This is the third and final report on the grant that William and Mary received from the Mellon Foundation in December 2006 to develop the College’s undergraduate research program. Over the past three years, this grant has supported 90 total projects in 27 departments and programs. “Teaching with research” has gone from an aspiration of our faculty to an institutionalized reality in many courses in disciplines ranging from Mathematics and Physics to Classical Studies and Art History.

Before we started this grant initiative, undergraduate research at William and Mary was mainly a co-curricular activity in the sciences, with opportunities for students to work in faculty labs being the modal student experience. This grant has had two core objectives: to move undergraduate research into the curriculum, and to move it across the curriculum, into the humanities and social sciences. The following summary of project and budget data is one way to capture the success of this initiative:

- We funded 25 projects in 2009: 12 in the humanities, 6 in the social sciences, and 6 in the sciences (one project focused on the web-site that is supporting all undergraduate research activities). Not counting purely administrative and support activities, we have funded 82 curriculum development projects over the three years of the grant: 36 (45%) in humanities fields, 27 (33%) in the social sciences, and 18 (23%) in the sciences and mathematics.

- In year three of the grant we expended Mellon funds totaling $113,249 and William and Mary funds totaling $40,625 on projects. Over the three years of the grant, we expended a total of $521,552 on grant projects. Mellon expenditures, including all interest, have totaled $312,439 (60% of the total), and William and Mary matching expenditures have totaled $209,113 (40% of the total).

**Undergraduate Research at William and Mary: Lessons Learned**

Much of the literature on undergraduate research has focused on two questions: can undergraduates do research? and should undergraduates do research? The first advances the concern that research – “real research” – might be beyond the reach of most undergraduates. The danger, according to this view, is that we could dilute the very meaning of research to bring it into compliance with the intellectual capacity and academic preparation of our students. The second question raises the concern that undergraduate research will re-orient the undergraduate curriculum to the laser-focused cutting edge of discovery instead of giving students the broad integrative liberal education that they need. Thus, the first perspective worries that research will be diminished by its association with liberal education, while the second worries that liberal education will be diminished by its association with research.

The experience of this grant suggests three responses to those who raise the first concern. The first is that our faculty have had remarkable success giving students collaborative roles in high
quality peer reviewed research. Examples drawn from year three alone would include two of the Mathematics projects (projects 8 and 14, below) and projects in Art History (23), History (12) and Hispanic Studies (24). Of course, the goal cannot, and should not, be to expand the professional resumes of all, or even most, of our students. But a remarkable number of our faculty now collaborate with their undergraduate students. Faculty development is critical to achieving this result, and especially institutionalizing opportunities for novices to learn from faculty who have developed successful techniques for mentoring students and integrating rigorous research into courses.

Second, faculty funded under this grant have expanded the range of outlets for student research beyond the traditional peer reviewed article. Our students, for example, conduct research on international security topics that are posed by Washington policy makers and then have the opportunity to present their work to this audience (21). Similarly, students in History and Hispanic Studies have contributed their research to an important international web resource on human rights abuses in Latin America (Year 2, 19).

Finally, undergraduate research experiences prepare students for careers producing high quality research, even in cases where they do not produce publishable research as undergraduates. Our Department of Government serves as an impressive example this year. The chair of the graduate admissions committee in political science at Stanford remarked recently that it was the quality of one of our student’s honors thesis that persuaded him and his colleagues that she is unusually prepared for a rigorous graduate program. William and Mary’s Government Department has also placed seniors this year in graduate programs at Princeton and Harvard, thanks in large measure to their strong undergraduate research experiences.

But even if undergraduates are capable of doing serious research, is it good for them? The primary response to this concern is the evidence that our faculty have incorporated research into their courses in a way that enriches, not undercuts, the College’s traditional liberal arts mission. After all, “teaching with research” means providing students with rigorous opportunities to work with primary materials and to formulate and test hypotheses – for active learning, problem solving, and cultivating the ability to communicate clearly and persuasively. This is a way to re-state the value placed on active and engaged learning that has always been at the venerable core of a liberal education.

More specifically, the fear that a research orientation will focus students too early into narrow areas of study, failing to give them a broad, integrative grounding, is not borne out by our grant experience. Indeed, while this was not explicitly encouraged in our calls for proposals, a large number of the proposals that we have received involved collaborations between faculty from different disciplines. For example, a project on post-conflict transitions in year one brought together an anthropologist, an economist, and two political scientists; a GIS project in year three included environmental scientists from a range of disciplines; and a first-year initiative in cognitive psychology was supported by a collaboration between a group of psychologists and faculty from philosophy, linguistics, and education. The lesson, it appears, is that the catalyst of
research can challenge rigid disciplinary boundaries, invigorate teaching methods, and provide students with an integrative window on knowledge.

Another critical lesson that we have learned is that the goal of bringing research into the curriculum is far more financially sustainable than the co-curricular model. The co-curricular model typically requires faculty to provide individual support for student researchers, often in the summer and usually with grant funds. In contrast, students pay tuition to take credit hours: curriculum-based research opportunities are sustainable within the university’s core, tuition-based business model. An analysis of all of the projects funded under this grant reveals that 28% of our funding has gone to faculty and 41% has gone to students, with the remainder going to materials and various administrative and support functions. However, much of the “faculty” funding went to one-time course-development grants, which will not be needed when these courses are offered in the future; and much of the “student” funding went to support for travel abroad projects, many of which will transition to standard tuition-supported study abroad programs. Compared to the co-curricular model, the curriculum-based model has the dual advantage of providing more students with research experiences and doing this for less money.

Finally, we have learned that technology plays a critical role in supporting our undergraduate research program. GIS, for instance, is now pivotal to research in a wide range of disciplines, from the humanities to the sciences. We would not be able to support this exciting work without our new Center for Geospatial Analysis, the creation of which Mellon funded. This grant has supported data base and web-based projects in Hispanic Studies, French, and International Relations that make it possible to accumulate information and support research initiatives over time. Finally, we are especially proud of the unique web site that we have built with grant funds, called POUR, the Process of Undergraduate Research [http://research.wmblogs.net/]. This site allows student researchers to blog about their in-progress research to the benefit of each other, students who wish to get involved with research, and diverse off-campus audiences.

An Overview of Where We Have Been and Where We Are Going

William and Mary is now a national leader in undergraduate research. We lead the way in curricular innovation, and our faculty and administrators are in great demand to conduct workshops on the topic at other universities and at national meetings. We will be hosting a conference on undergraduate research in fall of 2010. However, in our judgment, we have completed only the second of a three-phase process that, when completed, will fully accomplish our goal of integrating the teaching and research missions of the College and transforming the character of intellectual engagement on campus.

Phase One: Undergraduate Research at William and Mary Before this Grant

Before we received this grant, the undergraduate research program at William and Mary conformed primarily to the co-curricular model, and focused mainly on the sciences. This is still the norm at other universities – indeed, it is the very definition of “undergraduate research.”

Phase Two: Undergraduate Research Now at William and Mary
As developed above, this grant from the Mellon Foundation has made it possible for us to move beyond our “Phase One” program in two critical ways. We have brought research *into* the curriculum, into courses, study abroad programs, etc.; and we have extended it *across* the curriculum, by encouraging curriculum renewal projects in the humanities and social sciences, as well as the sciences.

**Phase Three: International Studies and Research Experiences Across Departments and Programs**

Our Mellon grant has made it possible for us to develop research experiences at the cellular level, as it were – at the level of individual courses. Our next step is to institutionalize research experiences at the organismal level, at the level of departments, programs, and families of departments and programs.

From our experience over the past three years, we have concluded that the curricular area most ripe for this final step at William and Mary is the area of *international studies*. We are using “international studies” here to refer to a wide range of departments and programs in the humanities and social sciences that study international and global topics, as well as global perspectives on U.S. topics. We are also referring to large cross-department ventures like our annual Global Film Festival, and our international relations and transformed study abroad initiatives. Thanks to the grant we have had from the Mellon Foundation, we now have both the commitment and the capacity to institutionalize imaginative research experiences across these international studies programs.

While we did not explicitly encourage proposals in the international area in our calls for proposals, fully 37, or 45%, of the projects that we funded were in this broad field. In the humanities and social sciences – i.e., outside of the natural and physical sciences – it is simply a fact that much of the energy and innovation on our campus is currently situated in international studies. For example, our ambitious annual film festival has become a “Global Film Festival,” and much of the faculty and student work in Environmental Science and Policy now addresses scholarship and policy analysis on international topics.

In Phase 1 we designed and re-designed courses; our next challenge is to ask questions about the relationship *between* courses, the pipeline of experiences our students have through the curriculum. An excellent example is the model that is emerging in study abroad programs that ask students to initiate rigorous research projects in courses on campus before participating in study abroad programs that are specifically designed to give them the opportunity to complete these projects. Both the Latin and the Greek majors, for instance, are experimenting with this model. Similarly, Hispanic Studies, French, and Government are planning to institute ongoing research projects that involve students from multiple courses, and the same students in a series of courses over time. Our new Community Studies minor requires students to complete a series of course and community experiences in a single policy area that culminates in a senior capstone research project.

We are aware of many of the challenges that we will confront as we undertake this initiative. For
example, while individual courses are sustained by individual faculty, the structures that will be needed to support program-wide initiatives will require some careful investments in new staff. An example of such an investment that, with the help of the Mellon Foundation, the College has already made is the creation of our Center for Geospatial Analysis with a new director. Similarly, the Global Film Festival, which supports several research-based courses, needs a director of undergraduate research, as does our international relations and policy program.

We are grateful to the Mellon Foundation for making it possible for us to transform the substance and, perhaps above all, the teaching methods employed in 85 courses currently taught at The College of William and Mary. This is an exciting transition that makes William and Mary a national model for thoughtful innovation in undergraduate research programs. This grant has brought us to the threshold of the third and final phase that will integrate research into the programmatic structure of our curriculum in international studies.
# Year 3 Summary

| Grant Total Beginning Year 3                  | $113,104.61 |
| Year 3 Interest                              | $143.77     |
| **Total**                                    | **$113,248.38** |
| Year 3 Expenses (W&M)                        | $41,170.00  |
| Year 3 Expenses (Mellon)                     | $113,249.00 |
| **Total Expenses**                           | **$154,419.00** |
| Total Remaining Mellon Budget                | $0          |

## Actual Year 3 Spending

(See below for brief descriptions of all projects)

<table>
<thead>
<tr>
<th>Project Total</th>
<th>Faculty Costs</th>
<th>Student Costs</th>
<th>Materials</th>
<th>General Administration</th>
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<td>Mellon</td>
<td>W&amp;M</td>
<td>Mellon</td>
<td>W&amp;M</td>
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<td>1 David Aday, Sociology and American Studies</td>
<td>$5,000.00</td>
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<td>2 Seth Aubin - Physics</td>
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<td></td>
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<td>3 Tim Barnard - English and American Studies</td>
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<tr>
<td>4 Arnab Basu - Economics</td>
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<td>$500.00</td>
<td>$500.00</td>
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</tr>
<tr>
<td>5 Tuska Benes - History</td>
<td>$4,267.00</td>
<td></td>
<td>$3,767.00</td>
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<tr>
<td>6 Christy Burns - English and Women's Studies</td>
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<tr>
<td>7 Dan Cristol, Biology</td>
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<td>$1,000.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Tanujit Dey and David Phillips, Mathematics</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>9 Maryse Fauvel - French and Francophone Studies</td>
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<td>$8,000.00</td>
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<td>10 Stuart Hamilton - GIS Program Director</td>
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<td>15 Arthur Knight - American Studies and English</td>
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<td>19 Deborah Morse - English</td>
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<td>20 Chris Nemacheck - Government</td>
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<td>22 Greg Smith - Applied Sciences</td>
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<tr>
<td>23 Susan Webster - Art and Art History</td>
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<td>25 Website Development for Undergraduate Research</td>
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</tbody>
</table>

**Grand Total**

$154,419.00

| % of Mellon and W&M Cost | 29% | 34% | 39% | 45% | 9% | 2% | 24% | 19% |
1. David Aday, Sociology and American Studies
Funding will support a two-week ethnography training program for students who will participate in two international engaged scholarship projects. The program will provide supervised field training during which students will collect data on migrant farm workers, with an emphasis on public health topics, on the Eastern Shore of Virginia and Maryland in preparation for similar work in The Dominican Republic.

2. Seth Aubin, Physics
Professor Aubin has continued to develop research projects for students in Physics, 351, Digital Electronics. Working with chips that support circuits with thousands of elements, students work in teams during the last month of the course to solve challenging research problems in electronics.

3. Tim Barnard, English and American Studies
Professor Barnard served throughout 2009 as Coordinator of Mellon Undergraduate Research Projects in the Humanities. His duties included organizing faculty development workshops to help faculty learn strategies for “teaching with research” in the humanities. He also served as the coordinator of the William and Mary Film Festival, providing students with opportunities to conduct a wide range of research projects on aesthetic topics, as well as on film history and on the history of audience reception of films.

4. Arnab Basu, Economics
Funding will make it possible to introduce research projects into Economics 300, Contemporary Issues in Developing Economies. Students, working in teams, will learn how to develop systematic literature reviews, to conduct rigorous research, and to make formal presentations on topics such as child labor, human trafficking, climate refugees, communicable diseases, and fair trade.

5. Tuska Benes, History
Funding will support a 1-credit research seminar in European Studies, which is attached to the core course Introduction to European Studies. With the aid of a graduate student, this course supports students who are preparing original papers for the program’s annual undergraduate research conference.

6. Christy Burns, English and American Studies
Funding will be used to employ three teaching fellows in Introduction to Women’s Studies, which enrolls about 100 students each spring. These fellows will supervise community-based research projects on gender topics, for example, studying domestic abuse data and the efficacy of governmental and non-profit programs that are designed to address this problem.

7. Dan Cristol, Biology (and others)
Funding will support workshops for student playwrights who are writing plays on topics dealing with the environment and environmental justice. The plays will be presented at program on
Earth day.

8. Tanujit Dey and David Philips, Mathematics
Professor’s Dey and Philips, working with advanced undergraduate assistants, will introduce research projects in the areas of computational mathematics and statistics into Foundations of Mathematics (Math 214) and Data Analysis (Math 352). An example is a research project to develop algorithms and simulations to help minimize air travel delays.

9. Maryse Fauvel, French and Francophone Studies (and others)
The goal of this project is to build a forum, both actual and virtual, to support student and faculty collaborative work in French and Francophone Studies. The project will include the development of a web site where student research projects will be published and where bibliographies and other resources will be collected to support ongoing and future research.

10. Stuart Hamilton, GIS Program Director
Funds will be used to support undergraduate researchers who use GIS techniques. One group of students will collect and interpret spatial data to calculate the amount of mangrove deforestation in estuaries on the Pacific Coast of Ecuador and Columbia since the advent of commercial aquaculture. A second group will study hyper-nutritified waters in the same region.

11. Matthew Haug, Philosophy
Experimental philosophers conduct empirical studies of the psychological processes underlying people’s intuitions about moral responsibility, free will, and other topics, often concluding that people think about these topics differently than philosophers have assumed. Funding will be used to conduct survey experiments into Philosophy 415, Advanced Metaphysics and Epistemology. Students in this class will themselves do substantial research projects, as well as supervising group research projects drawing on this data in Philosophy 201, Introduction to Philosophy.

12. Lu Ann Homza, History
Three advanced undergraduates will travel with Professor Homza to Pamplona, Spain to conduct research on projects that they have started during the academic year in two courses on medieval Spanish history. The research will take place in the bishop’s diocesan palace and The Royal and General Archive of Navarre, both in Pamplona. Student research will be presented at William and Mary’s second Symposium on Undergraduate Research in Medieval and Renaissance Studies.

13. William Hutton, Classical Studies (and others)
This initiative will launch a research/study abroad program in Greek Studies that is similar to the one developed by the department in Latin Studies last year, with support from this grant. Students will initiate research projects in courses during the academic year and then conduct critical primary research during a 3-week summer trip to Greece. Students will then be enrolled in a 1-credit follow-up course in the fall after they return during which they will present their research and complete their papers for submission to conferences and journals.

14. Charles Johnson, Mathematics
Professor Johnson will offer a special freshman seminar targeted for unusually able first-year students. He has a strong record of success involving young students in serious research, and, with the assistance of an advanced student who herself conducted research as a freshman, he will invite students to work on problems drawn from a portfolio of appropriate problems that he has developed. One goal is to build a pipeline of students to an upper-level NSF-sponsored undergraduate research program.

15. Arthur Knight, American Studies and English
As program director of the Film Studies Program, Professor Knight is also the overall director of the Global Film Festival, an annual festival that incorporates many undergraduate research activities build into courses for film studies majors and film festival student interns. The theme of this year’s festival was Global Film and Music.

16. Paul Kiefabber, Psychology
Funding will make it possible to embed research experiences into Psychology 470, Cognitive Psychophysiology. Students will learn brain imaging techniques to record and interpret cortical brain potentials using electroencephalograms (EEG).

17. Chi-Kwong Li and David Lutzer, Mathematics
Professor’s Li and Lutzer will teach a new advanced undergraduate course on quantum information science, studying the use of quantum effects in constructing fast computing devices and secure and efficient communication schemes. Undergraduates will undertake substantial research projects, working in teams with faculty members and graduate students.

18. Jennifor Mellor, Economics
Funding will support collaborative faculty-student summer research on health policy topics under the supervision of the Schroeder Center for Health Economics.

19. Deborah Morse, English
Funding will support teaching fellows who will supervise student research projects in topics related to the topic of “tolerance” in fiction and other Victorian literature (topics to include women’s rights, animal rights, and the rights of the working class).

20. Chris Nemacheck, Government
Funding will support two undergraduate teaching fellows who will facilitate a Supreme Court simulation that students may elect to do for 50% of their grade in Civil Liberties. These students must complete a 20-page research paper based on this assignment.

21. Amy Oakes and Dennis Smith, Government
Funding will support the Project on International Peace and Security, an undergraduate research initiative modeled after non-profit policy institutions in Washington. Members of the policy community in Washington will pose policy questions that will serve as the topics for student research projects. The project will conclude with a year-end conference in Washington.

22. Gregory Smith, Applied Sciences
Funding will support collaborative summer research in mathematics applied to the life sciences,
quantitative biology, and biostatistics. Examples of projects include: mathematical modeling or quantitative data analysis in molecular, cellular, or organismal biology; bioinformatics and computational molecular biology; population dynamics; theoretical aspects of evolution and ecology; and computational neuroscience.

23. Susan Webster, Art and Art History
She will take 3 advanced undergraduates for a 10-day research trip to Quito, Ecuador to do archival research and to investigate art collections. Students will begin research projects in courses on Iberian and Latin American art history; they will also study paleography before the trip. Student papers, focusing on seventeenth century architecture, painting, sculpture, and metalwork, will be submitted to a peer-reviewed student research journal, Hemispherios/Hemispheres, published at the University of New Mexico.

Professor Stock has collaborated with Troy Davis in our Media Center to teach a series of New Media and Production Workshops focusing on digital video, computer-generated animation, and video art. Professor Stock is a specialist on Cuba and these workshops have focused in particular on the impact of new media on Cuban politics and culture. Her students learn how to *use* new media to conduct research on the impact of new media.

25. Website Development for Undergraduate Research
A site has been developed to support undergraduate research at the College, “Process of Undergraduate Research” ([http://research.wmblogs.net/](http://research.wmblogs.net/)). This is a blog aggregation site for students blogging about their in-progress research. This site is intended to help students find people who are interested in their research area, to find assistance with problems that come up during their research, and to promulgate information about research opportunities to current and prospective students.