ordering and CP violation) in a major way.

2. Appropriateness of the Proposed Method or Approach

Does the proposed effort employ innovative concepts or methods?

How logical and feasible are the approaches?

Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions?

Does the applicant recognize significant potential problems and consider alternative strategies?

The approaches chosen seem reasonable to me. Having no previous Kaon physics experience I am not really in a good position to discuss the merits of a near-perfect tag at production, but it should be helpful. Application of the LEM analysis to the near detector is straight-forward and should help. The transfer matrix technique is also well established. No details are given regarding the neutrino cross section measurements of the near detectors, but I don't foresee unsolvable problems.

3. Competency of Applicant's Personnel and Adequacy of Proposed Resources

Does the proposed work take advantage of unique facilities and capabilities?

What is the past performance of the team?

How well qualified is the team to carry out the proposed work?

Are any proposed plans for recruiting any additional scientific and/or technical personnel including new senior staff, students and postdocs reasonable, justified, and appropriate?

Are the environment and facilities adequate for performing the proposed effort?

Are the senior investigator(s) or any members of the research group that are being reviewed leaders within the proposed effort(s) and/or potential future leaders in the field?

For senior investigator(s) proposing to work across multiple research thrusts, are the plans for such cross-cutting efforts reasonably developed and will the proposed activities have impact?

I have no reason to doubt the brilliance of the personnel, and given their previous experience with MIPP I think they are able to perform the proposed program.

4. Reasonableness and Appropriateness of the Proposed Budget

Are the proposed budget and staffing levels adequate to carry out the proposed work?

Are all travel, student costs, and other ancillary expenses adequately estimated and justified?

Is the budget reasonable and appropriate for the scope?

I think the program would profit from more graduate students as there is only one (Fermilab-resident) post-doc. I am rather surprised by the large travel budget as Wichita is not so far from Fermilab (about 700 miles), and Batavia/Geneva/Naperville is not a very expensive area.[Redacted]

5. Relevance of The Proposed Research to the Mission of DOE Office of HEP Program

How does the proposed research of each senior investigator contribute to the mission, science goals and programmatic priorities of the subprogram in which the application is being evaluated?

Is the proposed research consistent with HEP's overall mission and priorities?

For multi-thrust proposals, does the scope of the full proposed program provide synergy or additional *benefits to the HEP mission beyond the individual thrusts?*

How likely is the research to impact the mission or direction of the overall HEP program?

For senior investigator(s) proposing to work and/or transition across multiple research thrusts during the project period, will their overall efforts add value in the context of HEP program goals and mission?

Work on Nova is of course a central contribution to DoE's HEP mission since it is currently the leading experiment in U.S. neutrino physics. A role in the far detector analysis would further strengthen the proposal.

6. ACCOMPLISHMENTS AND PLANS OF EACH SENIOR INVESTIGATOR
The scientific merit and potential impact of the senior investigator's proposed work

The competency of senior investigator's team and likelihood of success

A comparison to other senior investigators working in the same research area

Prof. Solomey: In his role as MIPP co-spokesperson he is well positioned to lead analysis understanding the neutrino beam which is critical of an oscillation experiment of this type. Since the knowledge of neutrino cross section is poor, precision cross section measurements at the near detector are alway a good idea. The most innovative part of his research appears to be the tagged production of strange mesons.

Prof. Muether: He concentrates on understanding the detectors which is also quite important The transfer matrix to the far detector is a central element in an neutrino oscillation experiment. I can't really comment on any nuclear physics topics related to the near detector, but I am at least somewhat familiar with the axial mass mystery that seems to depend on q^2, so further studies there should be helpful.

Prof. Meyer: His main contribution appears to be also MIPP, but he's also involved in the near detector analysis and will contribute to the proposed test beam analysis. I think it would be good if he also adopted a more leading role in the near-detector LEM analysis and not only "oversee the technical aspects" to make his physics contribution clearer.

Overall Summary of the Proposal

Summary Comments: This is a modest-size proposal focussed on only Nova (and MIPP) and perhaps the stronger for it. It appears to cover all aspects of Nova and complements it with research on particle production in the Nova beam as well as systematic studies of the Nova (-like) detector response in a test beam. The analysis effort is for the Nova near detector appears and the no-oscillation prediction of the far detector.

Collapse

Reviewer 2

Criteria

1. Scientific and/or Technical Merit of the proposed effort

What is the scientific innovation of proposed research?

How does the proposed research compare with other research in its field, both in terms of scientific and/or technical merit and originality?

How might the results of the proposed research impact the direction, progress, and thinking in relevant scientific fields of research?

What is the likelihood of achieving influential results?

The group plans to continue participating in Nova, continue with MIPP analysis and possibly be involved in a Nova beam-test. The MIPP analysis is quite important for future long-baseline neutrino experiments. There is potential impact here, beyond simply participating in an experiment.

2. Appropriateness of the Proposed Method or Approach

Does the proposed effort employ innovative concepts or methods?

How logical and feasible are the approaches?

Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions?

Does the applicant recognize significant potential problems and consider alternative strategies?

Some of the analysis ideas on Nova do not seem feasible, though perhaps if they were more completely described and backed up with simulation, their viability would be more clear.
The MIPP work is quite important.

3. Competency of Applicant's Personnel and Adequacy of Proposed Resources

Does the proposed work take advantage of unique facilities and capabilities?

What is the past performance of the team?

How well qualified is the team to carry out the proposed work?

Are any proposed plans for recruiting any additional scientific and/or technical personnel including new senior staff, students and postdocs reasonable, justified, and appropriate?

Are the environment and facilities adequate for performing the proposed effort?

Are the senior investigator(s) or any members of the research group that are being reviewed leaders within the proposed effort(s) and/or potential future leaders in the field?

For senior investigator(s) proposing to work across multiple research thrusts, are the plans for such cross-cutting efforts reasonably developed and will the proposed activities have impact?

The team is competent and capable.

4. Reasonableness and Appropriateness of the Proposed Budget

Are the proposed budget and staffing levels adequate to carry out the proposed work?

Are all travel, student costs, and other ancillary expenses adequately estimated and justified?

Is the budget reasonable and appropriate for the scope?

The travel costs seem out of line.

5. Relevance of The Proposed Research to the Mission of DOE Office of HEP Program

How does the proposed research of each senior investigator contribute to the mission, science goals and programmatic priorities of the subprogram in which the application is being evaluated?

Is the proposed research consistent with HEP's overall mission and priorities?

For multi-thrust proposals, does the scope of the full proposed program provide synergy or additional benefits to the HEP mission beyond the individual thrusts?

How likely is the research to impact the mission or direction of the overall HEP program?

For senior investigator(s) proposing to work and/or transition across multiple research thrusts during the project period, will their overall efforts add value in the context of HEP program goals and mission?

The work is relevant to the mission.

6. Accomplishments and Plans of Each Senior Investigator

The scientific merit and potential impact of the senior investigator's proposed work

The competency of senior investigator's team and likelihood of success

A comparison to other senior investigators working in the same research area

The team is scientifically competent.

Overall Summary of the Proposal

Summary Comments: The group has experience pushing forward analysis in MIPP. This is quite important. The possible contribution of computing power is nice.

Collapse

Reviewer 3

Criteria

1. Scientific and/or Technical Merit of the proposed effort

What is the scientific innovation of proposed research?

How does the proposed research compare with other research in its field, both in terms of scientific and/or technical merit and originality?

How might the results of the proposed research impact the direction, progress, and thinking in relevant scientific fields of research?

What is the likelihood of achieving influential results?

This proposal describes work on NOvA and MIPP by the WSU group. Faculty members Solomey and Meyer are involved in the MIPP experiment, which has not taken data for a long time, but which has a large data set on tape still waiting to be analyzed. A new hire, Muether, intends to continue work on NOvA, and both other faculty members propose to participate in NOvA as well. The proposal also briefly mentions possible future involvement in LBNF.

NOvA has considerable intrinsic merit, as a leading current US experiment in the field. Data-taking is just starting up and has several future impactful results ahead of it, including new electron-appearance-based measurements of theta13 with an off-axis beam.

MIPP is a support-type experiment with the aim of measuring charged-particle distributions with beams at Fermilab. In principle these data are useful for understanding properties of neutrino beams. However the collaboration has been rather slow in producing results and few papers have been published, and only after long delay. It would be nice to see MIPP data analyzed.

2. Appropriateness of the Proposed Method or Approach

Does the proposed effort employ innovative concepts or methods?

How logical and feasible are the approaches?

Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions?

Does the applicant recognize significant potential problems and consider alternative strategies?

The strongest aspect of this proposal is the service work to NOvA proposed to be done by Muether, including data quality monitoring. Given his recent involvement at Fermilab, it's plausible this can be carried out well. Also proposed are near detector data analyses; the details of how this work will be carried out are not well fleshed out. The group proposes to take on shift and other support work.

A possible atmospheric tau neutrino analysis is mentioned; however the description contains an erroneous statement (tau appearance was not recently demonstrated by T2K), betraying the investigator's unfamiliarity with the analysis. A specific plan for this analysis is not described.

Exactly how the MIPP analysis, and possible NOvA test beam analysis (if the test beam happens) are to be carried out is not described.

3. Competency of Applicant's Personnel and Adequacy of Proposed Resources

Does the proposed work take advantage of unique facilities and capabilities?

What is the past performance of the team?

How well qualified is the team to carry out the proposed work?

Are any proposed plans for recruiting any additional scientific and/or technical personnel including new senior staff, students and postdocs reasonable, justified, and appropriate?

Are the environment and facilities adequate for performing the proposed effort?

Are the senior investigator(s) or any members of the research group that are being reviewed leaders within the proposed effort(s) and/or potential future leaders in the field?

For senior investigator(s) proposing to work across multiple research thrusts, are the plans for such cross-cutting efforts reasonably developed and will the proposed activities have impact?
While Solomey is co-spokesperson of MIPP, the researchers are not really leaders in the field-- the MIPP experiment has the reputation of being extremely slow to produce results (for the publication on charged pion production yields which finally showed up this year, it is not clear what the WSU contribution is).

Although their track record is not very strong, the group members are qualified to carry out the proposed work. The recent hire, Muether, was recently a Fermilab postdoc working on NOvA and appears best positioned to make a contribution to NOvA.

The request represents significant new personnel for the group (a postdoc, a grad student and two undergrads). While this would not be unreasonable for a group of this size, it's not clear funds would be optimally spent in this group without much advising record.

The facilities seem to be adequate.

4. Reasonableness and Appropriateness of the Proposed Budget

Are the proposed budget and staffing levels adequate to carry out the proposed work?

Are all travel, student costs, and other ancillary expenses adequately estimated and justified?

Is the budget reasonable and appropriate for the scope?

For the items requested, the budget is not too unreasonable, although the foreign travel seems rather high for a group doing research at Fermilab. As indicated above, it's not clear the large personnel increase is warranted for this group.

5. Relevance of The Proposed Research to the Mission of DOE Office of HEP Program
How does the proposed research of each senior investigator contribute to the mission, science goals and programmatic priorities of the subprogram in which the application is being evaluated?

Is the proposed research consistent with HEP's overall mission and priorities?

For multi-thrust proposals, does the scope of the full proposed program provide synergy or additional benefits to the HEP mission beyond the individual thrusts?

How likely is the research to impact the mission or direction of the overall HEP program?

For senior investigator(s) proposing to work and/or transition across multiple research thrusts during the project period, will their overall efforts add value in the context of HEP program goals and mission?

The proposed research is entirely relevant to the mission and priorities of HEP.

6. Accomplishments and Plans of Each Senior Investigator
The scientific merit and potential impact of the senior investigator's proposed work

The competency of senior investigator's team and likelihood of success

A comparison to other senior investigators working in the same research area

Solomey is a PI with some expertise but without a very strong track record of research or advising students. Although spokesperson of MIPP, it is not even clear his, or the WSU group's, role, and the experiment has been disappointingly slow in producing results.

Meyer is a PI with some expertise but without a very strong track record of research or advising students. The proposal is light on specifics of proposed research and weak compared to others proposing similar research.

Muether is a new hire and the most promising member of the WSU, having recent track record of contributions to NOvA as a postdoc. The proposal to develop and maintain data quality tools is the strongest element of this overall rather weak proposal.

Overall Summary of the Proposal

Summary Comments: The proposal is light on specifics of proposed research and weak compared to others proposing similar research.

Collapse

Reviewer 4

Criteria

1. Scientific and/or Technical Merit of the proposed effort

What is the scientific innovation of proposed research?

How does the proposed research compare with other research in its field, both in terms of scientific and/or technical merit and originality?

How might the results of the proposed research impact the direction, progress, and thinking in relevant scientific fields of research?

What is the likelihood of achieving influential results?

The WSU group is proposing a 3-year research effort supported by 3 senior investigators focused on NOvA near detector analysis and a proposed test beam run. The NOvA near detector is now fully operational and will collect a very large sample of neutrino interactions in the 2 GeV energy range. The analysis of this data is crucial for the NOvA neutrino oscillation program and in advancing our understanding of nuclear effects in neutrino scattering. If the WSU group can provide a strong team leading analysis of the NOvA near detector data, this could have a substantial impact on the NOvA program. WSU's support of the test beam run and analysis of MIPP data taken on the NuMI target could enhance this effort, although a coherent analysis plan for these 3 programs was not presented. How is this all connected and how do each of the research efforts strengthen each other?

2. Appropriateness of the Proposed Method or Approach

Does the proposed effort employ innovative concepts or methods?

How logical and feasible are the approaches?

Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions?

Does the applicant recognize significant potential problems and consider alternative strategies?

The PIs propose to build a team that will focus on measurements in the NOvA near detector. This effort is incredibly important and will provide valuable, high statistics datasets for analysis.

Near Detector (Solomey): proposes to explore neutrino-induced kaon production in the near detector. There is very little existing data on neutrino-induced kaon production so adding to this collection would be valuable. Specifically, the PI proposes to search for antineutrino-induced K- vs. K0bar production. Such events are proposed to be tagged based on the number of particles emitted from the interaction vertex. While the simple final states expressed in equations (1) and (2) are true for free nucleon scattering, nuclear effects greatly alter this picture. How will the carbon target present in NOvA modify this picture and the event selection being proposed? What do such events look like in the NOvA detector? Some example event displays of simulated K- and K0bar events would have been useful. The PI points out that "if a few thousand of these events can be found, there is the potential to do some interesting physics of the K0 oscillation mechanism", but does not state how many events might be expected in a reasonable NOvA beam exposure. The analysis uses antineutrino reactions. Will this study be done in neutrino and/or antineutrino mode running? The PI mentions "even though there is a small amount of antineutrinos in the beam of NuMI, because we would see a negative lepton (muon or electron), we then know that it was a neutrino that produced the K0 particle". The NOvA detector is not magnetized so it would have been helpful to explain how one will separate neutrino from antineutrino events for this study. Also, a reference should be included for the source of existing data on numubar p —> mu+ K- p in Equation (1) given that this sample is referred to twice in the text.

Near Detector (Muether): proposes to continue work on understanding the off-axis NuMI flux. This is crucial for any cross section measurements that are to be obtained from the near detector. Profs. Muether and Meyer also propose to measure the axial mass (MA) in quasi-elastic interactions in the NOvA near detector. The study of quasi-elastic scattering is an incredibly important avenue of research given the newly appreciated nuclear effects involved in such interactions and the role they play in the interpretation of neutrino oscillation data. The field needs more data to make sense of the current picture and the narrowly peaked off-axis NuMI flux provides a unique opportunity to scrutinize these events without the added complication of a very wide spectrum of participating neutrino energies. However, the analysis description is behind the times. The PIs are encouraged to focus on producing a less model-dependent physics result from this data than MA. Recent neutrino experiments, such as MiniBooNE, ArgoNeuT, T2K, MINERvA, etc. have instead concentrated on measuring the differential cross sections for the final state particles produced in such quasi-elastic interactions rather than axial mass extractions. This approach invokes less model assumptions and produces a more comprehensive set of data (not just a single number) that can be directly used by nuclear theorists and model builders to advance our understanding of the complex nuclear physics in play. Muether's added interest in initiating an atmospheric tau neutrino analysis in the NOvA far detector is intriguing. It would be more cohesive if there were a connection between this and the near detector program. For example, are there backgrounds or techniques for the tau neutrino search that can be specifically constrained using NOvA near detector data?

MIPP (Solomey/Meyer): The statement on planned MIPP analyses is vague. Who will be specifically working on this beyond oversight of ongoing work and what is the timeline for results? The MIPP data is valuable for a variety of reasons, yet it is unclear from the proposal whether WSU plans to contribute any WSU postdocs or students to the analysis of this data. With their close involvement in MIPP and the availability of hadro-production data on the NuMI target, the WSU group could advance the state of knowledge of the NuMI off-axis flux that would support the neutrino cross section program they propose. This seems like a missed opportunity.

Testbeam (Meyer/Muether): The WSU group is involved in plans to expose a prototype of the NOvA detector in the Fermilab test beam facility. They have considerable input to lend to this effort given Muether's expertise on the NOvA detector and Meyer's extensive experience on MIPP. This would also give valuable hands-on detector experience to their students. The description of what WSU would like to obtain from the test beam run, however, is very general. The proposal would have been stronger had the test beam run been connected to their planned near and far detector measurements. For example, what can be learned on kaons and protons in the proposed test beam exposure that would enhance the planned K0 and quasi-elastic near detector measurements, respectively? The test beam analysis plan is lacking specifics. What does the team want to get out of the testbeam and are they pushing for specific measurements that will enhance their NOvA near detector analyses?

The team presents two plans depending on the timeline for the NOvA test beam run. If the test beam run is delayed for some reason, focus will shift on NOvA far detector analyses. It is important to articulate this alternate plan, but it is not clear what "Additional Service" means in years 3,4 on the timeline on pages 7,8 or what far detector work the group will pursue (beyond Muether's atmospheric tau neutrino search) if the test beam run is pushed back in time and/or the new WSU computing core for LEM transfer is not realized.

3. Competency of Applicant's Personnel and Adequacy of Proposed Resources

Does the proposed work take advantage of unique facilities and capabilities?

What is the past performance of the team?

How well qualified is the team to carry out the proposed work?

Are any proposed plans for recruiting any additional scientific and/or technical personnel including new senior staff, students and postdocs reasonable, justified, and appropriate?

Are the environment and facilities adequate for performing the proposed effort?

Are the senior investigator(s) or any members of the research group that are being reviewed leaders within the proposed effort(s) and/or potential future leaders in the field?

For senior investigator(s) proposing to work across multiple research thrusts, are the plans for such cross-cutting efforts reasonably developed and will the proposed activities have impact?

Prof. Solomey is currently spokesperson of MIPP and will continue in this role. Prof. Meyer was previously commissioning and run coordinator for MIPP and could led valuable expertise to the proposed NOvA test beam run. In addition to the quasi-elastic measurement outlined above, Prof. Meyer also plans to continue to support the NOvA beam spill system, however it seems this role could easily be passed on to the WSU postdoc or graduate student who will be based at Fermilab. Neither seem to have a strong track record of mentoring students and MIPP has been very visibly slow in producing results.

Prof. Muether possesses an established and visible role on NOvA being a member of the NOvA executive committee and having been a former run coordinator for the experiment. He is a DAQ expert and is one of two qualified APD experts on NOvA. He will continue to lead the NOvA data quality effort. Getting students involved with the watchdog group would provide excellent training. He seems very well-suited to lead a NOvA near detector analysis team given his expert knowledge of NOvA. He appears best situated to make future contributions to NOvA.

The proposed research would leverage a new $226k 300+ core computing center that is in the WSU president's request to the state of Kansas. The proposal does not state how successful the realization of this new computing cluster is likely to be. If this second site is established at WSU, the LEM techniques could be readily extended to the planned near detector analyses and provide extra computing prowess for reprocessing NOvA data sets.

4. Reasonableness and Appropriateness of the Proposed Budget

Are the proposed budget and staffing levels adequate to carry out the proposed work?

Are all travel, student costs, and other ancillary expenses adequately estimated and justified?

Is the budget reasonable and appropriate for the scope?

The PI requests support for 2 summer months each year for Profs. Solomey, Meyer, and Muether, as well as one postdoc, one graduate student, and two undergraduates who will work on NOvA for the duration of the proposed research. As for the requested funding, two aspects of the proposed budget raise questions. (1) The proposed travel budget is large at a total cost of ~$50k/year. The expense is dominated by the need for 24 week-long trips to Fermilab per year for NOvA shift support and collaboration with other members of the NOvA team. There must be a more optimal schedule than traveling to Fermilab every other week (!). It is unclear why this is needed when the

WSU postdoc and graduate student will be based at Fermilab (and can provide local support) and when a remote shift facility at WSU is planned for early 2015. (2) The $15,608 budgeted for personal computing is not itemized - how many computers does this include, for which personnel, and on what timescale?

5. Relevance of The Proposed Research to the Mission of DOE Office of HEP Program

How does the proposed research of each senior investigator contribute to the mission, science goals and programmatic priorities of the subprogram in which the application is being evaluated?

Is the proposed research consistent with HEP's overall mission and priorities?

For multi-thrust proposals, does the scope of the full proposed program provide synergy or additional benefits to the HEP mission beyond the individual thrusts?

How likely is the research to impact the mission or direction of the overall HEP program?

For senior investigator(s) proposing to work and/or transition across multiple research thrusts during the project period, will their overall efforts add value in the context of HEP program goals and mission?

The proposed work is within the DOE OHEP's mission to further elucidate the properties of neutrinos by sending accelerator-based sources of neutrinos across long distances. NOvA is the flagship experiment in the U.S.-based neutrino program. Support for the analysis of the substantial datasets expected to be collected in the NOvA near detector will be critical to the success of the experiment. There will be a lot of data, many interaction channels, and a lot of complex physics that need to be understood with this device so a strong analysis team should be supported to carry out this work. In addition, a better understanding of the response of the NOvA detector by exposing a prototype to known particle beams will ensure the robustness of results obtained from both the near and far detectors.

6. Accomplishments and Plans of Each Senior Investigator

The scientific merit and potential impact of the senior investigator's proposed work

The competency of senior investigator's team and likelihood of success

A comparison to other senior investigators working in the same research area

Solomey and Meyer are PIs with some expertise, but it is unclear how successful they have been in leading postdocs and students to produce physics results. Muether is a new hire and most promising member of the WSU team, given his established record on NOvA as a postdoc for the past several years.

Overall Summary of the Proposal

Summary Comments: This proposal initiates an analysis team focused on the NOvA near detector and planned test beam run. Both data sets are important for the success of NOvA and will allow us to learn some important nuclear physics in the process. The strength of the proposal is in launching a new team devoted to NOvA near detector analysis. The weakness is the lack of detail and cohesiveness in the planned work. NOvA is currently the flagship neutrino experiment in the U.S. There will be a lot of data in the near detector, a lot of interaction channels, and a lot of complex nuclear physics that needs to be understood so a strong analysis team should be supported to carry out this work. With the new addition of Muether, WSU could, in principle, be that team.

Dr. Nickolas Solomey
Professor of Physics

Proposal Status | MAIN

Organization: Wichita State University

Proposal Detail:

Proposal Information

Proposal Number:	1607410
Proposal Title:	Neutrino Interactions in the NuMI Off-Axis Electron Neutrino Appearance (NOvA) Near Detector
Received by NSF:	10/28/15
Principal Investigator:	Mathew Muether

This Proposal has been Electronically Signed by the Authorized Organizational Representative (AOR).

NSF Program Information

NSF Division:	Division Of Physics
NSF Program:	ELEMENTARY PARTICLE ACCEL USER
Program Officer:	Randal Ruchti
PO Telephone:	(703) 292-7210
PO Email:	rruchti@nsf.gov

Proposal Status

Status As of Today Dated: **04/05/18**

Award **1607410** was made on **06/24/16** for **$ 246,000.00** with an effective date of **07/01/16**.

Award Duration: **36** (months)

Our records indicate that the following Annual Project Report(s) are due or overdue for the Award(s) listed below. Please submit the report(s) as soon as possible using the Project Reports System within FastLane.The report(s) will be considered overdue if not submitted by the Report Overdue Date mentioned for each report. Having an Overdue project report will affect/delay NSF actions on any other award related to the PI/Co-PI:

Award **1607410**: Annual Report **due** for period ending 06/30/2018 for **Mathew Muether**

Reviews

All of the reviews of your proposal that have been released to you by your NSF program officer can be viewed below. Please note that the Sponsored Project Office (or equivalent) at your organization is NOT given the capability to view your reviews.

Document:	**Release Date:**
Panel Summary #1	May 13 2016 11:23AM
Review #1	May 13 2016 11:23AM
Review #2	May 13 2016 11:23AM
Review #3	May 13 2016 11:23AM

Context Statement

For FY2016, proposals were reviewed by the Elementary Particle Physics (EPP) program using the following, well established NSF/PHY merit review process.

Target Date for Submission and Receipt of Proposals: The EPP program reviewed 38 proposals submitted to the Base Program with a target date of October 27, 2015.
Thirty-five proposals were submitted to EPP (1221), 2 to PA (1643) and one to NP (1234).

Ad hoc Reviews: Each of the proposals was sent to at least three external merit/ad hoc reviewers. The EPP requested reviews were submitted to NSF electronically during the period December 2015 through January 26, 2015 and all prior to the time of the EPP2015 Panel Meeting Feb. 1-3, 2016.
One proposal had significant research components in the area of Nuclear Physics (NP) program. For these proposals, EPP and NP program directors chose several ad hoc reviewers to provide expert advice from each of these domains. Similarly for the two proposals submitted to PA.

Panel Review: The 38 proposals were evaluated collectively and comparatively by the EPP2016 Panel (P161038), a group of thirteen distinguished scientists that met at NSF Headquarters in Ballston, Arlington, VA, on 1-3 Feb., 2016.

Proposal Discussion and Rating: Each of the proposals was reviewed in detail by three or four members of the Panel, one as the primary (or Lead) reviewer, one as the secondary (or Second) reviewer, and one as the tertiary (or Scribe) reviewer. The lead provided a brief summary of the proposed work, an overview of the relevant ad hoc reviews, and her/his rating of Intellectual Merit (IM) and Broader Impacts (BI) components as well as the rationale for these ratings, after which the Second and Scribe (and fourth if applicable) expressed their views, rating and rationale. The rating scale was: E (Excellent), V (Very Good), G (Good), F (Fair), P (Poor). There then followed an in-depth discussion of the proposal by the entire Panel, again with careful attention paid to both NSF Merit Criteria for Intellectual Merit and Broader Impacts. For those proposals with more than one PI, consideration was given to the contributions of each PI. The Scribe then drafted the EPP Panel Summary, which captured the conclusions of the entire panel following the discussion.

Proposal Ranking: After the discussion of a given proposal, the EPP Panel was asked to place it into one of three categories: Fund if Possible (FIP), Fund if Possible at Low Priority (LP), or Do Not Fund (DNF). In those cases where a proposal would also be reviewed by PA or NP programs, the EPP Panel provided its recommendation only for the EPP-specific elements of the proposal.
Then in a preliminary way, the Panel rank ordered the proposals from 1 to 38, with one being the highest ranking and 38 the lowest. After careful discussion of the relative order of the proposals and the category assignments, the panel set the final ranking.

Panel Summaries: Once all of the review summaries were completed, the Panel Summaries were entered into FastLane and then read aloud, with the wording of each agreed to by the full panel. Then the sign-off of approval of each summary was taken by the lead, second and scribe (and fourth if applicable) for each proposal.

Conflicts: For the Ad hoc/merit reviews, any Conflicts of Interest were acknowledged and with the reviewer declining to review. For the Panel, Conflicts of Interest of individuals on specific proposals were identified prior to the Panel Meeting. In all such cases, the persons having the conflict were recused for the period of the presentation and discussion of the proposal, and from participation in the follow-up deliberations including the rating and ranking of the proposal and the preparation of the panel summary.

NSF Attendees: Program Directors present during the EPP2015 Panel Review included: for PHY/EPP Jim Shank and Brian Meadows; for PHY/NP Allena Opper and Ken Hicks. And for PA, Jim Whitmore.

Recommendations: The Program Director's judgment of and recommendation for each proposal was reached by assimilating the comments contained in the merit/ad hoc reviews, the EPP2016 Panel Summary and ranking, site-visit reports (if any), programmatic considerations, and the FY 2016 budget for the EPP program.

◂ Back to Status Search Results

Panel Summary #1

Proposal Number: 1607410

Panel Summary:
Panel Summary

Intellectual Merit:

NOvA has shown its great promise to address some of the outstanding questions in neutrino interactions, and this proposal seeks to continue Muether's contributions to NovA as he has begun a new position at Wichita State University. The PI is well-suited to conduct the research he proposes, as he is a very well established member of the NovA collaboration, having served in various leadership roles - currently as Near Detector Physics Working Group Coordinator. Such a broad background prepares him well for bringing a new research effort to WSU in his new role as WSU resumes graduate programs, and to be very successful with what he proposes.

The panel noted that a large number of analyses were mentioned in the proposal, which likely derives from his role as NGPWG Coordinator, and not because he plans work on all the listed efforts. Certainly it seems to be too many for a single PI leading a single MS student and undergraduate, but most importantly it was not completely clear to which analyses the group intends their primary involvement. Being much clearer about this would have improved this proposal.

Intellectual Merit Rating: Very Good

Broader Impacts:

The PI has included a good discussion of broader impacts from this proposal. The issues raised include both impacts in terms of educational opportunities in the arena of data science and computational techniques, both of which fit very nicely and naturally into a particle physics environment, but the PI has specifically addressed how he will approach his efforts in this arena in an attractive fashion. Secondly, this proposal is attractive in terms of the population of students he aims to reach. WSU has the opportunity because of its setting to be effective in drawing students from underrepresented populations into this work, and the PI specifically seeks to engage them via the APS bridge program.

Finally, too, and this is increasingly important today, the PI is engaged already in public outreach via social media, as well as in specific events hosted by WSU to reach the surrounding K-12 student and teacher populations.

Broader Impacts Rating: Very Good

There is no Postdoctoral Mentoring Statement, as the proposal requests no funding for postdoctoral researchers.

The Data Management plan is exceptionally well spelled out, and is consistent with the NOvA standards developed in conjunction with the Fermilab Computing Division

Recommendation: Fund if possible

This summary was read by the panel and the panel concurred that the summary accurately reflects the panel discussion and recommendation.

Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Wichita State University

Review #1

Proposal Number:	1607410
NSF Program:	ELEMENTARY PARTICLE ACCEL USER
Principal Investigator:	Muether, Mathew
Proposal Title:	Neutrino Interactions in the NuMI Off-Axis Electron Neutrino Appearance (NOvA) Near Detector
Rating:	Very Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

1. What is the potential for the proposed activity to advance knowledge and understanding within its own field or across different fields (Intellectual Merit)?
The broad goal of the research is to enable precise oscillation measurements in the Nova experiment. In particular, the proposed project will lead to better understanding of neutrino interactions which are a necessary ingredient to performing oscillation measurements.
The measurements will also be useful input for the future DUNE oscillation experiment which is a high priority goal in high energy physics.

2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts? Why?
Neutrino electron scattering has a well know cross section and therefore can be used as an important constraint for determining incident neutrino flux. While the measurement will be statistics limited for Nova, developing the technique may be important for future experiments. An additional unique feature of Nova is the narrow-band beam which is in the energy range relevant for DUNE. Cross section measurements performed with this beam will be useful in that they will have largely independent flux systematic uncertainties than those preformed from other beam sources (NuMI on-axis, Booster, JPARC, etc.). The importance of these measurements is to support oscillation physics.

3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Why? Does the plan incorporate a mechanism to assess success?

The neutrino interaction physics measurements described are feasible and likely to produce successful outcomes.
The plan to use local computing resources to carry out data analysis projects sounds reasonable, useful and likely to succeed under the PI's guidance.

4. How well qualified is the individual, team, or institution to conduct the proposed activities? Why?

The PI is coordinator for neutrino interactions analysis in NOVA. He has a long history of important contributions to the Nova experiment including leading roles on physics analysis, run coordinator, and other hardware projects. He also has expertise in computing and is capable of mounting the LEM algorithm computing project using local resources. He is well qualified to carryout the proposed projects.

5. Are there adequate resources available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?

The PI is leveraging local computing resources and personnel expertise. Resources appear to be adequate for the proposed project.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

The educational component is useful and will in particular benefit regional participation in science and technology. It is well thought out and feasible. The PI has the right expertise to carry out the work and will likely succeed.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Summary Statement

The PI is a well respected and capable member of the Nova team and is capable of carrying the proposed research. The project is important, feasible and likely to have successful outcomes.

◀ Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Wichita State University

Review #2

Proposal Number:	1607410
NSF Program:	ELEMENTARY PARTICLE ACCEL USER
Principal Investigator:	Muether, Mathew
Proposal Title:	Neutrino Interactions in the NuMI Off-Axis Electron Neutrino Appearance (NOvA) Near Detector
Rating:	Very Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

The investigator is a NOVA collaborator measuring neutrino oscillations with the main contributions being measurements of neutrino interactions. Understanding neutrino interactions is central to neutrino oscillation studies, and it is crucial for NOVA to have this expertise in the collaboration. There is an ongoing international effort to understand neutrino interactions, so this work is in the context of studies from the currently running MINERvA and T2K experiments, as well as several completed experiments. One weakness in the proposal is that it does not comment on how these measurements will be related to MINERvA and T2K, which work in fluxes that bracket, and largely cover, the energy range seen at the NOVA near detector. The proposal is also less specific than it could be about the expected deliverables. Several important studies are proposed, but it's unclear on what timescale they will be completed.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

The proposal seeks use the work as a catalyst to expose students to "big data" tools by using a high performance computing cluster available at WSU. The proposal would indirectly help a WSU application to participate in the APS Bridge Program. The investigator also has a proven track record in social media out reach, and expresses interest to participate in the Wichita State Fairmont Center for Science and Mathematics Education.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

The investigator proposes a wide ranging research program with broad impact. Given the small size of the physics effort in the Wichita State University department of Mathematics, Statistics and Physics which currently enrolls two students in the physics PhD program, I am concerned that the available resources may not be well matched to the program.

Summary Statement

This proposal is scientifically sound, and has both significant intellectual merit and broad impact.

Back to Proposal Status Detail

Review #3

Proposal Number:	1607410
NSF Program:	ELEMENTARY PARTICLE ACCEL USER
Principal Investigator:	Muether, Mathew
Proposal Title:	Neutrino Interactions in the NuMI Off-Axis Electron Neutrino Appearance (NOvA) Near Detector
Rating:	Very Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

1. Potential of proposed activity
The proposal is aimed to measure neutrino interaction in the Nova near detector. Several measurement are discussed in details and their potential to improve the Nova oscillation analysis is made clear. The PI is well positioned in Nova to carry the proposed work but he will need to improve external collaboration, like NUSTEC at Fermilab to make this work even more effective. Connecting with existing group carrying the same kind of work in other experiments will be very important.

2. Creativity and Originality
The proposed project is original in its own scope in Nova, similar projects are already undergoing in the US at other institutions to analyze neutrino interactions in matter.

3. Quality of the research plan
The research plan is described in details, a list of possible measurements is presented and each measurement is discussed in details. Goals for each analysis are described and established. The overall plan is very sound and the PI position in Nova will allow him to succeed in his plan. There is no mention of the specific work that the undergraduate students or graduate students will do. It would be nice if in future proposal the PI can give more details on that.

4. Reputation of the PI and Preparation to carry out work
The PI has just started his position at Wichita State University. The PI seems to be already in a leadership position in Nova that will allow him to complete successfully the plan described in this proposal.

5. Adequate Resources
The PI seems to have adequate resources to carried out the outline research. The budget is very reasonable.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

1. Potential of proposed activity
The experimental program described in this proposal will enhance the Nova physics program and contribute to lower one of the major systematic uncertainties in the current Nova oscillation analysis.

2. Creativity and Originality
The work described in this proposal is unique in Nova.

3. Quality of the research plan
The research plan contains a good level of details, the specific of the work that the graduate and undergraduate students will be involved in is missing.

4. How well qualified is the individual, team, or institution to conduct the proposed activities?
Well Qualified.

5. Adequate resources
The Pi has adequate resources and good visibility to make this project successful.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Summary Statement

The proposal is original and have a good potential to succeed in Nova. The uncertainties on neutrino cross section is one of the major source of systematic uncertainties for the Nova and other neutrino experiments so the work proposed here is timely and needed. The PI does not describe any plan for which the results of his proposed work would be integrated in the current and future neutrino event generators or how his results would impact the US neutrino community. There is a brief mention to DUNE and reaching out to nuclear theorists but the PI does not address how his work will impact DUNE or the T2K experiment. The proposed work is important for Nova but it should benefit the entire neutrino community as well. There have been several attempts in the past to carry out the same measurements in neutrino experiments like SciBooNE, MiniBooNE, Nomad, etc.. Those attempt were successful but the lack of connection with the experimental and theory community made those measurments not as effective as they could have been. This will motivate my overall score of this proposal to be lower than excellent. There is also no details on how the graduate and undergraduate students will be involved in the proposed research. The data management plan is good and detailed. The budget is balanced and reasonable.
The outreach activity that the PI proposed are good and very interesting. This is overall a very good proposal and it should be funded if possible.

Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Wichita State University

Panel Summary #1

Proposal Number: 1514886

Panel Summary:
Panel Summary

BRIEF SUMMARY OF PROJECT
The proposal includes the analysis of the observed better stability for Helmholtz equations and systems of equations as the frequency increases, on which the PI has already obtained excellent results.

INTELLECTUAL MERIT
Strengths: The PI is a leading expert in inverse problem. His research in the past 10-15 years has been very influential and transformative in this field and he continues to do good work. The proposal is highly technical and is part of the PI's long term program.

Weaknesses:
The proposal was difficult to review because the descriptions of each project were too terse. The proposal might have been stronger if it included fewer projects, with longer descriptions that were accessible to a less technical audience.

BROADER IMPACTS
The panel remarked that the PI has trained students who are active in academia, and industries and plans to continue to do so. The PI has connections with the local aviation industry.

SYNTHESIS AND RECOMMENDATION

The panel placed this proposal in the category:
Low Competitive.

This summary was read by/to the panelists and they concurred that the summary accurately reflects the panel discussion.

Panel Recommendation: Low Competitive

Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Wichita State University

Review #1

Proposal Number:	1514886
NSF Program:	APPLIED MATHEMATICS
Principal Investigator:	Isakov, Victor M
Proposal Title:	Some inverse problems: increasing stability and drift-diffusion models
Rating:	Multiple Rating: (Very Good/Good)

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

The applicant proposes to study inverse boundary problems including (1) obstacle problems for scalar waves (2) inverse medium problems for the Maxwell equations at high frequencies and (3) the elasticity system with residual stresses and transverse
anisotropy. The goal is to establish improved stability estimates.

Strengths: The PI is a leading expert with a distinguished track record in studying theoretical aspects of inverse problems. It is very likely that substantial progress will be achieved in attacking the proposed problems.

Weaknesses: The term "increasing stability" is somewhat confusing.
In some sense an inverse problem has a certain intrinsic stability. The difficulty is to find the best possible stability estimate. This may mean a qualitative improvement or simply better regularity. In any case, it is the underlying physics that determines the intrinsic stability of the problem. That said, the PI does not really justify why he expects to be able to find better stability. Evidence could come from numerical reconstructions, but this avenue is not explored. Physical justification could also be provided. However, in the case of EIT at high frequencies, the penetration of electromagnetic fields is exponentially small.

The importance of better stability is ultimately in providing theoretical support for improved reconstruction. Thus the indicated line of investigation, without better justification, is somewhat academic. Of course, there are mathematical challenges to be overcome. However, this by itself does not elevate the overall significance of the proposed research.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

Adequately addressed

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Summary Statement

I rank this proposal in the middle third of those I have reviewed.

Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Wichita State University

Review #2

Proposal Number:	1514886
NSF Program:	APPLIED MATHEMATICS
Principal Investigator:	Isakov, Victor M
Proposal Title:	Some inverse problems: increasing stability and drift-diffusion models
Rating:	Excellent

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

The PI is an expert on difficult and highly technical aspects of inverse problems, but understands and addresses the physically important questions as well as the theoretical ones. It is common in the subject prove a very general type stability theorem, that asserts some sort of logarithmic stability, without paying any attention to the relevant physical regimes. In his description of previous work, he clearly addresses both issues. For example, in [17] and [13], he addresses explicit stability of unique continuation and the Lipschitz stability of low wavenumber information in the unique continuation for the Helmholtz equation.

In the PI's own words: "The PI will continue his work on fundamental theoretical questions. He believes that theoretical and practical aspects are closely related, and the area benefits from their combination."

I found the proposal extremely dense and terse. Much of the mathematics is based on Carlemann estimates (quantitative estimates that prove unique continuation, among other things), which I understand only superficially. He addresses a huge variety of problems, including new unique continuation principles, inverse problems for anisotropic elasticity, inverse problems in bio physics, and determination of the volatility function in Black-Scholes initial value problem. He even proposes new, more realistic Black-Scholes models for multi-asset European options.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

The PI has graduated 9 Ph.D. students since 1992. One is vice president of derivatives division of big investment company. He is the source of the PI's interest in options pricing, and the conduit that carries these results into practice. The PI has connections with the local aviation industry. The PI's results are, of course, relevant to the imaging of elastic structures and other imaging problems in science and engineering.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Summary Statement

Although I could not follow the details of the proposal, the PI's accomplishments justify his ability to carry them out.

He is responsible for the most general Carlemann estimates for scalar partial differential operators.He originated the method of singular solutions for domains and boundary identification which is now one of basic tools used for example by Alessandrini, Kirsch, and Kress to resolve uniqueness problems in inverse conductivity. This idea later evolved into the linear sampling method for inverse scattering and by Colton and Kirsch. Both credit the PI for the fundamental ideas behind this now very popular area of applied mathematics.

◀ Back to Proposal Status Detail

Proposal Status | MAIN

Organization: Wichita State University

Review #3

Proposal Number:	1514886
NSF Program:	APPLIED MATHEMATICS
Principal Investigator:	Isakov, Victor M
Proposal Title:	Some inverse problems: increasing stability and drift-diffusion models
Rating:	Excellent

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

The PI proposes to carry out a long-term plan on the analysis of important open problems in inverse problems theory. Such problems include the analysis of the observed better stability for Helmholtz equations and systems of equations as the frequency increases, on which the PI has already obtained excellent results. The analysis of anisotropic systems of elasticity is also a timely problem, where the PI is expected to shed interesting light. Finally, the PI proposes a theoretical study of drift-diffusion equations as they appear in finance and biophsycal applications.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

This is strong proposal with a very solid educational component (of graduate students) at Wichita State. The PI has an excellent record in the mentoring of graduate students at his institution.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Summary Statement

The PI presents an important, timely, research program on the theory of inverse problems with a standard but high quality educational component. I recommend funding.

Proposal Status | MAIN

Organization: Wichita State University

Panel Summary #1

Proposal Number: 1611780

Panel Summary:
Panel Summary

Intellectual merit: The PI proposes projects related to the classification of spaces with curvature bounds and with symmetries. Her recent publication record is very strong, including 9 publications in the last 5 years in very good journals, almost all related to the proposed research. Some panelists questioned whether there is broad general interest in extending this program to Alexandrov spaces, but overall the panel felt that the proposed projects were well-conceived and that the PI is well qualified to carry out the proposed research.

Broader impacts: The panel found this part of the proposal to be outstanding. The PI has organized several recent conferences, including the recent and very successful Women In Geometry meeting at BIRS. She is actively involved in mentorship at all levels, from students of middle school age through postdocs.

Prior Support: No prior NSF support.

Overall, the panel felt that this was a strong proposal, and the panel placed the proposal in the "Fund If Possible" category.

The summary was read by/to the panel and the panel concurred that the summary accurately reflects the panel discussion.

Panel Recommendation: Fund If Possible

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Organization: Wichita State University

Review #1

Proposal Number:	1611780
NSF Program:	GEOMETRIC ANALYSIS
Principal Investigator:	Searle, Catherine E
Proposal Title:	Lower Curvature Bounds, Symmetries and Topology
Rating:	Very Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

The proposal concerns the classification of spaces with curvature bounds. In particular, the PI is interested in classifying Riemannian manifolds and Alexandrov spaces with a lower curvature bound and symmetry properties ("large" isometry groups). Another direction is the construction of Riemannian manifolds with positive Ricci and almost non-negative sectional curavtures.

Understanding the interplay of curvature and topology is an important area of research in Riemannian Geoemtry.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

The PI has an impressive array of involvement in outreach and service. She has organized conferences with an impressive participation of female mathematicians. She co-organized the BIRS Women in Geometry workshop (WIG). She mentors middle school aged girls in the Wichita State Univ math circle and participated in summer research program for undergraduates.

As a side note, this reviewer was a participant in the WIG program. This program brings together female mathematicians their research interest in various areas of geometry for a week at BIRS. The participants formed research groups of about 6 individuals in all stages of their career. Initially, I was very skeptical of how such a program would be successful. I came away from the workshop extremely impressed how well organized it was and how successful it promoted collaboration.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Summary Statement

The project addresses important questions in Riemannian Geometry. Based on past research, the PI is well qualified to carry out the proposed activities. The exposition of the proposal could be improved by spotlighting the specific problem/questions/conjecture that the PI proposed to solve.

The proposal is strong in the broader impact.

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Proposal Status | MAIN

Organization: Wichita State University

Review #2

Proposal Number:	1611780
NSF Program:	GEOMETRIC ANALYSIS
Principal Investigator:	Searle, Catherine E
Proposal Title:	Lower Curvature Bounds, Symmetries, and Topology
Rating:	Very Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

The PI, a 1992-PhD from UMD and currently an assistant professor at Wichita State University in KS, proposes to analyze symmetries of Riemannian manifolds with sectional curvature and Ricci curvature lower bounds and their corresponding generalizations to Alexandrov spaces.

The proposed research activity will advance the basic understanding the following areas: (1) symmetries and topology of positively and non-negatively curved Riemannian manifolds and Alexandrov spaces and (2) symmetries and topology of Riemannian manifolds of positive Ricci curvature and almost non-negative sectional curvature. The proposed research will have some impact among Riemannian Geometry, Alexandrov spaces, compact Transformation Group Theory and Algebraic Topology. The PI is well qualified to conduct the research. She has a good track record of publications especially in recent 5 years. She has 9 publications with a couple of them as arXiv papers between 2011-2015 (in 2015 she has 3 publications); almost all of them related to the proposed research area.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

This research activity has strong broad impacts from several aspects. First, this research activity will have a broad impact on classic Riemannian geometry since positively curved spaces provide the infinitesimal models of Alexandrov spaces and hence of the closure of Riemannian manifolds with a lower curvature bound. 2) The proposed activity will broaden the participation of underrepresented groups through collaborating with the PI and allowing the PI to travel from a geographical area that is not very active in Mathematics to increase her synergistic activities. 3) The results from this research will be disseminated broadly through various geometric conferences that the PI co-organized, The PI has in fact, for example, co-organized the Smoky Cascade Geometry Conference, the Cascade Topology seminar, the Smoky Great Plains Geometry Conference, all three with at least 50% female speakers. The PI also mentors the 5th, 6th and 7th grade girls participating in the Wichita State University math circle and plan to create position for a post-doc in Geometry at WSU, where none currently exists.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Please see details above.

Summary Statement

Note: Even though the PI is currently is an assistant professor at WSU, but she was an Associate Professor at

Proposal Status | MAIN

Organization: Wichita State University

Review #3

Proposal Number:	1611780
NSF Program:	GEOMETRIC ANALYSIS
Principal Investigator:	Searle, Catherine E
Proposal Title:	Lower Curvature Bounds, Symmetries, and Topology
Rating:	Very Good

REVIEW:

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to intellectual merit.

In earlier work, Grove and Searle gave a topological classification of compact positively curved n-manifolds with maximal symmetry, meaning roughly that a torus of dimension n/2 acts isometrically. In the case of nonnegative curvature, Searle and co-authors have proposed a maximal symmetry rank conjecture, giving a conjectural classification when the dimension of the torus is roughly 2n/3. The first main topic of this proposal is about proving this conjecture. It has been verified in low dimensions. Proving it in general is clearly a long-term project. Searle proposes looking at various intermediate cases, such was when the action has cohomogeneity three. Related questions arise for Alexandrov spaces, where Searle proposes to look at almost maximal symmetry in the case of positive curvature.

The second main topic is about extensions and applications of a lifting result of Searle and Wilhelm for Ricci curvature and almost nonnegative sectional curvature. Speculatively, Searle proposes to use this to look for a negative answer to a diffeomorphism stability question.

In the context of the five review elements, please
evaluate the strengths and weaknesses of the proposal with respect to broader impacts.

Searle's department at Wichita State has a smaller graduate program. Searle arrived there in 2014 and cannot be expected to have done thesis supervision yet. Searle has organized quite a few conferences recently.

Please evaluate the strengths and
weaknesses of the proposal with respect to any additional solicitation-specific review criteria, if applicable

Summary Statement

Searle has a good recent publication record, with two papers in Geometry and Topology. This proposal was in the middle third of the proposals that I reviewed.

Back to Proposal Status Detail

From: Stark, Christopher [cstark@nsf.gov]
Sent: Friday, July 01, 2016 11:37 PM
To: Searle, Catherine
Subject: NSF proposal DMS 1611780

Dear Catherine,

This long note contains good news and some work for you. If you have questions or if anything seems problematic, please write. Also, please write soon if your circumstances are changing through other grant support, relocation, or other alteration.

It is my pleasure to inform you that evaluation of your NSF proposal DMS 1611780 has been completed and I am planning to recommend an award.
(It is important to understand that I can only recommend an award.
The final decision-making power lies elsewhere, and this communication from me is not official notice that a grant has been awarded.)

Please accept my congratulations: the competition for limited funds is very intense this year and only truly exceptional projects will be recommended for funding. When an official award letter is sent to you it will include instructions for reading the review materials for this proposal, along with my analysis of those reviews, and I highly recommend that you consult those documents to get more information about the competition and reviewers'
thoughts on your proposal.

Because of the demand on our limited resources it will be necessary to restrict the size of most awards, with many senior investigators receiving less than two months of summer support. (Junior investigators tend to be spared this cut.) We can not predict that program budgets will grow, so we also recommend relatively flat funding for most awards; this means that the annual budget is constant or nearly constant over the life of the award except for occasional special items such as computer equipment.

I am prepared to recommend a 3-year standard award of $150,000 total.

(In the National Science Foundation's lexicon, a "standard award" is one in which all of the funds are issued at once, in contrast to "continuing awards," which receive annual increments of funds. The choice between these alternatives is largely a matter of managing the program's budget, and might change by the time the award recommendation leaves my hands.)

(a) which can be no more than one page in total length
(47-49 lines of 70 characters),
(b) which should consist of two paragraphs, and
(c) which must be written in straight ASCII characters
(no TeX, PostScript, PDF, HTML, special symbols, word processor files, or other markup mechanisms -- there is no need to attach a file, and it's more transparent and efficient to send your abstract as a simple email message).

(2) The first paragraph of the abstract is a non-technical description that presents the work, its motivation, and significance. Think of the audience as a Member of Congress who asks you, ``What are you doing? Why would you do that? What does it mean?"

(3) The second paragraph must be a technical description of the project, aimed at professional peers. The proposal summary is often an appropriate starting place for this paragraph.

All of these abstracts are put in a public database, accessible on the World Wide Web through http://www.fastlane.nsf.gov/, and many of the abstracts are read by Members of Congress or their staff members, so you should view the first paragraph as an important opportunity to explain the value of your project. In particular, any concrete references you can justifiably make to applications in the areas of Federal strategic interest (high-performance computing, materials and manufacturing, environment or global change, biotechnology, civil infrastructure, and so on) are appropriate and greatly appreciated.

Your abstract is also likely to be read by future PIs working on their own proposals, or by other colleagues who are browsing the award lists or seeking a portrait of DMS programs.

I wish you continued success with your research. If you have any questions, please contact me at the numbers and addresses below.

Yours sincerely,

Christopher Stark

703-292-4869
cstark@nsf.gov

DEPARTMENT OF MATHEMATICS, STATISTICS, AND PHYSICS

2018 SELF-STUDY REPORT

ATTACHMENT #3

Office of Planning and Analysis Data

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Math

Tables 1 through 7 provide data for Section 2 of the Program Review Self Study Template.

Table 1: Fiscal Year Summation of Student Credit Hour (SCH) Production

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY average		
Course level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
Total	32,200	31,957	33,305	33,012	33,715	31,530	31,433	32,838	32,704	32,599
100-299	21,287	21,409	23,006	21,734	20,063	18,387	19,021	21,500	20,920	20,442
300-499	6,460	5,890	5,689	6,558	8,327	7,884	7,548	6,585	6,870	7,201
500-699	3745	4055	3,935	3,986	4,497	4,438	4,056	4,044	4,182	4,182
700-799	390	261	399	440	480	390	357	394	394	413
800-899	214	215	148	217	272	227	253	213	216	223
900-999	104	127	128	77	76	204	198	102	122	137

note: SCH of all enrolled department offerings summated by FY for each census day; in some cases department level SCH includes entire department offerings.

Table 2: Student Credit Hour (SCH) Production at Fall Census Day

	Year of Fall Census Day							Rolling 5 year average		
Course level:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Total	14,748	14,830	15,135	15,793	16,761	15,739	15,795	15,453	15,652	15,845
100-299	9,801	9,986	10,480	10,937	10,565	9,520	9,998	10,354	10,298	10,300
300-499	2,944	2,909	2,650	2,777	3,802	3,878	3,582	3,016	3,203	3,338
500-699	1606	1606	1,656	1,689	1,951	1,871	1,812	1,702	1,755	1,796
700-799	282	213	255	291	348	300	246	278	281	288
800-899	56	46	32	60	58	73	62	50	54	57
900-999	59	70	62	39	37	97	95	53	61	66

note: SCH of all enrolled department offerings at Fall census day.

Table 3: Student Credit Hour (SCH) Production among Department Instructional Faculty on November Employee Census Day (entire term SCH)

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Program total	11,787	14,199	14,230	15,401	16,153	14,849	15,603	14,354	14,966	15,247
Tenure eligible faculty	3147	5164	5,190	4,744	5,069	4,023	4,741	4,663	4,838	4,753
Non-tenure eligible faculty	3626	3306	2,827	3,705	4,286	4,502	4,841	3,550	3,725	4,032
Lecturers	1,957	2,603	3,416	3,863	3,703	2,239	2,142	3,108	3,165	3,073
GTA	2856	2895	2,459	2,858	2,714	3,830	3,224	2,756	2,951	3,017
Unclassified professional	201	231	338	231	381	255	655	276	287	372
Classified staff	0	0	0	0	0	0	0	0	0	0
GSA, GRA, UG std	0	0	0	0	0	0	0	0	0	0

note: faculty/staff with active class assignments and employment at November freeze.; employee type based on ecls and egrp matrix.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Math

Table 4: Instructional FTE Employed on November 1st Census Day

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Program total	44.7	51.5	54.3	53.1	58.2	61.0	55.3	52.3	55.6	56.4
Tenure eligible faculty	20.5	26.2	28.4	24.0	25.0	27.3	24.0	24.8	26.2	25.8
Non-tenure eligible faculty	8.8	8.8	8.8	9.8	11.8	12.4	12.8	9.6	10.3	11.1
Lecturers	6.0	7.3	8.4	10.7	11.1	8.1	7.3	8.7	9.1	9.1
GTA	8.5	8.3	7.8	7.6	9.3	12.2	10.0	8.3	9.0	9.4
Unclassified professional	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.0	1.0	1.1
Classified staff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GSA, GRA, UG std	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

note: active employment positions at November 1st freeze; employee type based on ecls and egrp matrix.; fte of 1 based on 80 hour bi-week appointment; employee type based on ecls and egrp matrix; KBOR minima for faculty (TTF) 3 for UG, plus 3 for masters, plus 2 for doctoral.

Table 5a: Student Credit Hour (SCH) by FTE for University Instructional Faculty on November 1st Census Day

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
(University level) Total	236	231	222	225	222	213	216	227	223	220
Tenure eligible faculty	227	216	194	194	195	183	194	205	196	192
Non-tenure eligible faculty	300	284	289	306	304	296	295	297	296	298
Lecturers	274	270	295	302	292	264	254	286	284	281
GTA	212	208	201	206	183	192	184	202	198	193
Unclassified professional	116	157	122	106	101	94	114	120	116	107
Classified staff	42	53	121	77	114	61	0	81	85	75
GSA, GRA, UG std	0	0	0	0	0	0	0	0	0	0

note: active employment positions at November 1st freeze.; employee type based on ecls and egrp matrix; instructional defined as active course enrollment.

Table 5b: Student Credit Hour (SCH) by FTE for College Division Instructional Faculty on November 1st Census Day

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
(College Division level) Total	320	279	276	297	331	332	346	301	303	316
Tenure eligible faculty	245	203	194	207	221	221	248	214	209	218
Non-tenure eligible faculty	592	464	474	495	595	590	627	524	524	556
Lecturers	449	360	429	477	451	497	407	433	443	452
GTA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
Unclassified professional	192	266	258	224	225	229	208	233	240	229
Classified staff	2	1	88	50	105	110	n/a	49	71	71
GSA, GRA, UG std	0	0	0	0	0	0	0	0	0	0

note: active employment positions at November 1st freeze.; employee type based on ecls and egrp matrix; instructional defined as active course enrollment.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Math

Table 5c: Student Credit Hour (SCH) by FTE for Program Instructional Faculty on November 1st Census Day

	Year of November Census Day							Rolling 5 year average		
Employee type:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
(Program level) Total	263	276	262	290	278	243	282	274	270	271
Tenure eligible faculty	154	197	183	198	203	147	198	187	186	186
Non-tenure eligible faculty	414	378	323	380	364	363	380	372	362	362
Lecturers	326	356	407	361	335	277	292	357	347	334
GTA	336	351	317	377	292	315	322	334	330	324
Unclassified professional	0	0	0	0	0	255	0	0	51	51
Classified staff	0	0	0	0	0	0	0	0	0	0
GSA, GRA, UG std	0	0	0	0	0	0	0	0	0	0

note: active employment positions at November 1st freeze.; employee type based on ecls and egrp matrix; instructional defined as active course enrollment.

Table 6: Program Majors (including double majors) on Fall Census Day

	Year of Fall Census Day							Rolling 5 year average		
Student Class	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Total	121	131	111	109	105	109	102	115	113	107
freshmen	10	8	5	6	6	5	8	7	6	6
sophomore	14	12	7	8	7	10	9	10	9	8
junior	27	22	18	19	20	18	18	21	19	19
senior	30	48	44	43	35	34	28	40	41	37
masters	25	26	24	19	21	21	19	23	22	21
post masters	0	0	0	0	0	0	0	0	0	0
doctoral	15	15	13	14	16	21	20	15	16	17
other	0	0	0	0	0	0	0	0	0	0

note: includes all active program matching majors among 4 possible major codes; other includes guest & nondegree students; KBOR minima 25 UG, 20 GR mast & 5 GR doc

Table 7: Degree Production by Fiscal Year

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY average		
Degree level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
Total	26	27	24	36	15	26	26	26	26	25
Doctoral	2	3	2	2	1	2	4	2	2	2
Masters	10	5	8	10	4	13	4	7	8	8
Bachelor	14	19	14	24	10	11	18	16	16	15
Associate	0	0	0	0	0	0	0	0	0	0

note: includes all active program matching majors among 4 possible major codes; KBOR minima 10 UG, 5 GR masters & 2 GR doctoral.

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Tables 8 provides data for Section 3a of the Program Review Self Study Template.

Table 8: Mean ACT score of Juniors and Seniors Enrolled on Fall Census Day (source=Fall Census Day)

	Year of Fall Census Day							Rolling 5 year average		
Statistic:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
University level	22.7	22.8	23.0	23.0	23.1	23.0	23.1	22.9	23.0	23.1
Program majors	25.9	26.1	26.5	26.6	26.4	25.8	27.4	26.3	26.3	26.5
Program majors count	57	70	62	62	55	52	46	61	60	55
reporting ACT	33	38	37	37	33	34	33	36	36	35
Percent reporting	57.9%	54.3%	59.7%	59.7%	60.0%	65.4%	71.7%	58.2%	59.5%	62.8%

note: if ACT missing and SAT available, SAT is used converted to ACT metric; KBOR captures ACT data for enrolled juniors & seniors only; KBOR minima >=20.

Table 9 provides data for Section 3b of the Program Review Self Study Template.

Table 9: Mean Application GPA of Admitted Graduate Student Majors (source= Applications)

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY weighted average		
Statistic:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
University level	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Program majors	3.7	3.6	3.6	3.7	3.7	3.6	3.7	3.7	3.6	3.7
Program majors count	22	25	26	22	30	20	28	25.0	24.6	25.2
reporting GR gpa	18	15	21	14	19	14	13	17.4	16.6	16.2
Percent reporting	81.8%	60.0%	80.8%	63.6%	63.3%	70.0%	46.4%	69.6%	67.5%	64.3%

note: graduate student application gpa based on last 60 hours of course work earned.

Table 10 provides data for Section 3d of the Program Review Self Study Template.

Table 10: Satisfaction with Program among Undergraduate and Graduate Students at End of Program Exit

	Academic Year (fall-spring-summer sequence)							Rolling 5 AY average		
Student level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
University **Undergraduate** level	n/a	79.5%	82.9%	81.4%	80.9%	80.7%	82.3%	n/a	81.1%	81.6%
College Division Undergraduate level	n/a	75.0%	77.0%	74.5%	69.9%	68.6%	67.1%	n/a	73.0%	71.4%
Program Undergraduate majors:										
Percent satisfied or very satisfied	n/a	81.8%	70.6%	94.1%	77.8%	55.6%	71.4%	n/a	76.0%	73.9%
mean	n/a	4.1	3.9	4.2	3.9	3.9	4.1	n/a	4.0	4.0
median	n/a	4	4	4	4	4	4	n/a	4	4
count	n/a	11	17	17	9	9	14	n/a	12.6	13.2
University **Graduate** level	n/a	80.0%	82.6%	82.1%	84.9%	85.4%	82.9%	82.4%	83.0%	83.6%
College Division Graduates level	n/a	70.0%	85.3%	93.3%	91.2%	88.9%	75.0%	85.0%	85.7%	86.7%
Program Graduate majors:										
Percent satisfied or very satisfied	n/a	100.0%	100.0%	100.0%	88.9%	93.8%	80.0%	97.2%	96.5%	92.5%
mean	n/a	4.8	4.5	4.5	4.4	4.6	4.2	4.6	4.6	4.5
median	n/a	5	5	5	5	5	4	5	5	4.8
count	n/a	10	11	11	9	16	10	10.25	11.4	11.4

note: primary majors only; data from the Application For Degree Exit Survey; scale of 1 to 5 with 5 being high (very satisfied).

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Tables 11 through Table 15 provide data for Section 4 of the Program Review Self Study Template.

Table 11: Applications, Admits and Enrollment for Undergraduate and Graduate Applicants

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY average		
Student level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
Undergraduates:										
Applicants	31	26	24	34	31	32	46	29	29	33
Admitted	29	26	21	34	30	32	46	28	29	33
Census day	16	18	11	15	16	10	16	15	14	14
Graduates:										
Applicants	30	30	35	30	41	29	36	33.2	33	34.2
Admitted	22	26	25	20	29	21	28	24.4	24.2	24.6
Census day	19	20	17	12	21	12	15	17.8	16.4	15.4

note: unduplicated count as last record of FY; applicants exclude incomplete or cancelled applications.

Table 12: Percent Under-represented Minorities (URM) on Fall Census Day

	Year of Fall Census Day							Rolling 5 year average		
Student level:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
University level:										
Freshmen & Sophomores	16.9%	17.9%	18.5%	18.5%	19.2%	19.1%	19.9%	18.2%	18.7%	19.1%
Juniors & Seniors	14.0%	14.8%	15.4%	14.9%	15.7%	15.9%	16.7%	15.0%	15.3%	15.7%
Masters	8.2%	9.8%	11.3%	9.7%	9.9%	10.2%	10.7%	9.8%	10.2%	10.4%
Doctoral	6.6%	5.4%	6.7%	6.5%	7.0%	9.0%	11.5%	6.4%	6.9%	8.1%
College division level:										
Freshmen & Sophomores	14.1%	12.3%	13.0%	16.6%	15.5%	14.9%	17.1%	14.3%	14.5%	15.4%
Juniors & Seniors	12.3%	14.3%	13.3%	13.2%	14.2%	12.9%	13.7%	13.5%	13.6%	13.5%
Masters	5.7%	5.8%	4.8%	8.1%	8.0%	5.3%	5.7%	6.5%	6.4%	6.4%
Doctoral	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	8.3%	1.9%	2.1%	2.4%
Program level:										
Freshmen & Sophomores	8.3%	20.0%	0.0%	0.0%	23.1%	20.0%	17.6%	10.3%	12.6%	12.1%
Juniors & Seniors	8.8%	11.4%	12.9%	6.5%	3.6%	3.8%	4.3%	8.6%	7.7%	6.2%
Masters	12.0%	11.5%	12.5%	10.5%	9.5%	4.8%	0.0%	11.2%	9.8%	7.5%
Doctoral	0.0%	0.0%	0.0%	0.0%	0.0%	9.5%	15.0%	0.0%	1.9%	4.9%

note: includes all active program matching majors among 4 possible major codes; URM includes black non-hispanic, hispanic, american indian/alaskan native & hawaiian.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Math

Table 13: Race/Ethnicity on Fall Census Day

Student level:		Year of Fall Census Day							Rolling 5 year average		
		2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
	Total	121	131	111	109	105	109	102	115	113	107
	Total URM	10	15	11	6	7	8	8	10	9	8
Freshmen & Sophomores	Total	24	20	12	14	13	15	17	17	15	14
	white non-hispanic	16	12	9	12	8	9	11	11	10	10
	black non-hispanic	1	3	0	0	1	0	0	1	1	0
	hispanic	0	0	0	0	1	2	3	0	1	1
	asian non-hispanic	1	0	0	0	0	1	1	0	0	0
	american indian/alaskan native	1	0	0	0	1	1	0	0	0	0
	foreign	4	3	2	1	2	2	2	2	2	2
	hawaiian	0	1	0	0	0	0	0	0	0	0
	multiple race	1	0	1	1	0	0	0	1	0	0
	unknown	0	1	0	0	0	0	0	0	0	0
Juniors & Seniors	Total	57	70	62	62	55	52	46	61	60	55
	white non-hispanic	37	46	46	48	44	43	36	44	45	43
	black non-hispanic	2	5	4	1	0	1	1	2	2	1
	hispanic	1	2	3	1	0	0	1	1	1	1
	asian non-hispanic	4	4	0	2	2	3	3	2	2	2
	american indian/alaskan native	2	1	0	1	1	1	0	1	1	1
	foreign	7	8	4	4	3	3	3	5	4	3
	hawaiian	0	0	1	1	1	0	0	1	1	1
	multiple race	2	2	1	1	2	0	1	2	1	1
	unknown	2	2	3	3	2	1	1	2	2	2
Master	Total	25	26	24	19	21	21	19	23	22	21
	white non-hispanic	13	13	14	12	14	12	15	13	13	13
	black non-hispanic	1	0	0	0	1	1	0	0	0	0
	hispanic	2	2	2	1	1	0	0	2	1	1
	asian non-hispanic	1	2	3	2	3	2	1	2	2	2
	american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
	foreign	6	5	3	3	2	3	2	4	3	3
	hawaiian	0	1	1	1	0	0	0	1	1	0
	multiple race	1	1	0	0	0	2	1	0	1	1
	unknown	1	2	1	0	0	1	0	1	1	0
Doctoral	Total	15	15	13	14	16	21	20	15	16	17
	white non-hispanic	9	8	6	5	3	4	3	6	5	4
	black non-hispanic	0	0	0	0	0	0	1	0	0	0
	hispanic	0	0	0	0	0	2	2	0	0	1
	asian non-hispanic	0	1	1	1	3	3	3	1	2	2
	american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
	foreign	6	6	6	7	9	11	11	7	8	9
	hawaiian	0	0	0	0	0	0	0	0	0	0
	multiple race	0	0	0	0	0	0	0	0	0	0
	unknown	0	0	0	1	1	1	0	0	1	1

note: includes all active program matching majors among 4 possible major codes.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Math

Table 14: Percent Under-represented Minorities (URM) of Degreed Conferred Students by Fiscal Year

	Year of Fall Census Day							Rolling 5 year average		
Degree level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
University level:										
Doctoral	7.6%	6.5%	7.8%	4.7%	6.9%	6.7%	10.0%	6.7%	6.5%	7.2%
Masters	6.4%	9.0%	10.8%	10.0%	8.6%	9.6%	9.6%	9.0%	9.6%	9.7%
Bachelor	12.1%	12.8%	12.7%	13.6%	14.3%	15.1%	14.1%	13.1%	13.7%	13.9%
Associate	18.8%	18.4%	21.2%	26.7%	20.8%	26.4%	16.2%	21.2%	22.7%	22.3%
College division level:										
Doctoral	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Masters	5.0%	3.7%	6.5%	9.1%	5.3%	12.9%	3.3%	5.9%	7.5%	7.4%
Bachelor	6.4%	11.9%	7.7%	11.7%	16.4%	11.3%	9.5%	10.8%	11.8%	11.3%
Associate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Program level:										
Doctoral	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Masters	10.0%	0.0%	12.5%	20.0%	0.0%	15.4%	0.0%	8.5%	9.6%	9.6%
Bachelor	7.1%	21.1%	7.1%	8.3%	10.0%	0.0%	5.6%	10.7%	9.3%	6.2%
Associate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

note: includes all active program matching majors among 4 possible major codes; URM includes black non-hispanic, hispanic, american indian/alaskan native & hawaiian.

Table 15: Race/Ethnicity of Degreed Conferred Students by Fiscal Year

		Year of Fall Census Day							Rolling 5 year average		
Degree level:		2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
	Total	26	27	24	36	15	26	26	26	26	25
	Total URM	2	4	2	4	1	2	1	3	3	2
Doctoral	Total	2	3	2	2	1	2	4	2	2	2
	white non-hispanic	0	2	1	1	0	1	1	1	1	1
	black non-hispanic	0	0	0	0	0	0	0	0	0	0
	hispanic	0	0	0	0	0	0	0	0	0	0
	asian non-hispanic	0	0	0	0	0	0	1	0	0	0
	american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
	foreign	2	1	1	1	1	1	1	1	1	1
	hawaiian	0	0	0	0	0	0	0	0	0	0
	multiple race	0	0	0	0	0	0	0	0	0	0
	unknown	0	0	0	0	0	0	1	0	0	0
Masters	Total	10	5	8	10	4	13	4	7	8	8
	white non-hispanic	8	3	3	6	2	7	2	4	4	4
	black non-hispanic	1	0	0	0	0	1	0	0	0	0
	hispanic	0	0	1	1	0	1	0	0	1	1
	asian non-hispanic	0	0	1	0	1	2	1	0	1	1
	american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
	foreign	1	2	1	2	1	2	0	1	2	1
	hawaiian	0	0	0	1	0	0	0	0	0	0
	multiple race	0	0	1	0	0	0	1	0	0	0
	unknown	0	0	1	0	0	0	0	0	0	0

(Table continued on next page)

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Math

(Table 15 continued)

Degree level:		2011	2012	2013	2014	2015	2016	2017	Rolling 5 year average 2011-2015	2012-2016	2013-2017
Bachelor	Total	14	19	14	24	10	11	18	16	16	15
	white non-hispanic	10	13	7	19	6	10	13	11	11	11
	black non-hispanic	0	2	1	1	0	0	0	1	1	0
	hispanic	1	1	0	1	0	0	1	1	0	0
	asian non-hispanic	1	1	1	0	0	0	1	1	0	0
	american indian/alaskan native	0	1	0	0	0	0	0	0	0	0
	foreign	0	1	4	2	1	1	2	2	2	2
	hawaiian	0	0	0	0	1	0	0	0	0	0
	multiple race	1	0	1	0	2	0	0	1	1	1
	unknown	1	0	0	1	0	0	1	0	0	0
Associate	Total	0	0	0	0	0	0	0	0	0	0
	white non-hispanic	0	0	0	0	0	0	0	0	0	0
	black non-hispanic	0	0	0	0	0	0	0	0	0	0
	hispanic	0	0	0	0	0	0	0	0	0	0
	asian non-hispanic	0	0	0	0	0	0	0	0	0	0
	american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
	foreign	0	0	0	0	0	0	0	0	0	0
	hawaiian	0	0	0	0	0	0	0	0	0	0
	multiple race	0	0	0	0	0	0	0	0	0	0
	unknown	0	0	0	0	0	0	0	0	0	0

note: includes all active program matching majors among 4 possible major codes.

Tables 16 provides data for Section 5 of the Program Review Self Study Template.

Table 16: Department Student Credit Hour (SCH) by Student Department Affiliation on Fall Census Day

Major & student level:	2010	2011	2012	2013	2014	2015	2016	Rolling 5 year average 2010-2014	2011-2015	2012-2016
Total	14,748	14,830	15,135	15,793	16,761	15,739	15,795	15,453	15,652	15,845
Program UG majors	445	512	430	389	358	331	386	427	404	379
Program GR majors	281	297	283	273	297	344	284	286	299	296
Non-program majors	14,022	14,021	14,422	15,131	16,106	15,064	15,125	14,740	14,949	15,170
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Program UG major	3.0%	3.5%	2.8%	2.5%	2.1%	2.1%	2.4%	2.8%	2.6%	2.4%
Program GR major	1.9%	2.0%	1.9%	1.7%	1.8%	2.2%	1.8%	1.9%	1.9%	1.9%
Non-program majors	95.1%	94.5%	95.3%	95.8%	96.1%	95.7%	95.8%	95.4%	95.5%	95.7%

note: program majors includes all active program matching majors among 4 possible major codes.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Physics

Tables 1 through 7 provide data for Section 2 of the Program Review Self Study Template.

Table 1: Fiscal Year Summation of Student Credit Hour (SCH) Production

Course level:	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY average		
	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
Total	32,200	31,957	33,305	33,012	33,715	31,530	31,433	32,838	32,704	32,599
100-299	21,287	21,409	23,006	21,734	20,063	18,387	19,021	21,500	20,920	20,442
300-499	6,460	5,890	5,689	6,558	8,327	7,884	7,548	6,585	6,870	7,201
500-699	3745	4055	3,935	3,986	4,497	4,438	4,056	4,044	4,182	4,182
700-799	390	261	399	440	480	390	357	394	394	413
800-899	214	215	148	217	272	227	253	213	216	223
900-999	104	127	128	77	76	204	198	102	122	137

note: SCH of all enrolled department offerings summated by FY for each census day; in some cases department level SCH includes entire department offerings.

Table 2: Student Credit Hour (SCH) Production at Fall Census Day

Course level:	Year of Fall Census Day							Rolling 5 year average		
	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Total	14,748	14,830	15,135	15,793	16,761	15,739	15,795	15,453	15,652	15,845
100-299	9,801	9,986	10,480	10,937	10,565	9,520	9,998	10,354	10,298	10,300
300-499	2,944	2,909	2,650	2,777	3,802	3,878	3,582	3,016	3,203	3,338
500-699	1606	1606	1,656	1,689	1,951	1,871	1,812	1,702	1,755	1,796
700-799	282	213	255	291	348	300	246	278	281	288
800-899	56	46	32	60	58	73	62	50	54	57
900-999	59	70	62	39	37	97	95	53	61	66

note: SCH of all enrolled department offerings at Fall census day.

Table 3: Student Credit Hour (SCH) Production among Department Instructional Faculty on November Employee Census Day (entire term SCH)

Employee type:	Year of November Census Day							Rolling 5 year average		
	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
Program total	2,393	136	309	290	428	658	0	711	364	337
Tenure eligible faculty	2,336	0	0	0	0	0	0	467	0	0
Non-tenure eligible faculty	0	0	0	0	0	0	0	0	0	0
Lecturers	57	100	259	250	428	658	0	219	339	319
GTA	0	36	50	40	0	0	0	25	25	18
Unclassified professional	0	0	0	0	0	0	0	0	0	0
Classified staff	0	0	0	0	0	0	0	0	0	0
GSA, GRA, UG std	0	0	0	0	0	0	0	0	0	0

note: faculty/staff with active class assignments and employment at November freeze.; employee type based on ecls and egrp matrix.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Physics

Table 4: Instructional FTE Employed on November 1st Census Day

Employee type:	2010	2011	2012	2013	2014	2015	2016	Rolling 5 year average 2010-2014	2011-2015	2012-2016
Program total	0.0	7.1	1.0	0.9	0.6	1.7	1.6	1.9	2.3	1.2
Tenure eligible faculty	0.0	6.7	0.0	0.0	0.0	0.0	0.0	1.3	1.3	0.0
Non-tenure eligible faculty	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lecturers	0.0	0.5	0.3	0.7	0.4	1.7	1.6	0.4	0.7	0.9
GTA	0.0	0.0	0.7	0.2	0.2	0.0	0.0	0.2	0.2	0.2
Unclassified professional	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Classified staff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GSA, GRA, UG std	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

note: active employment positions at November 1st freeze; employee type based on ecls and egrp matrix.; fte of 1 based on 80 hour bi-week appointment; employee type based on ecls and egrp matrix; KBOR minima for faculty (TTF) 3 for UG, plus 3 for masters, plus 2 for doctoral.

Table 5a: Student Credit Hour (SCH) by FTE for University Instructional Faculty on November 1st Census Day

Employee type:	2010	2011	2012	2013	2014	2015	2016	Rolling 5 year average 2010-2014	2011-2015	2012-2016
(University level) Total	236	231	222	225	222	213	216	227	223	220
Tenure eligible faculty	227	216	194	194	195	183	194	205	196	192
Non-tenure eligible faculty	300	284	289	306	304	296	295	297	296	298
Lecturers	274	270	295	302	292	264	254	286	284	281
GTA	212	208	201	206	183	192	184	202	198	193
Unclassified professional	116	157	122	106	101	94	114	120	116	107
Classified staff	42	53	121	77	114	61	0	81	85	75
GSA, GRA, UG std	0	0	0	0	0	0	0	0	0	0

note: active employment positions at November 1st freeze.; employee type based on ecls and egrp matrix; instructional defined as active course enrollment.

Table 5b: Student Credit Hour (SCH) by FTE for College Division Instructional Faculty on November 1st Census Day

Employee type:	2010	2011	2012	2013	2014	2015	2016	Rolling 5 year average 2010-2014	2011-2015	2012-2016
(College Division level) Total	320	279	276	297	331	332	346	301	303	316
Tenure eligible faculty	245	203	194	207	221	221	248	214	209	218
Non-tenure eligible faculty	592	464	474	495	595	590	627	524	524	556
Lecturers	449	360	429	477	451	497	407	433	443	452
GTA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
Unclassified professional	192	266	258	224	225	229	208	233	240	229
Classified staff	2	1	88	50	105	110	n/a	49	71	71
GSA, GRA, UG std	0	0	0	0	0	0	0	0	0	0

note: active employment positions at November 1st freeze.; employee type based on ecls and egrp matrix; instructional defined as active course enrollment.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Physics

Table 5c: Student Credit Hour (SCH) by FTE for Program Instructional Faculty on November 1st Census Day

Employee type:	2010	2011	2012	2013	2014	2015	2016	Rolling 5 year average 2010-2014	2011-2015	2012-2016
	Year of November Census Day									
(Program level) Total	n/a	19	307	314	724	395	0	273	352	348
Tenure eligible faculty	n/a	0	n/a	n/a	n/a	n/a	n/a	0	0	0
Non-tenure eligible faculty	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
Lecturers	n/a	200	778	334	1,028	395	0	468	547	507
GTA	n/a	n/a	74	229	0	n/a	n/a	61	61	61
Unclassified professional	0	0	0	0	0	n/a	0	0	0	0
Classified staff	0	0	0	0	0	0	0	0	0	0
GSA, GRA, UG std	0	0	0	0	0	0	0	0	0	0

note: active employment positions at November 1st freeze.; employee type based on ecls and egrp matrix; instructional defined as active course enrollment.

Table 6: Program Majors (including double majors) on Fall Census Day

Student Class	2010	2011	2012	2013	2014	2015	2016	Rolling 5 year average 2010-2014	2011-2015	2012-2016
	Year of Fall Census Day									
Total	34	53	68	57	54	44	63	53	55	57
freshmen	8	9	17	14	8	11	17	11	12	13
sophomore	5	9	13	9	7	7	14	9	9	10
junior	10	13	19	11	11	10	11	13	13	12
senior	11	22	19	23	28	16	18	21	22	21
masters	0	0	0	0	0	0	3	0	0	1
post masters	0	0	0	0	0	0	0	0	0	0
doctoral	0	0	0	0	0	0	0	0	0	0
other	0	0	0	0	0	0	0	0	0	0

note: includes all active program matching majors among 4 possible major codes; other includes guest & nondegree students; KBOR minima 25 UG, 20 GR mast & 5 GR doc

Table 7: Degree Production by Fiscal Year

Degree level:	2011	2012	2013	2014	2015	2016	2017	Rolling 5 FY average 2011-2015	2012-2016	2013-2017
	Fiscal Year (summer-fall-spring sequence)									
Total	4	5	3	4	8	5	8	5	5	6
Doctoral	0	0	0	0	0	0	0	0	0	0
Masters	0	0	0	0	0	0	0	0	0	0
Bachelor	4	5	3	4	8	5	8	5	5	6
Associate	0	0	0	0	0	0	0	0	0	0

note: includes all active program matching majors among 4 possible major codes; KBOR minima 10 UG, 5 GR masters & 2 GR doctoral.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Physics

Tables 8 provides data for Section 3a of the Program Review Self Study Template.

Table 8: Mean ACT score of Juniors and Seniors Enrolled on Fall Census Day (source=Fall Census Day)

	Year of Fall Census Day							Rolling 5 year average		
Statistic:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
University level	22.7	22.8	23.0	23.0	23.1	23.0	23.1	22.9	23.0	23.1
Program majors	28.6	27.8	28.1	28.0	27.5	27.6	29.2	27.9	27.8	28.0
Program majors count	21	35	38	34	39	26	29	33	34	33
reporting ACT	15	20	23	24	28	17	16	22	22	22
Percent reporting	71.4%	57.1%	60.5%	70.6%	71.8%	65.4%	55.2%	65.9%	65.1%	65.1%

note: If ACT missing and SAT available, SAT is used converted to ACT metric; KBOR captures ACT data for enrolled juniors & seniors only; KBOR minima >=20.

Table 9 provides data for Section 3b of the Program Review Self Study Template.

Table 9: Mean Application GPA of Admitted Graduate Student Majors (source= Applications)

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY weighted average		
Statistic:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
University level	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Program majors	n/a	n/a	n/a	n/a	n/a	n/a	2.9	n/a	n/a	2.9
Program majors count	n/a	n/a	n/a	n/a	n/a	n/a	7	n/a	n/a	7.0
reporting GR gpa	n/a	n/a	n/a	n/a	n/a	n/a	3	n/a	n/a	3.0
Percent reporting	n/a	n/a	n/a	n/a	n/a	n/a	42.9%	n/a	n/a	42.9%

note: graduate student application gpa based on last 60 hours of course work earned.

Table 10 provides data for Section 3d of the Program Review Self Study Template.

Table 10: Satisfaction with Program among Undergraduate and Graduate Students at End of Program Exit

	Academic Year (fall-spring-summer sequence)							Rolling 5 AY average		
Student level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
University **Undergraduate** level	n/a	79.5%	82.9%	81.4%	80.9%	80.7%	82.3%	n/a	81.1%	81.6%
College Division Undergraduate level	n/a	75.0%	77.0%	74.5%	69.9%	68.6%	67.1%	n/a	73.0%	71.4%
Program Undergraduate majors:										
Percent satisfied or very satisfied	n/a	66.7%	100.0%	100.0%	100.0%	100.0%	40.0%	n/a	93.3%	88.0%
mean	n/a	4.0	4.0	4.5	4.5	4.5	3.2	n/a	4.3	4.1
median	n/a	4	4	4.5	4.5	4.5	3	n/a	4.3	4.1
count	n/a	3	2	4	4	2	5	n/a	3	3.4
University **Graduate** level	n/a	80.0%	82.6%	82.1%	84.9%	85.4%	82.9%	82.4%	83.0%	83.6%
College Division Graduates level	n/a	70.0%	85.3%	93.3%	91.2%	88.9%	75.0%	85.0%	85.7%	86.7%
Program Graduate majors:										
Percent satisfied or very satisfied	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
mean	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
median	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
count	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

note: primary majors only; data from the Application For Degree Exit Survey; scale of 1 to 5 with 5 being high (very satisfied).

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Physics

Tables 11 through Table 15 provide data for Section 4 of the Program Review Self Study Template.

Table 11: Applications, Admits and Enrollment for Undergraduate and Graduate Applicants

	Fiscal Year (summer-fall-spring sequence)							Rolling 5 FY average		
Student level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
Undergraduates:										
Applicants	23	14	23	20	37	28	41	23	24	30
Admitted	21	13	23	18	36	27	40	22	23	29
Census day	9	7	18	11	19	14	24	13	14	17
Graduates:										
Applicants	0	0	0	0	0	0	9	0	0	n/a
Admitted	0	0	0	0	0	0	7	0	0	n/a
Census day	0	0	0	0	0	0	5	0	0	n/a

note: unduplicated count as last record of FY; applicants exclude incomplete or cancelled applications.

Table 12: Percent Under-represented Minorities (URM) on Fall Census Day

	Year of Fall Census Day							Rolling 5 year average		
Student level:	2010	2011	2012	2013	2014	2015	2016	2010-2014	2011-2015	2012-2016
University level:										
Freshmen & Sophomores	16.9%	17.9%	18.5%	18.5%	19.2%	19.1%	19.9%	18.2%	18.7%	19.1%
Juniors & Seniors	14.0%	14.8%	15.4%	14.9%	15.7%	15.9%	16.7%	15.0%	15.3%	15.7%
Masters	8.2%	9.8%	11.3%	9.7%	9.9%	10.2%	10.7%	9.8%	10.2%	10.4%
Doctoral	6.6%	5.4%	6.7%	6.5%	7.0%	9.0%	11.5%	6.4%	6.9%	8.1%
College division level:										
Freshmen & Sophomores	14.1%	12.3%	13.0%	16.6%	15.5%	14.9%	17.1%	14.3%	14.5%	15.4%
Juniors & Seniors	12.3%	14.3%	13.3%	13.2%	14.2%	12.9%	13.7%	13.5%	13.6%	13.5%
Masters	5.7%	5.8%	4.8%	8.1%	8.0%	5.3%	5.7%	6.5%	6.4%	6.4%
Doctoral	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	8.3%	1.9%	2.1%	2.4%
Program level:										
Freshmen & Sophomores	0.0%	0.0%	16.7%	21.7%	6.7%	16.7%	19.4%	9.0%	12.3%	16.2%
Juniors & Seniors	9.5%	11.4%	10.5%	17.6%	17.9%	15.4%	17.2%	13.4%	14.6%	15.7%
Masters	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	33.0%	0.0%	0.0%	6.6%
Doctoral	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

note: includes all active program matching majors among 4 possible major codes; URM includes black non-hispanic, hispanic, american indian/alaskan native & hawaiian.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Physics

Table 13: Race/Ethnicity on Fall Census Day

Student level:	Year of Fall Census Day 2010	2011	2012	2013	2014	2015	2016	Rolling 5 year average 2010-2014	2011-2015	2012-2016
Total	34	53	68	57	54	44	63	53	55	57
Total URM	2	4	9	11	8	7	12	7	8	9
Freshmen & Sophomores Total	13	18	30	23	15	18	31	20	21	23
white non-hispanic	10	14	20	13	11	12	18	14	14	15
black non-hispanic	0	0	3	1	0	1	2	1	1	1
hispanic	0	0	2	3	1	2	4	1	2	2
asian non-hispanic	0	1	1	1	1	0	1	1	1	1
american indian/alaskan native	0	0	0	1	0	0	0	0	0	0
foreign	2	2	1	2	0	1	5	1	1	2
hawaiian	0	0	0	0	0	0	0	0	0	0
multiple race	1	1	3	2	1	2	1	2	2	2
unknown	0	0	0	0	1	0	0	0	0	0
Juniors & Seniors Total	21	35	38	34	39	26	29	33	34	33
white non-hispanic	19	25	25	20	24	14	16	23	22	20
black non-hispanic	1	3	3	4	4	3	1	3	3	3
hispanic	1	1	1	2	3	1	4	2	2	2
asian non-hispanic	0	1	3	3	5	3	2	2	3	3
american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
foreign	0	4	4	4	2	4	4	3	4	4
hawaiian	0	0	0	0	0	0	0	0	0	0
multiple race	0	1	1	1	1	1	1	1	1	1
unknown	0	0	1	0	0	0	1	0	0	0
Master Total	0	0	0	0	0	0	3	0	0	1
white non-hispanic	0	0	0	0	0	0	0	0	0	0
black non-hispanic	0	0	0	0	0	0	0	0	0	0
hispanic	0	0	0	0	0	0	1	0	0	0
asian non-hispanic	0	0	0	0	0	0	0	0	0	0
american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
foreign	0	0	0	0	0	0	2	0	0	0
hawaiian	0	0	0	0	0	0	0	0	0	0
multiple race	0	0	0	0	0	0	0	0	0	0
unknown	0	0	0	0	0	0	0	0	0	0
Doctoral Total	0	0	0	0	0	0	0	0	0	0
white non-hispanic	0	0	0	0	0	0	0	0	0	0
black non-hispanic	0	0	0	0	0	0	0	0	0	0
hispanic	0	0	0	0	0	0	0	0	0	0
asian non-hispanic	0	0	0	0	0	0	0	0	0	0
american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
foreign	0	0	0	0	0	0	0	0	0	0
hawaiian	0	0	0	0	0	0	0	0	0	0
multiple race	0	0	0	0	0	0	0	0	0	0
unknown	0	0	0	0	0	0	0	0	0	0

note: includes all active program matching majors among 4 possible major codes.

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Physics

Table 14: Percent Under-represented Minorities (URM) of Degreed Conferred Students by Fiscal Year

Degree level:	2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
	Year of Fall Census Day							Rolling 5 year average		
University level:										
Doctoral	7.6%	6.5%	7.8%	4.7%	6.9%	6.7%	10.0%	6.7%	6.5%	7.2%
Masters	6.4%	9.0%	10.8%	10.0%	8.6%	9.6%	9.6%	9.0%	9.6%	9.7%
Bachelor	12.1%	12.8%	12.7%	13.6%	14.3%	15.1%	14.1%	13.1%	13.7%	13.9%
Associate	18.8%	18.4%	21.2%	26.7%	20.8%	26.4%	16.2%	21.2%	22.7%	22.3%
College division level:										
Doctoral	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Masters	5.0%	3.7%	6.5%	9.1%	5.3%	12.9%	3.3%	5.9%	7.5%	7.4%
Bachelor	6.4%	11.9%	7.7%	11.7%	16.4%	11.3%	9.5%	10.8%	11.8%	11.3%
Associate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Program level:										
Doctoral	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Masters	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Bachelor	25.0%	0.0%	0.0%	0.0%	12.5%	0.0%	25.0%	7.5%	2.5%	7.5%
Associate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

note: includes all active program matching majors among 4 possible major codes; URM includes black non-hispanic, hispanic, american indian/alaskan native & hawaiian.

Table 15: Race/Ethnicity of Degreed Conferred Students by Fiscal Year

Degree level:		2011	2012	2013	2014	2015	2016	2017	2011-2015	2012-2016	2013-2017
		Year of Fall Census Day							Rolling 5 year average		
	Total	4	5	3	4	8	5	8	5	5	6
	Total URM	1	0	0	0	1	0	2	0	0	1
Doctoral	Total	0	0	0	0	0	0	0	0	0	0
	white non-hispanic	0	0	0	0	0	0	0	0	0	0
	black non-hispanic	0	0	0	0	0	0	0	0	0	0
	hispanic	0	0	0	0	0	0	0	0	0	0
	asian non-hispanic	0	0	0	0	0	0	0	0	0	0
	american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
	foreign	0	0	0	0	0	0	0	0	0	0
	hawaiian	0	0	0	0	0	0	0	0	0	0
	multiple race	0	0	0	0	0	0	0	0	0	0
	unknown	0	0	0	0	0	0	0	0	0	0
Masters	Total	0	0	0	0	0	0	0	0	0	0
	white non-hispanic	0	0	0	0	0	0	0	0	0	0
	black non-hispanic	0	0	0	0	0	0	0	0	0	0
	hispanic	0	0	0	0	0	0	0	0	0	0
	asian non-hispanic	0	0	0	0	0	0	0	0	0	0
	american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
	foreign	0	0	0	0	0	0	0	0	0	0
	hawaiian	0	0	0	0	0	0	0	0	0	0
	multiple race	0	0	0	0	0	0	0	0	0	0
	unknown	0	0	0	0	0	0	0	0	0	0

(Table continued on next page)

Program Review Self Study FY2017 College: LAS Nat Sci & Math Department: Math, Stats & Phys Program: Physics

(Table 15 continued)

Degree level:		2011	2012	2013	2014	2015	2016	2017	Rolling 5 year average 2011-2015	2012-2016	2013-2017
Bachelor	Total	4	5	3	4	8	5	8	5	5	6
	white non-hispanic	3	5	3	3	4	4	6	4	4	4
	black non-hispanic	0	0	0	0	0	0	1	0	0	0
	hispanic	1	0	0	0	1	0	1	0	0	0
	asian non-hispanic	0	0	0	0	1	1	0	0	0	0
	american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
	foreign	0	0	0	0	2	0	0	0	0	0
	hawaiian	0	0	0	0	0	0	0	0	0	0
	multiple race	0	0	0	1	0	0	0	0	0	0
	unknown	0	0	0	0	0	0	0	0	0	0
Associate	Total	0	0	0	0	0	0	0	0	0	0
	white non-hispanic	0	0	0	0	0	0	0	0	0	0
	black non-hispanic	0	0	0	0	0	0	0	0	0	0
	hispanic	0	0	0	0	0	0	0	0	0	0
	asian non-hispanic	0	0	0	0	0	0	0	0	0	0
	american indian/alaskan native	0	0	0	0	0	0	0	0	0	0
	foreign	0	0	0	0	0	0	0	0	0	0
	hawaiian	0	0	0	0	0	0	0	0	0	0
	multiple race	0	0	0	0	0	0	0	0	0	0
	unknown	0	0	0	0	0	0	0	0	0	0

note: includes all active program matching majors among 4 possible major codes.

Tables 16 provides data for Section 5 of the Program Review Self Study Template.

Table 16: Department Student Credit Hour (SCH) by Student Department Affiliation on Fall Census Day

Major & student level:	2010	2011	2012	2013	2014	2015	2016	Rolling 5 year average 2010-2014	2011-2015	2012-2016
Total	14,748	14,830	15,135	15,793	16,761	15,739	15,795	15,453	15,652	15,845
Program UG majors	203	284	387	319	243	231	364	287	293	309
Program GR majors	0	0	0	0	0	0	24	0	0	5
Non-program majors	14,545	14,546	14,748	15,474	16,518	15,508	15,407	15,166	15,359	15,531
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Program UG major	1.4%	1.9%	2.6%	2.0%	1.4%	1.5%	2.3%	1.9%	1.9%	1.9%
Program GR major	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%
Non-program majors	98.6%	98.1%	97.4%	98.0%	98.6%	98.5%	97.5%	98.1%	98.1%	98.0%

note: program majors includes all active program matching majors among 4 possible major codes.

Math

May 9, 2018

I have had the opportunity to read and comment on the 2018 MSP self-study programs report.

Mark Arrasmith ______________________

Stephen Brady ______________________

Alexander Bukhgeym ______________________

Dharam Chopra ______________________

Casey Craig ______________________

Tinka Davis ______________________

Thomas DeLillo ______________________

Alexandra Echart ______________________

Buma Fridman ______________________

John Hammond ______________________

Rachel Heckman ______________________

Lop-Hing Ho ______________________

Xiaomi Hu ______________________

William Ingle ______________________

Victor Isakov ______________________

Thalia Jeffres ______________________

Zhiren Jin ______________________

Tianshi Lu ______________________

Chunsheng Ma ______________________

Daowei Ma ______________________

Phillip Parker ______________________

Sandra Peer ______________________

Justin Ryan ______________________

Paul Scheuerman ______________________

Catherine Searle ______________________

Ziqi Sun ______________________

Nathan Thompson [signature]

Physics

May 9, 2018

I have had the opportunity to read and comment on the 2018 MSP self-study programs report.

Elizabeth Behrman ____________________

Jason Ferguson ____________________

Terrance Figy ____________________

Hussein Hamdeh ____________________

Foudil Latioui ____________________

Holger Meyer ____________________

Mathew Muether ____________________

Nickolas Solomey ____________________

Syed Taher ____________________

Richard Traverzo ____________________