

ACS Mellon Foundation Faculty Renewal Grants

Final Reporting Guidelines

Mellon Foundation Faculty Renewal Final reports are due within 30 days of the end of the project period. The due date is in your award email from ACS. Your report should be e-mailed to mwhite@colleges.org At the ACS Faculty Renewal Initiative, 1975 Century Blvd., Suite 10, Atlanta, GA 30345. Fax: 404-636-9558.

Please address the following points in your *separate* ‘**detailed narrative**’ report with evaluation and dissemination information. (Do not simply answer the questions by filling in the answers below.)

Name of Person (s) Submitting Report: Alex M. McAllister

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Institution: Centre College

Name of project/event: Writing Projects in Mathematics

Date(s) of Project: June, 2008 through January, 2009

Amount Awarded: \$1100

Email your report to mwhite@colleges.org
Mellon Faculty Renewal Initiative
Associated Colleges of the South
1975 Century Blvd., Suite 10
Atlanta, GA 30345
Fax: 404-636-9558

The ACS-Mellon Faculty Renewal Grant Award for “Writing Projects in Mathematics” enabled me to attend a Summer 2008 workshop entitled “Expository Writing to Communicate Mathematics” sponsored by the Mathematical Association of America (one of the two premiere national mathematics organizations). A detailed description of the program is at <http://www.maa.org/prep/2008/expository.html>; to borrow from this website:

The three-and-a-half-day workshop component will allow participants to develop confidence and gain experience in expository writing, under the guidance of accomplished writers and journal editors. They will obtain tips directly from award-winning authors and other experts on effective bibliographic research, writing (and rewriting), manuscript preparation, presentation, and publication.

I experienced this workshop as a positive, transforming experience. I gained helpful guidance and insights into the processes of developing, writing, and seeking to publish expository articles and books. During the workshop I was able to focus and formulate my plans for an expository text, receive detailed feedback on excerpts of my writing, and really start moving forward on the substantial writing project I had planned for the summer and fall of 2008. In this way, the workshop fulfilled the hopes of the examples listed in the 2008 Request for Proposals for the ACS-Mellon Faculty Renewal Program: attending a particularly valuable workshop or seminar; attending a seminar on getting works published; and assisting in preparing materials for publication.

In Fall 2008, I invested a two-course release from a Centre College Stodghill Research Professorship in the creation of a book entitled *Mathematical Impossibilities*. This expository text seeks to provide an accessible description of important results identifying certain inherent limitations in mathematics. . The current table of contents for this book reads as follows:

- Chapter 1: The Possible, the Open, and the Impossible
- Chapter 2: Parallel Lines Do NOT Exist?!: Non-Euclidean Geometries
- Chapter 3: Chasing Zeros: The Insolvability of the Quintic
- Chapter 4: Just a Ruler and Compass: Geometric Constructions
- Chapter 5: To Infinity and Beyond: The Continuum Hypothesis
- Chapter 6: Could Math be Fundamentally Wrong?: Gödel’s Incompleteness Theorems
- Chapter 7: We Really Need Ctrl-Alt-Del: The Halting Problem
- Chapter 8: Impossible Social Choices: Arrow’s Theorem
- Chapter 9: Some Reflections

By the end of 2008, I had created a good working draft of this book, and I was able to utilize three of the chapters in the CentreTerm 2009 (Centre College’s January Term) course that I taught, fulfilling one of my first goals in creating this text. Based on the students’ feedback and my insights from working with the manuscript in this context, I have been working on revisions to *Mathematical Impossibilities* – both in the specific chapters we read for the course as well as in the other chapters. The course evaluations also suggest the positive impact this course had on these students; some of their comments about this course include:

- The course challenged my views on math and what is considered math.
- It made me realize that there are limits to what math and logic can and can't do.

- It really challenged what I had previously learned in geometry, and other math areas, broadening how I think of math. We really do not know everything there is to know about math, and subjects we learned freshmen year in high school are a lot more deep than I had originally thought.
- This course covers topics such as infinity and non-euclidean geometry, which are things one wouldn't normally consider. These mathematical concepts are more difficult to grasp than simply learning a method for solving a certain type of math problem. These concepts forced me to "think outside the box", quite literally.
- This course opened my eyes to a new aspect of mathematics: the impossible. Through a combination of history and arithmetic, the class gave me a new perspective on infinity and geometry.

Several of the students in this course are continuing their studies in mathematics this term; it will be interesting to see which academic paths they choose to pursue.

The goals of this ACS-Mellon Faculty Renewal Grant Award were all fulfilled with the exception of submitting the manuscript to publishers. At the present time, I am in the thick of adding more polish to this manuscript based on my students' feedback and my personal insights from using the book in a first-year studies course. During Summer 2009 I plan to invite some colleagues to read and respond to portions of the text. Based on this feedback, I will make additional modifications to the manuscript. In addition, I anticipate pulling together a book proposal and being in touch with the appropriate publishing houses regarding their interest in this manuscript. By August 2009 I hope to have accomplished this final goal of my original ACS-Mellon Faculty Renewal Grant proposal. I will, of course, acknowledge the support of the ACS-Mellon Faculty Renewal Grant Program in the acknowledgements for this text when it is published.

There was no evaluation or assessment connected to my participation in the writing workshop. For the *Mathematical Impossibilities* manuscript, I collected copies of the text from my students marked up with their corrections and observations in reading the text. I am working with their comments as part of my process of refining the text. In the next couple months, I hope to invite some colleagues to read and respond to portions of the text. I anticipate asking them to respond with any detailed comments about the text itself, and to some general questions based on the reviews I have been asked to complete in the past. I still need to compile this list of questions. The ultimate evaluation of this text will be made by publishing houses in their response to the manuscript and their decision to publish the text.

I was pleased with the structure of this project and I would choose to follow this same approach again. Attending the writing seminar at the beginning of a dedicated time set aside for writing was tremendously helpful, and I expect the information I learned during the workshop will continue to be helpful as I work toward publishing *Mathematical Impossibilities*. Similarly, I am pleased with the feedback cycles I am implementing at this time. The last book project I worked on was a joint project with another mathematician and our detailed writing discussions played a vital role in producing a well-written text. Since I am writing *Mathematical Impossibilities* on my own, I have had to seek out other sources of feedback, and it seems to be working well.

This project did not have any significant impact on faculty on this or any other campus, at least not yet. The publication of *Mathematical Impossibilities* will certainly provide the possibility of a broad impact. I should also mention the talk I gave recently at a Centre College Friday Faculty Hour. Every two weeks the faculty gather socially to share food, drink, conversation, and a general audience talk by one of the faculty. In mid-February 2009, I spoke on the ideas from Chapter 2: Parallel Lines Do NOT Exist?!: Non-Euclidean Geometries. We had an interesting discussion during and after the presentation, and a number of the faculty seemed delightedly intrigued by the idea of our universe not containing any parallel lines. In addition, two of the math faculty present at my talk mentioned that they had been unaware of the history of the development of these ideas and appreciate learning this story; perhaps these ideas will play some role in their future teaching of these ideas.

A summary of my work that may be included on the ACS Faculty Renewal website.

The funds from my 2008 ACS-Mellon Faculty Renewal Grant enabled me to attend a Summer 2008 PREP workshop entitled “Expository Writing to Communicate Mathematics” sponsored by the Mathematical Association of America. A detailed description of the program is at <http://www.maa.org/prep/2008/expository.html>; to borrow from this website:

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In the near future, I anticipate sharing the manuscript with handful of colleagues in seeking further feedback and, during Summer 2009, I plan to submit the manuscript to various publishing houses for consideration for publication. In addition to the workshop contributing in a positive way to my work in creating this text, I expect this experience will play an important role in guiding my next steps in seeking to publish *Mathematical Impossibilities*.