

Project Title

The Green Scale Research Project at the University of Notre Dame: Developing and Deploying a New Digital Design and Analysis Tool for Sustainable Building

Project Abstract

(150 word maximum) If you are awarded a grant, the project abstract will be published on our website and in other Graham Foundation materials relating to our funded projects. The abstract should therefore be a concise summary of your project that communicates to a broad public the significance of your project to the field. (It should not discuss how and when grant funds will be used.) The abstract should also be written in the present tense.

Prevailing discourse on “green” building design focuses almost exclusively on the capacity of emerging technologies to generate “sustainable” design solutions. Yet there currently exists no universally accepted method or tool capable of holistically measuring the broader impact of advanced technologies on the built and natural environment.

The Green Scale Research Project (GSRP) fills this void by generating objective, quantifiable data and analysis of the implications of materials and methods used in building design and construction.

The goal is to build a dynamic digital modeling tool that will enable students of architecture and professionals across the building industry to evaluate more accurately the impact of their design and material decisions from the very earliest stages of the design process. The Green Scale Tool will provide greater access to the information needed to make us better stewards of the environment and better educators about how sustainability is measured and achieved.

One sentence description of your project, including the final form your project will take.

The Green Scale Research Project (GSRP), initiated and led by Aimee Buccellato, will develop and release an easy-to-use, online digital design and analysis tool, designed to interface with industry leading solids modeling and building design software (for example: AutoCAD & Revit), enabling students and design professionals to use GSRP’s analysis methodology to quantitatively evaluate the consequences of their design decisions at every step of the building design process—including environmental impact, thermal performance, durability, and building life-cycle costs.

Project Start Date

Any work to be funded by the Graham Foundation must start after April 15, 2012. While your project may have started before the application period, indicate the start date of the activities for which you are seeking Graham Foundation support.

May 17, 2012

Project End Date

Research Grants must be completed within one year. Production and Presentation Grants must be completed within two years. Applicants should allow sufficient time to plan, implement, close out their project, and, if funded, acknowledge Graham Foundation support in all published media.

May 1, 2014.

Project Budget

Enter whole numbers. Do not enter dollar signs, commas, or decimal points.

100000 (100K)

Request Amount

Enter whole numbers. Do not enter dollar signs, commas, or decimal points.

20000 (20K)

Project Expenses

(250 word maximum) In list format, provide the expenses for this project. Include the line item and amount, and total your expenses.

Phase I

Refinement and development of Green Scale Analysis tool	\$6,250
Expansion of domestic materials database	\$1,500
Validation and testing by GSRP team, student focus groups, and select architectural firms	\$3,000
Development of GSRP website and online deployment of Green Scale analysis tool	\$4,250
Research of data format compatibility to enable GS analysis tool to interface with industry leading digital solids modeling and building design software	\$5,000
Subtotal	\$20,000

Phase II

Further development of analysis methodology and tool to include additional categories of measurement and analysis	\$44,500
Complete interface of GS tool with industry leading building design software to enable simultaneous design-impact analysis.	\$31,500
Testing and validation of Phase II analysis tool	\$4,000
Subtotal	\$80,000
Total Project Expenses	\$100,000

Project Income

(250 word maximum) In list format, provide information on additional funding for this project, if applicable. Include funding source, amount, status, and total your income.

Current Support: University of Notre Dame Faculty Research Support Program, 2011 Initiation Grant: \$10,000

Total Income in 2011: \$10,000

If your project is funded, what will Graham Foundation funds be used for?

(One sentence maximum)

Funding from the Graham Foundation would support the collaborative development and deployment of the “Green Scale Digital Design and Analysis Tool”.

Project Statement

(350 word maximum) The project statement should describe your project and discuss its immediate and larger objectives to show its impact and how it will make a meaningful contribution to discourse and/or to the field.

The current public discourse on “green” building design focuses almost exclusively on the capacity of emerging technologies to generate “sustainable” design solutions. When implemented, however, the construction of hyper-efficient buildings can consume exponentially more energy than what the most energy-efficient building uses annually. And yet there currently exists no universally accepted method or tool capable of holistically measuring the broader impact of advanced technologies on the built and natural environment.

The Green Scale Research Project (GSRP), initiated and led by Aimee Buccellato, has developed a novel analysis methodology aimed at producing objective quantifiable data describing the broader implications of materials and methods used in building design and construction. Through a series of case studies, GSRP has put its methodology to the test, comparing purportedly “green” materials and methods of assembly alongside alternative methods. GSRP has presented its findings at several academic and professional conferences, revealing that there can exist a quantifiable difference between newness—in terms of advanced building technologies—and effectiveness.

In 2011, the GSRP team began translating the methodology into a prototype digital design and analysis tool. In beta tests, the prototype Green Scale Tool has produced useful preliminary results, accelerating GSRP’s current research but is in need of substantial further development before it can serve as an effective and useful tool for educators and practitioners.

In 2012, GSRP will further develop the design and analysis tool. As part of this effort, GSRP will improve the tool’s ease-of-use, expand our existing domestic-material database, conduct rigorous software testing and validation, and develop and launch an online platform through which the tool can be accessed. Additionally, GSRP will begin exploration of data format compatibility to enable the tool to interface with industry leading building design software, which will allow users to see the impact of their decisions at every step of the design process. It

is our hope that the current prototype and future, more robust iterations of our design and analysis tool will serve as effective means for practitioners and educators to measure, evaluate, and promote the execution of truly sustainable building design.

Biographical Narrative

(150 word maximum per person, written in the third person) Provide a biographical narrative that identifies current professional position(s), related academic or professional training, and other relevant background and qualifications. If you are awarded a grant, the biographical narrative will be published on our website and in other Graham Foundation materials relating to our funded projects. (Collaboratives should provide a biographical narrative for each collaborator.)

Aimee P. C. Buccellato earned a Bachelor of Architecture degree (2000) from the University of Notre Dame and a Master of Design Studies Degree from the Graduate School of Design at Harvard University (2005). Professor Buccellato's practice, including published built-work, research, and teaching is focused on advancing the study of sustainable design and building technology with particular emphasis on quantifying the inherently durable and sustainable characteristics of traditional materials, methods, and principles of design. Alongside this research, Professor Buccellato works with faculty in the departments of computer science, mechanical and electrical engineering to optimize the integration of computational waste heat – an enormous, underutilized passive heat source – in buildings (<http://greencloud.crc.nd.edu>). Prior to joining the faculty of the School of Architecture at the University of Notre Dame, Professor Buccellato was an associate at G. P. Schafer, Architect in New York City.

Charles F. Vardeman II earned a Bachelors degree in Chemistry (2000) and a Ph.D. in Theoretical Chemistry (2009) from the University of Notre Dame. A major focus of his graduate research in material science focused on the exploration of heat transfer between nano-scale materials and their surrounding environment. Computational models for this research were developed in the open source molecular computational package OpenMD (<http://www.openmd.net>). Dr. Vardeman continues this research interest as a Computational Scientist in the Center for Research Computing at the University of Notre Dame and is involved in developing continuum models that describe heat transfer in nano-scale materials. As head of the Scientific Frameworks development group, Dr. Vardeman leads a team of professional programmers who engineer software to investigate a wide variety of scientific problems. Dr. Vardeman is a participant in the open source scientific software movement as a contributor to OpenScience Project (<http://www.openscience.org>).

Work Plan and Project Timeline

(200 word maximum) List key project dates

Phase I:

Summer & Fall 2012:

- 1) Refinement of GSRP Graphic User Interface & Master Database Builder Interface Support Tool: Collaboration with professional programmers at CRC to further develop and refine the GS analysis tool for validation and testing by the GSRP Team:
Estimated programming hours for refinement tasks (CRC-ND): 80

Testing and Validation (GSRP): 200 hours*

- 2) Deployment of analysis tool online, including CRC Design consulting:
Estimated programming and design consulting hours (CRC-ND): 40
Testing and Validation (GSRP): 200 hours*

Spring 2013:

- 1) Commence data format compatibility with ISO standard XML format to enable GS analysis tool to interface with industry leading digital solids modeling and building design software.
Estimated programming hours (CRC-ND): 40
Testing and Validation (GSRP): 200 hours *

Phase II:

Summer 2013-Spring 2014:

- 1) Further development of analysis methodology and tool to include additional categories of measurement and analysis (CRC-ND and GSRP)
- 2) Complete interface of GS tool with industry leading building design software to enable simultaneous design-impact analysis.
Estimated programming and model refinement (CRC-ND): 16 weeks
Testing and Validation (CRC-ND, GRSP): 300 hours*

*Including involvement of undergraduate researchers enrolled in Professor Buccellato's course, Special Research in Sustainable Design and Building Technologies.

If you selected Film/Video/New Media/Web or Other as the Program Area on page 4, please provide the following information:

List the running length; screening date(s); the name of the distributor; and any other specifications relevant to the project. For Other, list any specifications relevant to the project.

The Green Scale Digital Design and Analysis Tool for Sustainable Building will be made available through an online platform hosted through the University of Notre Dame School of Architecture. GSRP will launch the analysis tool on its website, www.greenscale.nd.edu, Summer of 2012.

If you are advanced to the second stage of review, you will be asked to provide two letters of reference. We strongly suggest that you select referees who are not directly involved in the proposed project, but who have expertise in the field and can speak to the importance of your proposed project.

In preparation for the second stage of review, please list the names of two people from whom you would seek letters of support.

We will not accept reference letters unless you are advanced to the second stage of review and we will not contact references at this time.

Reference Names, Titles, and Organizational/Company Affiliations

Shahin Vassigh
Associate Professor and Co-Director, Environmental Technology Lab
Florida International University School of Architecture

Ryan Smith
Associate Professor and Co-Director, Integrated Technology and Architecture Center
University of Utah College of Architecture & Planning

In addition, if you are applying for a Production and Presentation Grant and you are advanced to the second stage of review, you will be asked to provide a letter from your Committed Producer confirming a commitment to producing and/or presenting your project. Please list below the name of the Committed Producer.

Committed Producer Name

Michael Lykoudis
Francis and Kathleen Rooney Dean
School of Architecture
University of Notre Dame

Applicants may opt to submit work samples, such as writing samples and images, with the Inquiry Form. These materials are uploaded as attachments to your Inquiry Form on page 9.

In the space below, please provide a list, such as an image key or bibliography, that identifies the work samples you are submitting with the Inquiry Form.