# NSF Doctoral Dissertation Research Improvement (DDRI) Evaluation
# Geography and Spatial Sciences (GSS)

Bruce Wm. Pigozzi

(Originally written to/for students in a graduate research seminar, April, 2010, revised 2011)

Several of you know that April 12 thru April 13, 2010 I attended my first of what will be 4 NSF Doctoral Dissertation Research Improvement (DDRI) advisory panel meetings. Doctoral students, like most of you, and their advisors should be aware of the DDRI program and I think what I experienced may have relevance for you and them. The DDRI proposals are currently limited to 10 pages of text, not counting bibliography and supplemental pages including 2, 2-page bio's, one for the student and one for the student's advisor. This means the DDRI is *much* shorter than most dissertation proposals presented and defended in this department. (The current NSF requirements are attached toward the end of this document.) The proposals are given a number by the NSF, but it was interesting to learn, *the primary identifier used in the review process was the last name of the advisor*. So, advisors, be aware your name is clearly attached to the proposal. There are two rounds per year. This April, the panel evaluated 109 proposals. (December 2010 there were 68, and April 2011, 113).

Recently I've heard a misconception repeated by students and a few faculty members; I'd like to correct it. <u>You do NOT have to be a citizen of the US to apply for a DDRI. Neither does the advisor. But, the proposal must come from a US college or university</u>. Since MSU is a US university, any PhD student in our Department can apply.

This document includes a summary and my reactions to the review process. I also have distilled some advice for applicants. The current NSF instructions for the DDRI, the NSF statement of the outcome of the session I attended, and a 2005 essay by Thomas Baerwald are also attached (with permission). Tom is current director of the Geography and Spatial Sciences program and in the essay he introduces NSF programs in Geography. Whenever I indicate anything as *quoted* from a proposal it's been altered enough that one can't connect it to the original but I'm not exaggerating at all. *Confidentiality* is imperative throughout the review process.

## <u>Background to what happened</u>

There were 18 panel members, Geography faculty from all across the country. Back in March, a website was made available to all panel members where the .pdfs for all proposals could be found and retrieved. Each proposal was assigned to one primary reviewer and two secondary reviewers from the 18. From the other side, each panel

member was assigned 6 proposals where they were primary and 12 where they were secondary reviewers. Since there were 109 proposals some panelists had slightly larger loads.

Over the intervening few weeks, we all read our charge of 18 proposals, wrote reviews, gave each a "grade" from *"Excellent, VeryGood, Good, Fair, Poor",* and then uploaded these reviews to a central site. We were not able to view the other two reviews until we'd up-loaded our own. Also, we were not able to see the reviews of any proposals where we had a *conflict of interest* (COI) such as a student from our home program or an advisee.

At our meeting in DC, the list of proposals was ordered by <u>the last name of the advisor</u> and then a "random" letter was selected for our start. (I suspect many advisors don't realize their names are so prominent in the process. Several relatively famous Geography faculty members had their names attached to shoddy proposals.) This time we started at the letter "L". The primary reviewer for the first "L" proposal then gave a brief summary to the entire panel of 18 (plus the 3 NSF GSS program directors, Thomas Baerwald, Scott Freundschuh, and Ezekiel Kalipeni; Antoinette WinklerPrins will replace Scott in the Fall). This was immediately followed by the two secondary reviewers' comments. Interesting discussions of the merits and demerits ensued because, you see, not everyone "graded" these the same. A proposal might have received two "fairs" and an "excellent" or various other combinations. Any of the other 15 panelists could join in the discussion if they chose to. This happened when they had read the proposal or if the proposal had been submitted in an earlier round and there may have been memory of the prior critique. This discussion would continue until the 3 current panelists, the primary and 2 secondaries, agree to the proposal's placement on a different priority scale:

> *HighPriority, High-MediumPriority, MediumPriority, Medium-LowPriority, LowPriority*, and *Decline* (or not "fundable in their current form")

They use a different scale rather than just take the average of the prior "grades" precisely because the reviewers should be informing one another, producing a new different evaluation. The last of these categories, decline, is interpreted as "not fundable;" the other five are all "fundable" but in descending priority. This processed continued until we'd gone from L through to K and all 109 proposals. Each proposal received an average of 7.5 minutes of discussion by persons who were quite familiar with them. This took the panel nearly 14 hours intensely spread over 2 days.

After each proposal's discussion, the primary reviewer wrote a summary of the discussion along with the decision and posted this document, again using the website, to the two secondary reviewers for their corrections, comments, and suggestions.

When the 3 are satisfied, the summary is posted to the NSF officers and they approve it and post it for all to be able to see (except for COIs), or they'd come back to the primary suggesting specific revisions. After we'd gone through the entire lot, we collectively considered "moving" any up or down in the rankings.

All in all, a very, very intensive, thorough process! I did some *"back of the envelope calculations"* and I estimate the costs, real and opportunity, are well over $1,100 per proposal evaluated. Each proposal receives many person-hours of attention before and during the panel meeting.

Advice

First, do not consider submitting a DDRI application without your advisor's fully informed endorsement. I don't mean just getting his/her signature; they must endorse the research design thoroughly. There is a range of *possible* linkage between a departmentally approved dissertation proposal and an NSF DDRI proposal. NSF DDRIs are technically *"independent from the process going on within the university."* However, from the NSF standpoint, the DDRI submission comes from the university so university rules will have been applied before NSF sees it. The NSF doesn't require prior departmental approval for an applicant; however, a university might. Inherent in this, at least for us at MSU, is that a student might apply for a DDRI in their first semester IF they can get an advisor to apply with them. Granted, there are major timing issues for many students, especially for research involving work overseas, so fairly early application is called for in many situations. Often, students have not defended an academic proposal before they apply for a DDRI; maybe they don't even have their full advisory committee's approval. In other cases, a student might submit nearly simultaneously to the department and the NSF. BUT, at the very least, have your advisor's fully informed approval (and you might share this doc with them too).

Returning to what actually happened in the spring of 2010. At the end of the April round of evaluation (there will be another in the late fall of 2010) there were 52 proposals in the bottom "do not fund" category and 57 scattered around the "fundable" ranks. (See the "Context Statement" sent to PIs by NSF, reprinted at the end of this document.) This means that the panel looked at a lot of proposals which had major problems. The purpose of rest of this statement is to give some advice based on these problems.

The biggest and most common problem was a failure to clearly explain *methodology*. Around here, I'm thought of as a methodologist; this problem wasn't just my evaluation; it wasn't just the failure to explain *quantitative* methods but ANY KIND of method; surveys, interviews, drilling, measurement, whatever. What this means is that there were some proposals where the "research question" was interesting, maybe even

important, but it was deemed *unfundable* because the RESEARCHERS hadn't explained a clear methodology. I emphasize RESEARCHERS because the advisor and student were in this together. And, even if the advisor has published a textbook on the topic or the method, the panel can't *infer* that the student and the project's methods will be sound. (See first Advice paragraph!)

There were some proposals that had 8.5 pages of theoretical background and literature review and just a small paragraph on methods and data. Don't just say *"I selected Norway as my study area for demographic reasons;"* this begs an explanation of what demographic characteristics of Norway are/were important; without such explanation, it just sounds foolish. *"Quantitative information gathered will be age, sex, and so on"* is not a sufficient statement for your data section and it conveys a sense that the person writing (and advising) hasn't really thought about what they are going to gather. It's not enough to say you're going to *"survey taxi drivers and record their oral histories on a digital tape recorder."* You need to cover how many taxi drivers you intend to interview, specific notions you want to extract from their histories, and what you intend to do with this information. In this case the medium, *"digital tape",* is irrelevant and might appear to be padding (see budget comments below). Research designs that include interviews or surveys should include sample questions and explanation of how the answers will inform or test your hypotheses.

You also need to understand the data you're going to gather and use. If these data are quantitative understand their natures (e.g., *angles* usually require different statistics than linear measures). But, saying you're going to do a content analysis of corporate websites doesn't explain what information will be extracted from that content analysis or what you'll do with it.

You will need to proof read your proposal (as you should everything you write). Typos look bad and cast your work in a bad light by themselves, but they can also lead to serious interpretation problems. For example, a proposal with several typos set out to do interviews in two places, A and B. The sampling design said they were going to conduct interviews *"for 3 days per week over 3 weeks in"* A *"and 2 days per week over 2 weeks in"* B. Notice, this means they will have 9 days of sampling from A and 4 days from B; an apparently lopsided sampling design that was never explained. However, could they have really *meant* to say 3 days per week over 2 weeks in A and 2 per week over 3 weeks in B? That would mean 6 days in each and the design would be balanced. Was it a typo? We didn't know, but, the panel has to go with what's printed not what we think the researchers *might* have meant.

*"How do city assembly personnel* <u>*conceive*</u> *abandoned buildings?"* is quite a different question from *"How do city assembly personnel* <u>*perceive*</u> *abandoned buildings?"* Another proposal had <u>3 different titles</u>, one on the cover page, one atop the summary

page, and a different one on page one of the proposal text. This is possibly minor compared to the sampling question above, but it demonstrates a lack of diligence on the part of the coPI and the PI; it should be embarrassing, but it also diminishes the good parts of a proposal.

Be careful to insure that the scale, or scales, of your theoretical argument(s) are compatible with your data and the analyses you propose. You can't offer a theoretical argument based on countries or states and then test these arguments with 10 household surveys in 2 neighborhoods unless you've carefully, logically structured the scale transfers. It was not uncommon to read theoretical arguments that were couched totally in "globalization" and then tests were done at the neighborhood level and no transition was even attempted. The "ecological fallacy" isn't just for correlation.

Get your definitions right and listen to your own words. Reference to *"naturalized residents"* is not a legally correct phrase; *permanent residents* or *naturalized citizens*, but not *"naturalized residents."* Indeed, *"residents"* of a city may not be synonymous with *"citizens"* of the same city. On more Geographic themes: *"spatial statistics"* aren't "data," *"econometrics"* is not a single method, and the word *"pollution"* doesn't constitute a variable without some sort of measurement backing it up. Understand the words you are using.

Don't throw methods into your proposal unless you know how to do them and how they fit the data you want to use. If your data are vegetation-diversity measures under high tension lines, you have *corridor data*; that is, data in a "discrete space." *Geographically Weighted Regression* might not be appropriate even though it sounds good. There were several instances when the proposal would say they'd do "a multiple regression" but there weren't any variables mentioned. In general, NSF proposal or within the Department, I advise you to never put forth a proposal that relies on *methods* you don't yet understand. If you do, there's a good chance you'll come off as sounding foolish in the proposal; but, it's an invitation for disaster when you actually do attempt the research.

I read a proposal that proposed doing *"thick description."* I'd never heard of it; so, giving it the benefit of the doubt, I *Googled* it and got a *Wikipedia* entry. It is an Anthropological methodology phrase. Unfortunately, the proposal exactly quoted the *Wikipedia* entry without giving any credit (perhaps the PI or coPI wrote the *Wikipedia* entry but…). This was most likely plagiarism! Ironically, the same proposal claimed it would use a *"chai-square"* test. (I thought maybe it was a form of *"tea-test"* but alas it wasn't, it was an error.) Another proposed using *Monte Cristo Simulation* (I think the author meant *Monte Carlo Simulation*). This sort of error is so easy to commit. One might argue that MicroSoft Word's spell checker did it. But it might also indicate you don't know the method. And it certainly means you don't proof read and edit properly.

Don't pad the bibliography with material you don't use, or worse, don't really know anything about. Geographers, and some of the non-geographers, realizing their proposal would be reviewed by a panel of Geographers, would stuff their bibliography with Geographic references and then not use them at all. Maybe they planned to read them but it was often clear they hadn't as of the writing. Another red flag is waved when the research articles in the bibliography are all pre-1980; or when no research literature was referenced at all, just books. At the extreme, one of the rejected proposals had nearly 70 references (in 10 pages) to <u>one book</u> and nothing else.

If one is thinking only "strategically," this advice could be seen as a balancing act between too much vs too little. But, I contend this is the wrong way to look at it. Your bibliography should refer to the work that grounds your proposal theoretically <u>and</u> methodologically. The phrase *"relevant literature"* doesn't mean you should include every piece you've ever read, or that has anything at all to do with your topic; it means literature **relevant** to your explanation of what you're going to do and why it is important. Frankly, and I know it's almost sacrilegious, I discourage advisees from having a "Relevant Literature" chapter in their theses and dissertations; I'd rather they integrate the relevant literature into the presentation of their research. Otherwise, it often ends up being a bibliography in paragraph form.

The importance or justification of the research, was also an element looked for in the review process. It included the "publish-ability" of the product, for sure. Has something been published by the researchers already on the topic or, at least, were there plans for presentations and publication? But also, is your product of value to the world beyond the academy? Again, at the other extreme, don't claim *"My study of X will validate X as a critical topic that warrants further study."* This is the same as saying *"My study will validate me doing it."*

Don't claim you're going to interview impoverished metal gleaners in Mumbai if you can't speak any of the languages they speak. Even if you have a translator, you may have trouble getting the gleaners to pay attention to you. People scratching out a marginal livelihood anywhere in the world may not be captured by the noble purposes of your dissertation; you may have to budget some sort of compensation for them. Be sensitive and rational.

Budgets can be telling for the review process also. The example above where the plan was to record taxi driver interviews on a digital tape recorder showed up in the budget; giving the impression the researcher just really wanted a digital tape recorder. Another review situation that casts a sour aspect: suppose the budget limit for a specific program is $12,000 (as it is at this writing); it was clear in several instances that the researcher started with $12,000 and worked backward to construct a budget that would get exactly the maximum. This isn't wrong, but it casts doubt on the numbers and

maybe more. It's better to figure out what you actually need and if it exceeds the program limits suggest where you might find the rest. Also, check your arithmetic.

Finally

Read the directions. Read what you've written (try reading out loud, you'll often hear your mistakes even when your eyes skip over them). Get it to your advisor and other mentors early enough for them to read it and give feedback. And, spell-check it; but don't just automatically take all of Microsoft's spelling suggestions (eg "chai square," "Arch View," or "Monte Cristo Simulation"). Then, proof it again.

BWP

Addendum:

For the Spring 2011 funding cycle a new requirement was attached: the so called *"Data Management Statement."* Excerpts from the NSF are:

***Chapter II.C.2.j, Special Information and Supplementary Documentation,*** *contains a clarification of NSF's long standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. Fastlane will not permit submission of a proposal that is missing a Data Management Plan. Cross-references are included in the Project Description section (II.C.2.d), the Results from Prior NSF Support (II.C.2.d(iii)), Proposals for Conferences, Symposia and Workshops (II.D.8), and the Proposal Preparation Checklist (Exhibit II-1). The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal or both.*

*Plans for data management and sharing of the products of research, including preservation, documentation, and sharing of data, samples, physical collections, curriculum materials and other related research and education products should be described in the Special Information and Supplementary Documentation section of the proposal (see GPG Chapter II.C.2.j. for additional instructions for preparation of this section). Plans for data management and sharing of the products of research. Proposals must include a supplementary document of no more than two pages labeled "Data Management Plan". This supplement should describe how the proposal will conform to NSF policy on the dissemination and sharing of research results (see AAG Chapter VI.D.4), and may include:*
*1. the types of data, samples, physical collections, software, curriculum materials, and other materials to be produced in the course of the project;*
*2. the standards to be used for data and metadata format and content (where existing standards are absent or deemed inadequate, this should be documented along with any proposed solutions or remedies);*
*3. policies for access and sharing including provisions for appropriate protection of privacy, confidentiality, security, intellectual property, or other rights or requirements;*

*4. policies and provisions for re-use, re-distribution, and the production of derivatives; and*
*5. plans for archiving data, samples, and other research products, and for preservation of access to them.*

*Data management requirements and plans specific to the Directorate, Office, Division, Program, or other*
*NSF unit, relevant to a proposal are available at:*
*http://www.nsf.gov/bfa/dias/policy/dmp.jsp.*

*A valid Data Management Plan may include only the statement that no detailed plan is needed, as long as the statement is accompanied by a clear justification. Proposers who feel that the plan cannot fit within the supplement limit of two pages may use part of the … Project Description for additional data management information. Proposers are advised that the Data Management Plan may not be used to circumvent the … Project Description (page) limitation.*

This is a new requirement which is likely to only get more and more important, and complicated. NSF isn't exactly clear how they will be evaluating these. At this point it's simply "adequate" or "not adequate." The Spring 2011 panel gave some advice about issues found in the 113 proposals reviewed in April 2011. If you have NSF funding and are producing unique primary data, the American public has some proprietary rights of access, <u>BUT don't promise to give it all away until you're done with it!</u> You will publish articles, may be a book. You can make summaries available and even share with select colleagues but this information is likely to be the start your career; be a little jealous of it. More discussion on this to be added later.
BWP

# NSF PROTOCOL (as of 4/14/2010)

Proposals for Doctoral Dissertation Research Improvement Grants submitted to the Geography and Spatial Sciences Program must comply with or have information about the following bulleted items:

- **Deadline Dates** : **February 15 and October 15** - These deadlines are firm. Extensions rarely are granted, and if so, occur under very unusual circumstances and with prior approval of a GSS Program Director. (If a deadline falls on a weekend or holiday, the deadline effectively becomes the next business day following the deadline date.)
- **Project Duration** : Maximum **24** Months
- **Project Budget** : A maximum of **$12,000** may be awarded for each DDRI award. The funds are to be used for field, lab, and/or data-collection expenses not normally underwritten by the host institution. (Student stipends, tuition expenses, assistantships, and the doctoral advisor's travel expenses are not eligible.) No indirect costs or administrative overhead are allowed, although the university may claim waivers of such costs as part of its cost-sharing component.
- **Proposal Title** : should begin with the prefix: "Doctoral Dissertation Research:" followed by the substantive title of the project.
- **Project Summary** text may not exceed one (**1**) page and should provide a summary of the research to be undertaken if the proposal is funded. It should include a statement of the project's theoretical context, project objectives, and the methods to be employed. The Project Summary should contain explicit statements of **both** (1) the intellectual merit of the proposed activity; and (2) the broader impacts resulting from the proposed activity. (Intellectual Merit and Broader Impacts are the two primary NSF evaluation criteria. See Chapter III of the Grant Proposal Guide for elaboration of the items considered appropriate for each of these criteria. Note that the broader scholarly significance of research (such as anticipated contributions toward theory) relates to the Intellectual Merit of a project. Broader Impacts refers to items such as the integration of research and education, contributions toward diversifying the scientific workforce, and potential practical applications and societal significance of research.)
- **Project Description** text may not exceed ten (**10)** pages but the Geography and Spatial Sciences Program will allow up to two (**2**) additional pages in the Project Description to present graphics that illustrate any portion(s) of the Project Description. These graphics may be maps, photos, satellite imagery, flow charts, or any other format that is predominantly graphic rather than textual. Captions on the graphics pages must be short and cannot incorporate lengthy explanatory statements. Each graphic must be referenced from the text in the Project Description. Graphics may also be included along with text in the first ten (10) pages of the Project Description, but Pages 11 and 12 of the Project Description cannot have any content other than graphics and brief captions. All text included in the Project Description (including any footnotes or endnotes) must comply with **all** of the margin, font, and spacing requirements specified in the Grant Proposal Guide. Failure to comply with the page limitations specified here or any of the other formatting requirements specified in the GPG will result in the proposal being returned without review.
- **Results from Prior NSF Support** does not need to be specified in DDRI proposals.
- **References** are listed in a separate section of the proposal and do not count against the page limits in the Project Description.
- **Biographical Sketches** must conform to the format specified in the Grant Proposal Guide, with all appropriate sections as specified in the GPG, including a list of collaborators, advisors/advisees, and other affiliations.
- **Current and Pending Support Forms** must be submitted for the doctoral advisor, doctoral student, and any other individuals specified as a PI, Co-PI on the project.
- **A Facililites form** must be submitted, even if it states that no special facilities, equipment, or other resources are necessary.
- **Appendices** may not be included in the proposal. If applicants want to include items like survey instruments, they must do so by including them in the Project Description.
- The **Supplementary Documents** section may include letters of cooperation from labs or foreign institutions. It is preferable to include letters that have been prepared on institutional letterhead and signed by a person with proper authority, but letters submitted by e-mail may be used if the transmission information to validate the identity of the sender is included. If letters are written in a language other than English, a translation of the text into English should follow.
- A statement from the department chair or the advisor certifying the student's progress towards the degree should **NOT** be included. GSS funding decisions will be based on the quality and the

coherence of the project as described in the proposal, not on the positive comments that others may make about the doctoral student.

- Proposals must be submitted by a U.S. institution that grants doctoral degrees. A faculty member (normally the doctoral candidate's advisor) must be the principal investigator (Project Director) with the doctoral candidate as the second investigator (or co-PI). Although the student cannot submit a proposal independently, it is expected that the intellectual input to the proposed research be predominantly that of the student.
- All proposals must be submitted electronically via FastLane or Grants.gov. Proposals must be submitted before 5:00 PM your local time of the deadline date.

Samples of successful DDRI research proposals are available for review.

What happens after you have submitted your proposal? (The Review Process)

After a proposal is submitted via FastLane, GSS program directors will check the proposal to make sure that it is compliant with NSF and GSS Program guidelines. They will look to make sure that the number of pages does not exceed those allowed, that type sizes and margins are not too small, that the Project Summary addresses both Intellectual Merit and Broader Impacts, that Biographical Sketches are complete, and that a host of other guidelines have been followed. These guidelines are specified above and in the Grant Proposal Guide. If one or more of these guidelines are violated, the proposal will be returned without review, and you will have to wait until the next deadline date to resubmit. In the event that the GPG and GSS guidelines are not consistent, the GSS guidelines apply.

After a proposal is found to be compliant, it will be sent to reviewers whose identities will remain anonymous. These reviewers will read your proposal and write reviews, commenting on the validity and significance of the research as well as the quality of your proposal, paying particular attention to the major NSF review criteria of Intellectual Merit and Broader Impacts. They will submit their reviews via Fastlane. When all reviews have been returned, a GSS DDRI Advisory Panel will meet to discuss and rank the proposals and make funding recommendations to the GSS program directors. The GSS Program Directors will then make decisions regarding which proposals will be funded and which ones NSF will decline to support. Funding limitations may prevent the GSS Program Directors from recommending awards for all meritorious proposals.

The general amount of time it takes to process your application is 6 months from the deadline date (not from the time of your submission). Official notification of a decline or an award will be communicated to your advisor and the Sponsored Projects Officer of your university. If your proposal results in an award, that notification will come from the NSF Division of Grants and Agreements. If the proposal is declined, notification will come from the Division Director for the Division of Behavioral and Cognitive Sciences. Regardless of whether the proposal is funded or declined, the reviewers' comments and a panel summary will be made available to you in FastLane.

If you have additional questions, please contact a GSS Program Director listed above.

**NATIONAL SCIENCE FOUNDATION**
**GEOGRAPHY AND SPATIAL SCIENCES PROGRAM**

# CONTEXT STATEMENT -- SPRING 2010 DOCTORAL DISSERTATION RESEARCH IMPROVEMENT (DDRI) ADVISORY PANEL MEETING

The Geography and Spatial Sciences (GSS) Doctoral Dissertation Research Improvement (DDRI) Advisory Panel met on April 12-13, 2010, to evaluate proposals that were submitted prior to the February 15, 2010, submission deadline. The 18 members of the GSS DDRI panel considered 109 proposals. A total of 104 of these proposals were evaluated solely by GSS; the other 5 proposals were jointly evaluated with another NSF program.

Proposals were evaluated using the NSF review criteria of intellectual merit and broader impacts as articulated in the Grant Proposal Guide (NSF 10-1). At least three members of the panel were asked to read and write reviews of each proposal. All members of the panel listened to and were able to participate in discussions of each proposal, except when individuals recused themselves during discussions of proposals for which they had conflicts of interest.

On the basis of panelist reviews and extensive discussion during the panel meeting, the GSS DDRI Advisory Panel recommended that 57 proposals be considered as potentially fundable by the GSS Program and 52 proposals not be considered as fundable in their current form. Of the 57 proposals judged to be potentially fundable, 2 were placed in the High Priority category, 12 were placed in the High-Medium Priority category, 14 were placed in the Medium Priority category, 12 were placed in the Medium-Low Priority category, and 17 were placed in the Low Priority category. Depending on the availability of program funds, GSS Program Directors anticipate recommending about 20 to 25 proposals for awards.

Verbatim copies of all completed reviews and any relevant panel summaries are made available to principal investigators via the FastLane system. GSS panelists and program officers do not necessarily agree with or endorse all statements by reviewers. Some reviews may contain irrelevant comments, which are not used in making final funding decisions. Panel members are asked to reflect on the substance of the written reviews and to draw generalizations that extend beyond the summary ratings alone. The reviews and panel summary contain evaluative material and constructive suggestions that may be used by the principal investigator in the conduct of future research regardless of whether a proposal is awarded or declined.

Ezekiel Kalipeni (ekalipen@nsf.gov, 703-292-8457)
Scott M. Freundschuh (sfreunds@nsf.gov; 703-292-4995)
Thomas J. Baerwald (tbaerwal@nsf.gov; 703-292-7301)
Geography and Spatial Sciences Program Directors

# Geography and the National Science Foundation

By Thomas J. Baerwald

(Jan 07, 2005)

## The Broader Context: The National Science Foundation

The National Science Foundation is a different kind of agency. Wander the corridors of its headquarters in the Ballston area of central Arlington, Virginia, and you'll often hear staff members talk about how NSF differs from "mission agencies." Such terminology makes it seem that NSF has no mission, but that is wrong.NSF has a very distinctive mission, and that distinction makes a much different breed of cat that almost all other federal agencies.

Whereas other agencies have specific, targeted missions - to keep the environment clean in the case of Environmental Protection Agency, to facilitate roadway construction in the case of the Federal Highway Administration, to provide weather, water, and climate forecasts and warnings in the case of the National Weather Service - the National Science Foundation is charged with nourishing and sustaining the nation's fundamental science and engineering enterprise.

The basic charge for NSF was laid out in its founding legislation in 1950: "To promote the progress of science; to advance the national health, prosperity, and welfare; [and] to secure the national defense." To characterize what it does, NSF uses terminology associated with an investment model.NSF invests money - federal dollars, which totaled roughly $5.5 billion in FY 2004.It also invests the time, knowledge, and skills of its staff and of many thousands of other individuals who write reviews and serve on advisory panels and committees at NSF.

NSF investments result in grants and cooperative agreements that support a diverse set of scientific research and educational activities. Awards range from small, highly focused grants that provide up to $12,000 to support doctoral dissertation research to science and technology center awards that total up to $40 million over a ten-year period.

NSF expects the projects it supports through its awards to yield products in one or more of three categories - people, ideas, and tools.NSF expects its awards to enhance the knowledge and capabilities of people who will form a competitive science and engineering workforce. It expects its projects to yield discoveries and new knowledge across the frontiers of science. And it expects many of the projects to result in new methods, resources, and other forms of science and engineering infrastructure.

## The Evaluation of Proposals at NSF

NSF evaluates proposals seeking its funds by using external merit evaluation based on peer review. A single-blind process is used, with reviewers asked to comment on the capabilities of the researchers, among other things, while the identity of reviewers is not disclosed to the investigators who submit the proposal. In addition to individual reviews, advisory panels review and provide a comparative evaluation of all proposals under consideration at a specific time.

Regardless of whether evaluated by individual reviewers or by panels, reviewers are asked to consider two major criteria with respect to all proposals. First, they are asked to assess the intellectual merit of a proposed project. Does it draw on and will it contribute to relevant theories? Is it scientifically sound? Are the investigators capable of conducting the proposed research, and do they have the necessary facilities? Will the proposed research help to advance frontiers of understanding within and across disciplines, or will its impact be relatively narrow?

Reviewers also are asked to assess the broader impacts of a proposed activity. How effectively is the research integrated with education? Will the activity help to broaden the diversity of the science and

engineering workforce? Will the research result in databases, methods, tools, or other forms of scientific infrastructure? What is the broader societal significance of the proposed work?

With the funding rates of many NSF competitions being 20 percent or less (meaning that fewer than one in five of all proposals submitted results in an award), the competition for NSF's dollars is extremely intense. Investigators submitting proposals therefore should make the strongest, most persuasive cases possible that their projects will have the greatest possible intellectual merit and the most significant broader impacts.

**The Varied Nature of NSF Competitions**

Although NSF can support research and related activities proposed by individuals from a broad range of institutions, the vast majority of its awards go to universities. The academic orientation of the agency is reflected in its administrative structure. NSF's primary subdivision, the directorate, is similar to a college within a university. The six research-oriented directorates of NSF serve the biological sciences, computer sciences, engineering, geosciences, physical sciences, and social and behavioral sciences.(A separate directorate focuses on education.) Within the directorates are divisions, and within the divisions are programs that generally focus serving specific disciplinary or topically oriented communities. Nearly every program conducts "unsolicited" competitions one or two times each year, although proposals that relate to the interests of two or more communities can be jointly reviewed by multiple programs.

While the standing programs generally focus on more narrowly defined topics and issues, NSF also conducts a set of broader ranging competitions that involve two or more programs and sometimes the entire foundation. In recent years, for example, NSF has conducted major crosscutting competitions dealing with information technology research, biocomplexity in the environment, human and social dynamics, and nanoscale science and engineering.

Before writing and submitting proposals, investigators should spend time exploring which competitions within NSF are most likely to be receptive to their proposed work. The best initial source of such information is the NSF *Guide to Programs*. For more information about different programs and special competitions, you can consult the NSF web site. When preparing proposals, investigators should to rigorously follow the guidelines and policies in the NSF Grant Proposal Guide. All proposal submissions must be made online using the FastLane interactive system. First-time investigators should contact the sponsored projects office at their institution to obtain a FastLane user ID and password.

In addition to doing homework to learn about the formal descriptions, guidelines, procedures, and other issues associated with competitions, investigators should feel welcome to contact relevant program officers. Well in advance of a submission deadline, investigators can send a brief e-mail message to the program officers who will be managing the competition to which a proposal might be directed. The message can include a page-or-so description of the project being developed as well as any relevant questions that the investigators have. If the investigators are wondering whether two or more programs (or competitions) might jointly review a proposal, they should send the same inquiry to all relevant program officers at the same time to facilitate communication among NSF staff who might have mutual interest in the proposed work.

Investigators should plan their research well in advance and leave adequate time for the evaluation of their proposals.NSF sets six months as the maximum amount of time that will elapse between a competition deadline and the time when investigators are notified whether their proposal will be funded or declined. A few additional months may be required to complete the work necessary to make an award based on the proposal, so investigators should generally submit their proposals nine months or longer before the date they hope to begin receiving support. Those seeking funding to start with a summer field season, for example, should submit their proposals in the late summer or early fall of the preceding year.

**The NSF Geography and Regional Science Program**

*(this program is now called **Geography and Spatial Sciences** bwp)*

Investigators engaged in geographic research can seek funding from a variety of sources at NSF. The most likely source of funding may be the Geography and Regional Science (GRS) Program.

Although a standing program within the Division of Behavioral and Cognitive Sciences of the Directorate for Social, Behavioral, and Economic Sciences, GRS funds research that extends well beyond behavioral and social topics. In addition to research on human geography, GRS supports research in physical geography, human-environmental interaction, and geographic information science. A large number of proposals considered by GRS (often more than half) are jointly reviewed with one or more other programs, thereby increasing possibilities for support for meritorious projects.

With an annual budget of almost $4.8 million in FY 2004, the average GRS award supported work for about 2.5 years with annual funding (including both direct and indirect costs) of about $80,000.There is a wide range around those averages, however, with some awards providing up to $200,000 annually for as long as five years while others are much smaller and shorter in duration. The percentage of proposals considered by GRS that result in awards now tends to be in the 15 percent to 20 percent range during each semi-annual competition. GRS also makes about two dozen doctoral dissertation research improvement (DDRI) awards annually, with the maximum DDRI award at $12,000.The funding success rate for GRS DDRI proposals usually is around one-third.

The GRS Program does not have predefined topics that are of special interest. Instead, it evaluates proposals submitted by investigators across a diverse range of topics.GRS program directors use the comments or reviewers and advisory panel members to identify projects whose "bang for the buck" is especially significant. The "bang" they are seeking relates to the likelihood that a project will make significant contributions to general knowledge related to geographic theory as well as to its positive impacts. In addition to assessing both the intellectual merit and broader impacts of specific projects, GRS program directors seek to provide support across a broad range of subfields and to leverage GRS funds with contributions from other programs.

GRS has had a long-standing tradition of supporting the development of new methods in geography and related fields in addition to funding basic research on substantive questions. From 1988 through 1999, GRS was the primary source of core support for the National Center for Geographic Information and Analysis (NCGIA) at the University of California-Santa Barbara, State University of New York-Buffalo, and University of Maine. More recently, GRS has managed major infrastructure awards to support the Center for Spatially Integrated Social Science (CSISS) at Santa Barbara and the National Historical Geographic Information System at the University of Minnesota-Twin Cities.

Although some GRS awards have primarily focused on new methodological advances, experience has shown that proposals to advance methods are more successful when they are linked to specific substantive inquiries. A proposal to refine a remote sensing analytic method, for example, will be more likely to receive funding if the refinement of the technique is being made to improve capabilities to answer specific questions that are grounded in a broader theoretical framework.

**Other Opportunities to Support Geographers at NSF**

While GRS Program funds provide nearly $5 million in support each year, an estimated $10 million more has been awarded annually through special competitions to projects that involve geographers and add to fundamental geographic knowledge. Among the competitions in which geographers have been successful have been the Biocomplexity in the Environment special competition on the Dynamics of Coupled Natural and Human Systems and the Human and Social Dynamics competition. Geographers also were successful in competitions that focused on information technology research, including the Digital Government competition.

Because special competitions tend to be conducted for only a limited number of years and topics for

which competitions are held change from year to year, investigators should check the NSF web site frequently to see if competitions of interest to them will be conducted. They can also contact NSF program officers when they formulate ideas to obtain feedback regarding the appropriateness of their plans for one or more special competitions. Although GRS program directors will always be happy to try to assist geographers to find appropriate matches for their ideas, it often is more useful to directly contact the individuals listed as the NSF points of contact for specific competitions. A brief e-mail message with a page-or-so description of what the investigator has in mind usually is the most effective medium for such communications.

---