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**MEMORANDUM**

TO: Christa Slaton, Dean, Arts and Sciences

FROM: Joseph Lakey, Academic Department Head

DATE: 15 November 2013

SUBJECT: Fall 2012 – Spring/Summer 2013, Mathematical Sciences Department Summary and Analysis

## Mission Statement

The Department of Mathematical Sciences provides core education in mathematics and statistics that prepares graduate and undergraduate students to be knowledgeable and responsible citizens of the world. It does this by conducting research, scholarship, and teaching, including teaching service courses for other programs, to fulfill the land grant mission of the university.

## Personnel Changes

The relative accomplishments of the department should be considered in the context of its recent personnel changes. Dan Ramras, a very active Assistant Professor, took a position at IUPUI, and Doug Kurtz, a Professor who was very active in a funded program, retired at the end of Spring 2013. The department has two new Assistant Professors, Shibin Dai and Nicholas Michalowski. Annual reports, from which the data for this summary was compiled, were thus submitted from eighteen tenure-track faculty members. The department also lost two College Faculty members, Erica Voges, an outstanding teacher who moved to Albuquerque, and Bill Bramlett, who retired, and lost Larry Hughes, the Director of the Math Success Center, who also retired this summer. Abby Train is now serving as Interim Director of the MSC. There are now eight College Faculty (seven in

funded lines at 6.5 FTE) in the department. The department remains heavily dependent on contingency funds to cover courses, particularly during the Fall semester.

**Accomplishments**

**Externally Funded Activities**. The faculty members in the Department of Mathematical Sciences were involved in diverse externally supported work. In many cases the work was interdisciplinary or multi-institutional or both. Funding of several of these programs ended at the end of 2012 or during Summer 2013. With Doug Kurtz's retirement, there is no longer a departmental lead on *Mathematically-Connected Communities* ($MC^2$), although several members of the department continue to be very involved with the program (Mary Ballyk, Pat Morandi, Bruce Olberding, Maribeth Olberding, Ted Stanford and Linda Zimmerman). Pat Morandi is PI of the *Learning Institutes for Teachers* (LIFT) program that is funded by NSF from July 2009 to June 2014 with total funding just under $5M. LIFT funds courses that lead to a Master of Arts in Teaching degree in the College of Education. Bruce Olberding, Maribeth Olberding, and Ted Stanford are also actively involved in the LIFT program. Department faculty members also participate in other teaching related grants. Susana Salamanca-Riba was funded though Park City/IAS for the program *PD3: PCMI and the Districts Partner for Design Professional Development* through August 2013. Jerry Lodder was PI on the NSF grant *Collaborative Research: Learning Discrete Mathematics and Computer Science via Primary Historical Sources*, which ended in 2012. Guram Bezhanishvili was also funded by this project, which was collaborative with the Computer Science Department and involved several institutions nationwide. Mary Ballyk and Ernie Barany are co-PIs together with three faculty members in Biology on an NSF grant *UBM-Group: Research Mentoring in Mathematical Biology at NMSU*, funded through 2013. Ballyk is also co-PI on a second NSF grant with Biology*, Collaborative Research: Integrating Mathematics into the Introductory Biology Curriculum: A First Step*, funded through 2014. Ted Stanford is a co-PI on the NSF funded grant *Math Snacks: Addressing Gaps in Conceptual Mathematics Understanding with Innovative Media*.

There is also funded activity in the department whose primary purpose is to produce original mathematical research. Tiziana Giorgi holds an NSF research grant *Investigations of Liquid Crystalline Mesophase Transitions via Landau-de Gennes Phenomenological Models* through 2014. Louiza Fouli holds a Simons Foundation Collaboration Grant, *Parameters, Blowup Algebras and Connections to Combinatorics*, through 2017. Fouli also is a lead member of a team that was awarded funding from NSF to hold the *Southwest Local Algebra Meeting* (SLAM) in Tucson in 2013 and from NSA to hold SLAM in March 2014 in College Station. Susana Salamanca-Riba was funded through the NSF subaward *FRG: Collaborative Research: Atlas of Lie Groups and Representations: Unitary Representations*, until June 2013. Guram Bezhanishvili is supported by two research grants through the Georgian Shota Rustaveli National Science Foundation, one for his ongoing work in modal logic and one to co-supervise a Georgian PhD student. Several other faculty applied for funding during the performance period. At most six of the twenty

tenure-track faculty will either not be funded or not have applied for funding through November, 2013.

Renewal funding has been sought for most of the funded programs that ended in 2012–2013. Despite several positive proposal reviews, none of the renewal proposals submitted in 2012–2013 were successful, federal sequestration being cited in several cases.

**Research and Creative Activity**.
Counting papers is not always the most meaningful way in which to gauge creative output. Nonetheless, research papers were reported as published or accepted for publication by Mathematical Sciences faculty 52 times during the reporting period. Six faculty reported having four or more papers published or accepted and these six accounted for a total of forty authorships, with one faculty member reporting fifteen papers published or accepted. Four tenure-track faculty members did not report any articles as published, accepted or submitted, although one of these four did report convincingly a high level of creative activity.

**Awards, Recognitions and Leading Scholarly Service.** Several faculty members had their creative work recognized in other ways. Tiziana Giorgi, Pat Morandi, and Susana Salamanca-Riba were recognized for their creative and educational activities in *LC-Sun News* feature articles. Morandi was also interviewed by KRWG. Ted Stanford is part of the MathSnacks team that was the sole recipient of two gold medals in the International Serious Play Awards Competition for the Math Snacks games *Ratio Rumble* and *Game Over Gopher*. Several faculty were also recognized through external appointments. Tony Wang continues to hold the position of *Visiting Chair and Houji Scholar* at Northwest A&F University in Xian, China through December 2013. In this role Tony delivered no less than thirteen colloquia and conference presentations throughout China and Thailand during winter and late Spring. Louiza Fouli was recognized as a *Member of the Mathematical Sciences Research Institute* during Fall 2012, participating in the Institute's Special year in Commutative Algebra. Tiziana Giorgi was awarded a *Visiting Fellowship* to Cambridge University to attend a six-week long program *The Mathematics of Liquid Crystals* in Spring 2013. Both Fouli and Giorgi's appointments were awarded on a competitive basis. Tiziana Giorgi was also recognized with a *University Research Council Distinguished Career Award* in 2013.

Several members of the Department of Mathematical Sciences serve as editors or associate editors for international journals in their respective areas of specialization, including Pat Baggett (*European Journal of Mathematics and Science Education* Member, Editorial Advisory Board,) Guram Bezhanishvili *(Journal of Language, Logic, and Computation*, Member, Editorial Board *Tbilisi Mathematical Journal*, Editor, *Studia Logica,* Associate Editor), John Harding (*Order*, Editorial Board Member), Pat Morandi *(Journal of Algebra and Computational Applications,* Editorial Committee Member), Bruce Olberding (*Journal of Commutative Algebra,* Associate Editor) and Ross Staffeldt (*Journal of Homotopy and Related Structures,* Managing Editor). Other faculty were involved in professional service

in different ways and at greatly varying levels. Five faculty were involved in conference organization and two more served on conference boards, six reviewed advanced books, nine faculty refereed journal articles; in some cases a dozen or more reviews were done. At least six faculty served on scientific advisory boards with a broad scope of purposes. A few faculty were involved in grant proposal reviews and writing external letters for tenure and promotion cases, but there was less activity in this regard compared to recent years, presumably due to recent retirements.

**University Service and Outreach**. Most faculty in Mathematical Sciences play their part in keeping the department's programs running smoothly. Several faculty members also served the College of Arts and Sciences on its standing committees, including Pat Baggett (*Graduate Affairs*), Tiziana Giorgi (*Curriculum and Educational Policies*), Pat Morandi (*Awards*), Bruce Olberding (*Planning and Budget*) and Susana Salamanca-Riba (*Research Affairs Chair* and *College Council*). Several faculty members also served as external members of Promotion and Tenure committees, some active and some not, for various departments. Faculty were also active in service on various university level committees or represented the university externally, including Alyne Fulte (*New Mexico Mathematical Association of Two-Year Colleges* Executive Board Member and *New Mexico Articulation Task Force* Chair), Amal Mostafa (*Committee for the Assessment of Student Learning-GE*), Laura White-Hosford (*Statewide Teacher Preparation* representative for Math and Science), Ted Stanford (*Mathematics Teacher Education Partnership*), Abby Train and Joe Lakey (*Faculty Senate*), Robert Smits (*University Research Council*) and Ross Staffeldt (*Graduate Council*).

In addition to the outreach work being done in relation to several funded projects noted above, several Mathematical Sciences faculty reported conducting activities in Las Cruces school classrooms or with school students at NMSU including Pat Baggett (*Sonoma Ranch Elementary* and *Sierra Middle School*), Maribeth Olberding (*Sonoma Elementary* and *East Picacho Elementary*), Ted Stanford (*J Paul Taylor Academy*, *Hillrise Elementary*, *Sonoma Elementary*), and Laura White-Hosford (*Columbia Elementary*).

Faculty have also used their expertise to serve the community in other ways, including Alyne Fulte (AAUW Girls Can! Conference), Tiziana Giorgi (Siemens Competition - Math Science Technology advisor), Amal Mostafa (New Mexico Regional Science and Engineering Fair and New Mexico Science and Engineering Fair Judge), Susana Salamanca-Riba (Massachusetts Institute of Technology Educational Council representative) and Robert Smits (Probability Seminar, German Air Force at Holloman)

**Student Credit Hour production**. According to IRPOA data, at the 9/10/2012 Census date the department had enrollments totaling 11,834 SCH (+1.2%) in lower division classes, 1,302 (-1.8%) in upper division classes, and 421 (-22.0%) in graduate level courses. The percentages are relative to the 9/5/2011 data. The corresponding Spring 2013 comparison as of 2/1/13 census was 10,294 (+4.9%) in lower division, 1440 (+15.9%) in upper

division, and 418 (-13.6%) in graduate level, for a net increase of 5.3% relative to Spring 2012 census data. This follows a 5.2% net increase from Spring 2011 to Spring 2012. Despite a one-year decline, the Spring 2013 graduate SCHs were almost identical to those reported in Spring 2010 (416) despite a net loss of six graduate faculty lines during that period. Relative to Spring 2010 numbers, the department had net grown by 9.3% in SCHs while offering 100 unique sections of MATH/STAT classes in Spring 2013, versus 107 in Spring 2010. Similar figures apply to Fall 2013 versus Fall 2010. It should be emphasized that there were not a lot of empty math seats to begin with in 2010: Most of the efficiency came about by decreasing the breadth of courses being offered in our graduate programs and by some faculty making huge in-load contributions to SCH production, including Marcus Cohen (1200), Alyne Fulte (1308), Christ Stuart (936), Abby Train (1452), Laura White-Hosford (1029) and Linda Zimmerman (1182).

**Majors and Degrees.** According to Cognos data, a total of twenty MATH degrees were awarded from Fall 2012 to Summer 2013, including 10 Bachelor of Science, 6 Master's, and four PhDs (David Hren (Visual Intelligence Corp, Houston, Advisor Bruce Olberding), Simplice Tchamna Kouna (Assistant Professor, Georgia College, Advisor Bruce Olberding), Van Vo (Lecturer, Vinh University, Vietnam, Advisor Dante DeBlassie) and Taewon Yang (Visiting Assistant Professor, Florida Atlantic University, Advisor John Harding)). Six degree recipients were female, including one Master's and one PhD recipient, three recipients were Hispanic, one African American, two were listed as multiracial, six Asian, six white, and two listed as unknown. The total number of Math degrees is down significantly from 28 degrees awarded Fall 2012 to Summer 2012, (17 BSCI, 5 Master's and 6 PhD), but similar to 2010–2011 numbers (10 BSCI, 8 Masters and 4 PhD). We can expect a trend of diminished numbers of PhDs produced in the next few years, as we have struggled to recruit PhD students who are ready to begin their studies at an advanced level. This trend is likely due to both a smaller tenure-track faculty and meager compensation for graduate assistants relatively to programs with comparable size and academic reputation.

In terms of ongoing students, Cognos lists 44 Graduate students with a declared Major in Math and 66 undergraduates with a declared primary or secondary Major in Mathematics, including 6 Freshman, 17 Sophomore, 14 Junior and 29 Senior. Cognos data for Fall 2013 also reports 16 distinct students who have declared a MATH minor, including 13 female students. Although the department offers a supplementary major in Applied Mathematics, Cognos does report this under academic interest.

**Progress on Goals.** Departmental goals in **teaching** for 2013 included tracking completion rates in our General Education courses MATH 120, 121G, MATH 190G–291G and STAT251G and continuing to work on documenting teaching effectiveness and student learning outcomes. Our long-term goal for successful completion rates included a 75% success rate in "G" courses relative to a course readiness metric. This approach is consistent with the envisioned role of new national common core college readiness standards and with ACT benchmarks. The department has begun discussing what is desired baseline performance in core classes and how it should be measured.

The departmental goals for **research** were to have each graduate faculty member have a paper either submitted or accepted/published in 2013, and to have faculty frame their scholarly activities within the context of the Boyer model. As noted, four faculty did not meet the first threshold; however, one of these excelled in framing creative activities in the Boyer framework.
Departmental goals in **service** included having at least half the graduate faculty involved in a college or university committee or policy body, having at least two-thirds of the graduate faculty involved in professional committees or reviewing scholarly work, and involving half or more of the College Faculty in the department in committee or policy work that extends beyond the department. These benchmarks have essentially been met, however, there continues to be vast variation in the *quantity* of university and professional service performed by different individuals.

Goals for our graduate programs included moving towards a more even distribution of students in our respective Master's and PhD programs, having half of our current Master's students complete their work (or move on) in 2013 and have one-fourth of our current PhD students successfully complete their work (or move on) in 2013. For our undergraduate major we had hoped to have a dozen undergraduate majors complete Bachelor's degrees between December 2012 and August 2013. We did not produce as many degrees as we would have liked. At the undergraduate level this was likely due to natural fluctuation. However, in our graduate program we have found an increasing number of entering students not having the skill level needed for timely degree completion while, on the other hand, some of our students better able to complete a PhD are leaving NMSU after completion of a Master's to complete their PhD at a different institution.

On a more positive note, an increasing number of PhD students have attended and presented their work at national meetings. Support for graduate travel has come from a combination of Arts and Sciences funds, Graduate School funds, department funds, most notably the Walker endowment, and conference sponsor funds. Graduate students who traveled include Pradip Aryal (Cornell Summer School in Probability and American Mathematical Society (AMS) meeting), Kristina Brantley (History and Pedagogy of Mathematics (HPM) conference), Valeria Holguin (HPM conference), David Hren (CUNY workshop and AMS conference), Imad Jaradat (CRM conference in Montreal), Simplice Tchamna Kouna (AMS annual meeting), Lokendra Paudel (AMS meeting), Feras Yousef (AMS meeting and Conference on Numerical Analysis conference)

**Mathematical Sciences Goals for 2014**. The department views its primary goals as being long term ones. As such, those for 2014 are modest variations of the ones from 2013.

Teaching Activities: Continue to track completion rates in our General Education courses MATH 120, 121G, MATH 190G–291G and STAT251G. Continue to identify meaningful and concise ways to document student-learning outcomes.

Teaching Goals: (1) Hire a long term Director of the Math Success Center who can help to develop instruments measuring student preparation for "G" courses relative to national common core readiness standards and who can measure success rates relative to adequate preparation. Seek 75% or better success rates in "G" courses consistent with national benchmarks. Work with Arts and Sciences to identify desired learning outcomes that can be measured in a meaningful way.

Research Activities: Continue overall publication and other nationally and internationally recognized scholarship at levels consistent with recent years.

Research Goals: Involve each graduate faculty member in peer-reviewed work either submitted or accepted or performed in a suitable context in 2013–2014. Continue to emphasize the Boyer framework in the context of performance suitable for a research-intensive department of Mathematical Sciences.

Service Activities: Continue to serve the college, university, and profession in ways that reflect the central role of mathematics in promoting quantitative reasoning across curricula and quantitative analysis in strategic planning, and in maintaining a national reputation.

Service Goals: Involve at least half the graduate faculty in college or university committees or policy bodies, or in scholarship in the service of broader educational interests. Involve at least two-thirds of the graduate faculty on professional committees, panels or conference boards, or in reviewing scholarly work. Involve half or more of its College Faculty in committee or policy work that extends beyond the department.

Program Activities: In graduate recruiting, seek to establish a balance of about twelve to fourteen funded students in the Master's program and about 16 to 18 funded students in the PhD program. Articulate parameters for acceptable performance in fundamental Master's and PhD courses. Continue to make undergraduate students aware of our major emphases and clarify what is required for timely degree completion.

Program Goals: Encourage half of our current Master's degrees to complete their work (or move on) in 2014. Have one-fourth of our current PhD students successfully complete their work (or move on) in 2014. Produce about a dozen Bachelor degrees in MATH between December 2013 and August 2014.