Notes on Review analysis from PAM

https://inside2.nsf.gov/bfa/dias/policy/pam/pamjan16/6.htm#VIB4

The cognizant PO should note in the Review Analysis that the proposal was triaged. When triage is utilized as an option, the Context Statement should indicate that proposals were reviewed by ad hoc and/or panel review.

The review analysis must clearly indicate that multiple ratings were submitted.

For new awards and renewals, the review analysis section should provide a summary of the major findings of the *ad hoc* review and, if applicable, the advisory committee/panel review that justifies the favorable recommendation. Program Officer analysis should clearly describe how the project addresses both merit review criteria. Reviewer ratings and significant reviewer comments, especially fair and poor ratings that are in apparent conflict with the Program Officer recommendation, should be addressed. Where appropriate, the analysis should indicate how the PI responded to major criticisms.

For declinations, the review analysis should describe how the project addresses both merit review criteria and must contain a brief statement of the reason(s) for declination of the proposal. Significant comments and review ratings in apparent contradiction with the recommendation (i.e., "excellent") must be discussed.

For withdrawals, no review analysis is required; however, the record of the review to date must be kept in the file and a statement of the reason(s) for the withdrawal, if known, should be included.

Program Officers must comment on the intellectual merit and the broader impacts of the proposed activity and how the project addresses both criteria.

Reviewer ratings and significant reviewer comments that are in apparent conflict with the Program Officer's award recommendation should be addressed in the Review Analysis; "fair" and "poor" reviews **must** be addressed. (For awards?)

The analysis should indicate how the PI responded to major criticisms. Any special feature of the review process (for example, a site visit or departure from the standard review procedure used by the cognizant Division) or other information (revised budgets, change of scope, etc.) relevant to the decision should be documented. If a person submitted an independent review for only one proposal and also participated in the panel discussion only for that one proposal,that should be documented in the Review Analysis.

Special instructions and documentation relevant to DGA or DACS should be included at the bottom of the Review Analysis. This includes (but is not limited to):...

... budget changes should be clearly documented in the Review Analysis.

If a person submitted an independent review for only one proposal and also participated in the panel discussion only for that one proposal, that should be documented in the Review Analysis.

...

Program Officers also should comment briefly on the relationship of a recommended award to other current or potential research support of the PI. Such comments may range from "no other support" to "duplicate proposal to be withdrawn" to more extensive comments. Program Officers are encouraged to contact staff at other agencies to obtain clarification of possible overlaps. Such contacts should be documented. If the PI submitted a response to reviewer comments, the Program Officer should address it in the Review Record.

TRIAGE

Inconsistent observance of the new procedure: CHS is only program that I recall. Less work to do the following.

Proposals that receive low *ad hoc* and/or individual panelist reviews prior to commencement of a panel may be triaged by Program Officers.

**Varying levels of "low" – know your rules. Where in the jacket are we specifying what rules were used? Does the DD have guidance?**

A list of the triaged proposals should be provided to the panel at the start of deliberations. Panelists may ask that proposals be removed from the triage list and discussed, if they believe there is merit in doing so. For proposals removed from the triage list, the procedures outlined in Section 3.c and d below and in PAM Chapter V.D.5 should be followed.

Proposals not discussed by the panel should be given a ranking of "NDP" (Not Discussed in Panel), and the panel summary should be left blank and should be marked "unreleasable". The cognizant PO should note in the Review Analysis that the proposal was triaged. When triage is utilized as an option, the Context Statement should indicate that proposals were reviewed by *ad hoc* and/or panel review.

Awd Rec

NATIONAL SCIENCE FOUNDATION
**Review Analysis**

**Proposal:**1514429 **PI Name:**Feiner, Steven

Cyber-Human Systems
Division of Information and Intelligent Systems
National Science Foundation

Proposal: 1514429
Title: CHS: Medium: Collaborative Research: Augmented Reality for Multiple People, Perspectives, Platforms, and Tasks
PI: Feiner, Steven K.
Institution: Columbia University
collaborative with
Proposal: 1513841
Title: CHS: Medium: Collaborative Research: Augmented Reality for Multiple People, Perspectives, Platforms, and Tasks
PI: Tversky, Barbara
Institution: Teachers College, Columbia University

This was one of 13 projects considered by a Cyber-Human Systems Medium panel, P151530, that was held April 23-24, 2015. This panel recommended 5 projects for possible funding, rating 2 of them Highly Competitive, and 3 of them Competitive. The panel rated this proposal Highly Competitive. One of the panelists had a conflict of interest with respect to this proposal, was not present for the discussion, and did not in any way influence the recommendation. The Cyber-Human Systems program officers recommended support for this proposal.

This is a project to improve the utility of augmented reality for tasks involving physical objects and geographic spaces.

Reviewers rated this proposal Excellent (1), Very Good (1), and Good to Very Good (1).

A key factor in the decision to recommend funding for this project is the fact that augmented reality (AR) appears poised for rapid development at this point in time, and the expertise of the PIs prepares them well to contribute significantly to what may be a major transformation. Two forms of AR are described in the proposal, head-mounted displays (glasses) which are heavily being promoted by several major corporations, and handhelds employing cameras which have already been deployed by the millions. Here is the panel's justification for a Highly Competitive classification: "The panel felt this was a strong proposal with few weaknesses and an excellent team that has been at the forefront of AR research for many years. The proposal asks an excellent set of questions that, when answered, will advance the state of the art in AR."

The reviewer who rated this proposal Excellent praised the nice balance of diversity and integration of the several projects that justify this being a Medium project rather than a Small one. The reviewer who gave a Very Good rating said that the research was somewhat incremental, but that criticism is rendered less significant by both the high quality of the researchers and the fact that VR seems to be at a turning point when some very good and well founded research could be more significant than usual in its consequences. The least enthusiastic reviewer felt that more detail about some of the

studies could have been provided, although of course the PI faced a trade-off between explaining one part of the work in depth versus saying enough about all the projects to render the overall plan intelligible to readers of the proposal.

Among the broader impacts is the exploration of AR technology within a minority community of East Harlem, New York City, which not only will be valuable for the participants, but potentially shape the course of VR's future development to be valuable for more diverse communities than is often the case for new information technologies. As one reviewer explained, "The project will also train graduate students and some undergraduates and include students in class with the PI and co-PI as well as students in journalism at Rutgers University who will use software developed during the project." Reviewers also saw benefit in potential applications, "from repair technician training to aiding surgical procedures," and "to improve navigation and maintenance and assembly, tasks that are quite common to daily life."

On the basis of the written reviews, the very positive recommendation from the panel, and consideration of the entire Cyber-Human Systems portfolio, I recommend that this set of two collaborative proposals be supported at the levels requested, as continuing grants from funds allocated to Cyber-Human Systems:

1514429 Feiner, Steven K. = $802,286
Fiscal Year 2015: $260,275
Fiscal Year 2016: $267,351
Fiscal Year 2017: $274,660

1513841 Tversky, Barbara = $397,714
Fiscal Year 2015: $104,141
Fiscal Year 2016: $144,014
Fiscal Year 2017: $149,559

William Sims Bainbridge, Ph.D., July 20, 2015

Awd Recc w/ Fair Review

NATIONAL SCIENCE FOUNDATION
**Review Analysis**

**Proposal:**1527410 **PI Name:**Sawyer, Steven

Cyber-Human Systems
Division of Information and Intelligent Systems
National Science Foundation

Proposal: 1527410
Title: CHS: Small: Governance of scholarly digital infrastructures: comparing interoperability, interconnection, capacity management, and systems management
PI: Sawyer, Steven B.
Institution: Syracuse University

Title simplification: Governance of Scholarly Digital Infrastructures

This was one of 20 projects considered by a Cyber-Human Systems Small panel, P151908, that was held June 1-2, 2015. This panel recommended 6 projects for possible funding, rating 2 of them Highly Competitive, and 4 of them Competitive. The panel rated this proposal Competitive. One of the panelists had a conflict of interest with respect to this proposal, was not present for the discussion, and did not in any way influence the recommendation. The Cyber-Human Systems program officers recommended support for this proposal.

This is a project to study the governance of scholarly digital infrastructures, comparing interoperability, interconnection, capacity management, and systems management.

Reviewers rated this proposal Excellent (1), Very Good (1), and Fair (1).

The panel began its consideration of intellectual merit by agreeing, "Overall, the panel felt that this proposal addresses an important area of research." The reviewer who rated the proposal Excellent added, "The proposed work... is well thought out. The PI is excellently positioned to carry through this work. The work, if funded, would lead to important understandings and a body of data that would be a treasure trove for future research." The reviewer who gave the Very Good rating listed several intellectual strengths, including the well conceptualized and detailed plan of work, appropriateness of the research methods, and good grounding in theory.

The reviewer who gave the Fair rating raised two questions that required later analysis. One was that early pages of the proposal make a distinction between DI (digital infrastructure) and CI (cyberinfrastructure), but it does not do much with this comparison later on. I suspect that this reviewer missed the crucial definition of DI, especially this sentence in the proposal's project summary: "A DI is about access to data artifacts and is a subset of what a cyberinfrastructure (CI) provides." Thus, the discussion of DI/CI was not intended to set up a comparison between two different phenomena, but CI was mentioned to provide background for the discussion of the topic of the proposal, which is DI. The other question raised by this reviewer had more substance, and was summarized in the review's final sentence: "The work plan would be strengthened by evidence of preliminary engagements with field sites (for data collection) and with policy-making bodies (for broader impact)." In addition, the panel was not completely convinced that the five sites listed were ideal. I communicated with the PI about this,

and his response was uploaded in a diary note. He had verified the accessibility of the five sites, but it is also the case that many other suitable sites exist, so the researcher could change the particular set to be studied, in response to the reviewers' comments, logistical changes at a particular site, or findings early in the research that suggest a different site would provide the best comparison.

The most direct of the broader impacts is the subsequent improvement of access systems for scholarly digital infrastructures, based on the findings of this research. But there are also impacts in education and dissemination, as summarized by one reviewer: "The proposed research will support and train students at all levels, including undergraduates, master's and doctoral. The PI will integrate the results of this research into course offerings. The research will also inspire several workshops at relevant professional conferences that will focus on DI governance, gathering researchers from multiple disciplines."

On the basis of the written reviews, the panel discussion, and consideration of the entire Cyber-Human Systems portfolio, I recommend that this proposal be supported at the level requested, $494,511, as a standard grant from fiscal year 2015 funds allocated to Cyber-Human Systems.

William Sims Bainbridge, Ph.D., July 22, 2015

Competitive Decline



Highly Formatted, Descriptive of Process, lengthy
Good job conveying considerations of Pgm.

**NATIONAL SCIENCE FOUNDATION**
Arlington, Virginia 22230
Directorate for Computer and Information Science and Engineering (CISE)
Division of Computing and Communication Foundations (CCF)
Communications and Information Foundations (CIF)

**Review Analysis**

**Program:** CIF: Small (Assigned to Panel P161288; Panel emphasis: Information Theory)
**Organization Code:** 05010000
**Program Element:** 7797
**Program Reference Code:** 7935 (Communications and Information Theory)

**Proposal Number:** 1617063
**PI:** Rose, Christopher
**Co-PI**: Rosenstein, Jacob
**Institution:** Brown University
**Title:** CIF: Small: Communicating With Inscribed Matter

**Requested Amount:** $497,709
**Total Recommended Award:** DECLINE

**Panel Rating**: Competitive
**Reviewer Ratings:** E/V, V, V, V

**Review Procedure(s)**
An advisory panel reviewed this proposal according to the NSF merit review criteria. The panel included reviewers with expertise relevant to the main research thrusts of the proposal. Prior to the panel meeting, the panelists submitted their reviews through Fastlane. Each proposal in the panel was reviewed based on the intellectual merit of the proposed activity, its relevance to CCF objectives, and the broader impacts of the proposed activity. The panel also may have considered additional aspects such as the strength of research and coordination plans, the integration of research and education, and the advancement of diversity in the field.

At the panel meeting, any panelist and/or NSF staff who had a conflict of interest with a proposal left the room for any discussion, and did not participate in any way in the review and decision process. At the end of the panel meeting, the panelists reached a consensus as to a panel recommendation by designating the proposal as one of the following:

- Highly Competitive (HC)
- Competitive (C)
- Low Competitive (LC) (a.k.a. marginally competitive)
- Not Competitive (NC)

The panel recommendation was based on substantive comments from both individual reviews and the

collective assessment of the proposal by the panel, as discussed during the panel meeting and documented by one of the panelists acting as scribe. The resulting panel summary and copies of all individual reviews are included in the jacket and made available to the PIs on FastLane.

The panel paid special attention to and discussed at great length proposals receiving one or more reviews rated as Excellent (E) or Very Good (V) but for which the panel's recommendation was either Not Competitive, Low Competitive or at the low end of Competitive, and proposals that received one or more reviews rated as fair or poor but for which the panel's recommendation was "Competitive". Proposals falling in either of these categories would have very low priority for funding.

**Panel Specifics**
In this CIF Small panel (P161288), five projects received a Highly Competitive rating, four projects received a Competitive rating, and eleven projects received a Low Competitive rating, out of 25 projects considered by the panel. The remaining project(s) were rated Not Competitive. The proposals in this panel were not force ranked, but this proposal sorts as the sixth highest-scored proposal on the panel.

**Scope of Project and Intellectual Merit**
The proposed work is directed toward understanding the fundamental limits of communication systems that do not use radiation, e.g., radio waves, optical transmission, and/or acoustics, but rather use matter, e.g., the emission and reception of molecules of varying complexity. Print media is also an example of such "inscribed matter". The proposal makes a case that communicating with RNA and DNA allows for incredible information density and very low per-bit energy requirements. The goals of the research plan are to (i) develop a general mathematical framework for inscribed matter communication, (ii) carefully quantify the benefits and liabilities of inscribed matter communication, and (iii) demonstrate low power molecular communication links operating at "world-record" data rates.

While the scope of the claimed goals is broad, more than a third of the project description is dedicated to describing a specific and narrow molecular communication channel in which identical molecules are emitted at certain times and they arrive with random delays (and can even arrive out of order). In this setting, the molecules themselves contain no information; all of the information is conveyed in the timing of the received molecules. The problem is then generalized to the case where the molecules carry payloads (like RNA/DNA) so that information is contained in the molecules and their timing.

The theoretical research tasks are expressed in less than a page of the project description and are focused on (i) developing tighter and more general capacity bounds and coding methods, (ii) reconciliation and comparison of the timing channel with the more commonly used diffusion channel, (iii) token/molecule corruption and feedback, and (iv) interference and multiple users. The project also includes a detailed experimental plan to demonstrate communication with inscribed matter (although, like the preliminary results, the emphasis is primarily on the case where the molecules are identical and the information is carried only in the timing of the molecule arrivals).

**Broader Impacts**
The proposal makes the case that even a microgram of RNA or DNA can carry petabits of information and, as such, communication with inscribed matter can offer tremendous data rates with very low energy per bit. From a technical point of view, the broader impacts of this work could be significant if it furthers our understanding of these types of communication channels and storage systems. The proposal states

"in addition to providing the theoretical underpinning and a proof of concept for a new high efficiency communication method, our work may provide a broader technological drive for rapid construction/reading of oligmers (D/RNA, proteins and others). Such technology would certainly impact biology/biocomputation/synthetic biology users of base sequencing/reading. Likewise, molecular communication could benefit from advances in these more biological fields." The PIs also propose to use Brown's "SciToons" composition facility to illustrate the concepts to broad audiences and to train student researchers "with an explicit eye toward attracting under-represented groups into the STEM fold".

**Reviews**

The reviewers were generally positive about this proposal, praising the clear exposition of an interesting and challenging project and the prior work by the PIs. The panel unanimously agrees that the proposed research is of type high-risk with potentially very high return, and may have an even bigger impact beyond the CIF community. Franceschetti (E/V) praises the proposal for its focus on the quantum channel model (as opposed to the more conventional concentration based model) and also notes that the PIs provide a good mix of skills for this project with one PI focused on the theory and the other PI focused on the experimental tasks. Franceschetti criticizes the proposal, however, for the limiting symmetry assumptions necessary to compute the capacity bounds in the preliminary results. Neuhoff (V) mostly summarizes the project in his review but offers "this is an interesting and challenging project". Neuhoff does not note any weaknesses. Serpendin (V) does not offer much praise or critique of the intellectual merit, but praises the potential for broader impacts and characterizes the project as "revolutionary". Cuff (V) characterizes the encoding of information into molecules such as DNA as "extremely exciting if feasible" and notes that the scale of the problem is ample. Cuff offers the most substantive criticism of the proposal, however, by pointing out that "If the information carrying capacity is so high in each item of infused matter, then the capacity calculation that arises from timing and out-of-order reception and negligible".

**PD Analysis and Final Recommendation**

In general, the panel was unanimous in its enthusiasm for the idea of communicating with inscribed matter. DNA storage is an active research area and promises incredible information densities, very high durability, and very low energy transmission (although read/write costs are currently high, as noted below). Nevertheless, despite allusions to communicating with RNA/DNA, this proposal is almost entirely focused on computing the capacity of an insertion/deletion timing channel in which all of the molecules are identical and carry no intrinsic information at all. Based on the panel discussion and my own reading of the proposal, I find the Cuff review to be the most insightful. Specifically, if the inscribed molecules are RNA/DNA, then any information conveyed in the timing is negligible compared to the information in the molecule itself. Moreover, out-of-order reception is not a problem in this setting since embedding a sequence number into the RNA/DNA will also have negligible impact on the payload of the molecules. Hence, while the idea of communicating with inscribed matter is interesting and likely to have broad impacts, I find that this proposal does not address the problem in a credible way. The theoretical aspect of the research plan is also far too brief; the proposal places far too much emphasis on developing prior results that have been on Arxiv since 2013 (and apparently not accepted for publication as of March 31, 2016). Moreover, the PIs' understanding of the costs of communicating with inscribed matter seems to be somewhat limited; there is no consideration of the costs of writing/reading messages to molecules. These costs, e.g., energy, time, can be quite high with current technology if the "inscribed matter" is DNA/RNA. I also considered this proposal in relation to other proposals reviewed in this and

other panels, the need to maintain appropriate balance among subfields, the total amount of funds available to the program for new proposals, and general Foundation policies. In light of all of these considerations. I have little choice but to recommend that it be declined.

D. Richard Brown III
Program Director
CISE/CCF/CIF

HC Decline

NATIONAL SCIENCE FOUNDATION
**Review Analysis**

**Proposal:**1618820 **PI Name:**Choe , Eun Kyoung

Short statement of the proposal and reviewing context:

This proposal is about supporting aging-in-place by finding effective, privacy- and dignity-respecting ways for children and their older adult parents to share and collaborate around activity tracking data to create a "culture of health within families". Through a participatory design approach, the goal is to learn about families' needs and values around sharing and using health information, develop and evaluate prototypes in-lab, and do a longer-term deployment to better understand the effects of such technologies. Broader impacts will accrue through the work itself and the knowledge created, as well as the use of the design process as a service learning opportunity that will both enhance the school's existing curriculum and broaden participation through attracting members of underrepresented groups. The work follows a line of smart home work in HCI that shares the aging-in-place concerns of this proposal; however, rather than focusing on sensors embedded in the home, the proposal looks at mobile/wearable technologies more associated with quantified self-style activity tracking.

The proposal was reviewed on panel P161307, an 8-person panel that met April 7 and 8 in person at NSF with one remote participant via telephone. The panel reviewed 22 projects (4 HC, 4 C, 8 LC, 0 NC, 6 NDP); this proposal was rated HC and received three reviews with ratings of E/V, V, and V/G. No panelists declared a COI so all participated in the discussion, and the reviews and panel summary are released in eJacket.

Evaluation of intellectual merit and broader impact:

The panel saw the intellectual merit as quite strong. They were excited by the problem and its formulation; they saw it as novel, timely, and creative. They particularly liked the focus on families rather than individuals, as well as the emphasis not just on providing data about adults to the children in a kind of big brother role, but on actual "interaction and collaboration" around those data. Panelists also appreciated that the team plans to produce both practically useful technologies and more generalizable insights into the requirements and needs of families around this kind of health activity data sharing. Further, they saw the plan as solid, appropriate, and well-justified; there was a minor concern about the size of study population (around 25, half children and half parents), but panelists decided that for this style of work it was a reasonable number of participants. They also saw the partnership with a local retirement community as a strength that mitigated risks around recruitment and the team as having the skills to carry this off.

The panel also saw merit in the broader impacts. They saw real potential impacts of the work and tools on quality of life for older adults -- though wished there had been a more concrete plan for how these would be disseminated -- as well as wider impacts through disseminating the guidelines described above. In their reviews, panelists also noted good educational impacts. The team has a history of broadening participation and plans to use the project to recruit people from underrepresented groups, seeing this kind of service learning/community-situated research as especially attractive to such groups. The team also intends to use both the research activities themselves and the resulting data as resources for courses, although "the proposal does not spend very

much time developing" these ideas. Still, on balance the panel rated the proposal quite strongly on broader impacts as well.

At a high level I agreed with the panel's read, though with a major reservation. I agreed that focusing on collaborative vs. individual approaches to working with health data is a promising and relatively new direction and that a high level all the strengths noted above were there in both intellectual merit and broader impacts.

The major reservation is that the proposal is missing references to a growing body of literature that is studying exactly these questions of information sharing in aging in place contexts. Its references are too centered in the HCI/CSCW literature in smart homes and miss important work in the gerontology and medical fields. This often happens when researchers reach into other domains and fields, but means that much of the first third of the proposal around understanding values and needs might be redundant. I had noted this in my own read, and asked Wendy Nilsen to take a look from the point of view of SCH. She confirmed that there is a lot of existing work about data sharing and privacy and that this proposal had not engaged with that work. There is a counter-argument to using general insights, that you need to be intimately familiar with specific populations to design well for them, but the proposal didn't make that argument, and this was a real problem.

Recommendation:

Although there are clear strengths to the proposal on both the intellectual merit and broader impacts front, in the end three things weigh it down: (1) the concern that much of the formative work might be unnecessary/redundant/ill-informed described above; (2) real skepticism on the part of other CHS program officers that older adults would be willing to do this kind of data sharing (which might also be at least partly addressed by better engagement with the literature); and (3) portfolio balance issues, as there was a similar, stronger proposal on this panel around collaborative use of health data in families (in that proposal's case, younger children living with parents).

Given these concerns and discussion with other program officers, on behalf of the program I recommend this proposal be declined.

Dan Cosley, Ph.D.
Cognizant Program Officer

Awd Recc - Relatively low review scores

**NATIONAL SCIENCE FOUNDATION**
Arlington, Virginia 22230

**Division of Information and Intelligent Systems (IIS)**
**Information Integration & Informatics Program (III)**

**Program Solicitation NSF 14-596**
**Information and Intelligent Systems (IIS): Core Programs**
**Small Projects**

**Review Analysis**
**(Form 7)**

**1527984 Tsotras, Vassillis University of California-Riverside**
**III: Small: Discovering Hidden Semantics from Spatiotemporal Sensed Data**

**Review Process:**
This collaborative proposal was among 16 IIS-III-Small proposals reviewed by the advisory panel (P151883) dedicated to the review of Information Integration & Informatics Program (III) proposals in the areas of spatio-temporal informatics (ST).

All panelists and NSF staff, if any, who had a conflict of interest with any proposal left the room before the discussion of it began and did not participate in any way in the review and decision process. Conflict of Interest information is recorded in the Review Record/Form 7.

Reviews were submitted prior to the panel meeting through Fastlane and used as the basis of the panel discussion. The panel took into consideration available ad hoc reviews. The panel used a pre-approved triaging process to focus the attention and efforts of the panels and the PDs on identifying the Competitive and Highly Competitive proposals, while maximizing the quality of the outcome of the panel review process. Each of the proposals under review by the panel was considered, one at a time, as a candidate for detailed discussion, based on the panelists' individual review ratings. Each proposal with at least one review rating of "Very Good" or better was retained for an in-depth discussion, as was any proposal that at least one panelist wanted discussed (regardless of the reviewer ratings). Each proposal that was not chosen for in-depth discussion by the panel was placed in the "Not Recommended for funding by Panel" category, by unanimous consent of the panelists who did not have a conflict of interest with the proposal under consideration. Verbatim copies of individual reviews are being provided to the PIs of the triaged proposals. In the case of triaged proposals, the individual reviews are included in the jacket along with a standard panel summary for the triaged proposals.

The proposals that were not triaged were retained for discussion by the panel. The panel discussed separately both the intellectual merit and broader impacts. Panelists were instructed to make a recommendation in one of four categories: Highly Competitive (at most 10% of proposals), Competitive (at most 20% of proposals), Low Competitive (LC) and Not Recommended for Funding by Panel (NRFP) (at least 70% of LC and NRFP proposals, including the triaged NRFP proposals) and rank the proposals in HC and C categories. In the case of proposals discussed by the panel, the resulting panel summary and copies of all individual reviews are included as part of the jacket.

The panel placed 1 proposal Highly Competitive, 3 in Competitive, 3 in Low Competitive, 8 proposals in Not Recommended for Funding by Panel category, and 1 proposal was not placed in any category, as the panel recommended another evaluation in the multimedia panel.

**Reviews:**
The individual review ratings for this proposal are predominantly strong: V, V, V, F.

The panel placed this proposal in the "Competitive" category and ranked it as 4th out of 16 projects.

Intellectual Merit (Criterion I):
The goal of proposed project is harnessing very large spatio-temporal trajectory datasets created by deployment of monitoring and tracking mechanisms, including video cameras, cellular phones, activity trackers and roadside sensors and enabling discovery of high-level information about the behavior of moving objects as well their interactions with each other and with objects in the environment from the trajectory data.

The research approach addresses a class of problems in the spatio-temporal domain, which pose technical challenges, including queries that elicit the semantics of "dwell regions", i.e., interactions between moving objects and their environment and "concave queries" eliciting potential interactions (e.g., meetings between moving objects) and interactions in the real-world contexts, where the available data is incomplete and imprecise. The proposed work also explores complex spatio-temporal "reachability" queries, which elicit possible interactions between objects via intermediaries using dynamic and time-dependent graphs. The proposed research is expected to advance the use of Hilbert curves to index trajectories. Finally, given the sheer magnitude of spatio-temporal datasets, this proposed research aims to provide solutions that scale. However, details are lacking for the scalability approach.

The panelists had reservations about the overall framework, as the proposal addresses many issues without a comprehensive plan that would better tie its components together. In addition, the proposal lacks a proper evaluation plan including benchmarks, evaluation metrics, and test datasets.

The PIs have very relevant experience in spatial and spatiotemporal problems including spatial joins, moving objects, indexing trajectories, or spatial aggregation.

Broader Impacts (Criterion II):
The resulting techniques are likely to have a broad impact in a range of applications dealing with trajectory data, such as surveillance, traffic or scientific domains. However, the proposal lacks concrete plans for collaboration with stakeholders.

The proposed activities include a strong educational component that is well integrated with the research. The UC Riverside student body includes a large number of underrepresented students and the proposal includes a credible plan for broadening participation activities.

The inclusion of undergraduate students via an embedded REU request in the requested budget was viewed as a sign of commitment to work with students.

Postdoctoral Mentoring Plan (if applicable):
N/A

Data Management Plan:
The plan for dissemination of the developed tools (including source programs), test data, and other results is well presented.

Collaborative Plan:
N/A

Results from Prior NSF Support and Track Record:
PIs have a strong research track record. The research results indicate significant intellectual merit contributions and were reported in strong publications and conference presentations. The PIs also widely disseminated software and engaged in broader impact activities.

The results are of high quality, therefore, the ambitious proposed research is likely to succeed and contribute new fundamental results and have significant broader impacts.

Fair Review:
The reviewer rated the proposal Fair. The points raised by the reviewer include the incremental nature of the proposed research and too many topics addressed without a cohesive framework. While these are valid concerns, they are not serious problems.

Majority of reviewers considered this proposal to be solid, and the panel agreed to place the proposal in the Competitive category.

I concur with panel's consensus.

Recommendation:
This proposal received favorable reviews. The proposal formulates several novel classes of queries that elicit the semantics of interactions between moving objects and their environment, where the available data can be incomplete and imprecise. The panel included suggestions for improving the proposal, including a well-planed evaluation plan and closer collaboration with domain experts.

The proposal was discussed together with other strong proposals by Information Integration & Informatics (III) Program Directors in who had no conflict of interest with III-Small proposals. Taking into consideration the strength of both the Intellectual Merit (Criterion I) and Broader Impacts (Criterion II) Merit Review Criteria, **III Program recommends the proposal for funding**. The recommendation has also been made taking into account the specifics of the III scope, the need to maintain appropriate balance among subfields, the availability of other funding for the topic area, the total amount of funds available for the III proposals, and general Foundation policies.

Since the reviewers made some suggestions for improvement, I asked the PI to submit an updated "Research and Education Plan" (see Correspondence) and specifically address reviewers' comments in "Response to Reviewers' Comments" (see Correspondence). This additional information is a satisfactory response to the reviews and provides a good roadmap for the proposed project.

PI History and Current & Pending Support:
I requested an updated statement of the PIs' Current & Pending Support, in order to determine the PIs' level of commitment in other supported projects. There were no changes. Although the PIs have other current support, the have the capacity to carry out this proposed research (see Correspondence: Current & Pending Support).

Human Subjects:
N/A

I recommend the award in Information Integration & Informatics Program (III) (05020000, 7453) as a **standard grant** at the reduced level of **$500,000 for 3 years**, with the **effective date** of **September 1, 2015**.

The requested support reduction of was necessary due to the III budget limitations. The PIs were asked to remove the requested REU support from the 1st year of the budget and are encouraged to request an REU Supplement annually, as appropriate. The PIs provided satisfactory Revised Budget and "Budget Impact Statement".

*Maria Zemankova, Ph.D.*
Program Director, III/IIS/CISE

Eager Awd

NATIONAL SCIENCE FOUNDATION
**Review Analysis**

**Proposal:**1647427 **PI Name:**Ware , Stephen

Information and Intelligent Systems Division
Cyber-Human Systems Program

Short statement of the proposal and reviewing context:

EAGER - NO PEER REVIEW REQUIRED

The goal of this project is to improve the software that generates stories automatically for virtual environments like training simulations and educational games. Specifically, the software will be able to reason about what is actually true, what each character thinks is true, what they think others think is true, and so on, to improve the way virtual characters act and make them seem more believable and more human. Current approaches to designing these narratives often assume agents know everything about others' beliefs and goals; this often leads to inconsistent or un-believable behaviors by the agents, which damage the credibility of the software and quality of the experience for their human users. The proposal will extend the lead researcher's existing narrative planning system, using an approach that lets agents consider multiple sets of beliefs that are consistent with their own and others' actions so far, ruling out situations where agents have beliefs that are inconsistent with their actions. Compared to existing approaches, this should allow the narrative planner to generate a wider variety of narratives that are also more believable to humans, as well as to handle situations such as trickery and uncertainty where reasoning about beliefs is crucial. The research team will test the software and these assumptions through several experiments that ask people to compare narratives generated by the new software to those generated by state of the art methods. If successful, the project sets the stage to improve the quality of systems where virtual agents interact with humans such as smart phone assistants, online games, automated customer chat tools, and educational software. In particular, the work will lead to training scenarios where understanding others' beliefs is crucial, such as officer-citizen interactions. The work is also interdisciplinary, ranging from computer science to psychology, and the lead researcher is committed to training young researchers to do work that crosses these intellectual boundaries and to recruiting researchers who might not otherwise participate in computer science-related research.

In the work, the lead researcher proposes to develop a model of agent belief based on doxastic modal logic and possible worlds reasoning suitable for use in a planning algorithm that coordinates a virtual environment. By supporting a single modal 'believes' predicate, the planner can treat the narrative search space as a Kripke structure to reason about epistemically accessible states. This improves on previous models by allowing arbitrarily nested beliefs while simultaneously reducing the burden on the virtual environment's author to write alternative scenarios, thus increasing their flexibility and expressiveness. The research team will integrate this model of beliefs into a prototype system based on the Glaive narrative planner previously developed by the lead researcher. This prototype will take advantage of Glaive?s existing heuristic-driven state-space search techniques: in addition to expanding temporally accessible states, Glaive will also expand epistemically accessible states and track when an action taken by an epistemic child can be anticipated by its epistemic parent in the Kripke structure. The initial prototype will be too slow for real-time use, but it will be suitable for

conducting the proposed experiments that investigate to what extent such a model improves the believability of agent behavior in automatically generated stories. In particular, the team will study whether the planner produces narratives whose structure better meets the expectations of a human audience: that is, the model will answer questions about agent beliefs more similarly to a human audience and the resulting planner will generate stories more like those composed by human authors. Further, the prototype is expected to solve certain narrative planning problems which algorithms that lack a model of agent beliefs cannot solve. These claims will be evaluated by having the new prototype and two state-of-the-art planners generate narratives for a library of scenarios to be developed by the team that rely on agents having a theory of mind for other agents, then asking both the systems and human users a number of questions about the generated narrative and agents' beliefs to evaluate how well the planners' output conforms with humans' expectations and believability.

According to the current version of the Proposal and Award Manual effective January 25, 2016 (cf. https://inside2.nsf.gov/bfa/dias/policy/pam/pamjan16/toc.htm), this proposal is exempt from the requirement for peer review under Section V.B.2 "Exceptions to External Merit Review" Paragraph j: "proposals for EArly-Concept Grants for Exploratory Research (EAGER), as defined in the Grant Proposal Guide."

Evaluation of intellectual merit and broader impact:

This proposal qualifies as an EAGER as per the GPG, in that the research is especially "high risk-high payoff" and engages novel interdisciplinary perspectives, it represents exploratory work in its early stages on untested but potentially transformative ideas and approaches, and the effort is likely to catalyze rapid and innovative advances.

This particular EAGER is based on the related CHS small proposal 1618975 by the PI, which also proposed a modal logic-based planner to support reasoning about beliefs. The panel saw great novelty and potential in this idea compared to existing planners, but judged the proposal too risky because the whole proposal turned on this question of whether a modal logic-based planner would in fact generate more believable narratives and they wanted to see some evidence. This EAGER will allow the PI to directly address this risks quickly and at relatively low cost, supporting future work and proposals in this area (assuming the approach bears fruit here). Thus, I see a good amount of intellectual merit in trying this out.

Further, the proposal speaks directly to both the interdisciplinary goals of EAGERs and there are concrete plans around working with PhD students from underrepresented groups, giving it some direct broader impacts in addition to the 'long con'/if-this-is-successful claimed impacts. These are also satisfactory broader impacts for the scope of an EAGER.

Recommendation:

The proposal has good intellectual merit and broader impacts. Further, it is good from a portfolio balance point of view: the PI is junior, the university is not a 'usual suspects'

place and is in an EPSCoR state, and the focus on virtual agents is distinctive relative to other work from the CHS core portfolio this year.

Given these virtues, I recommend that this proposal be funded:

- at the level requested by the PI ($156,969), to be paid from my single signature pot.
- as a 12-month standard award starting on the requested date of 8/15/2016.

Other award notes:

- On other funding for the PI: the PI currently has a CRII award that pays no summer salary, so there are no issues of overcommittment. The EAGER will build on that work, with the new focus on agent reasoning about beliefs and human believability.

- On IRB: The institutional IRB has judged the work exempt; their determination is uploaded in the human subjects section of the jacket.

Dan Cosley, PhD
Cognizant Program Officer

EAGER DECL - Special Mechanism

NATIONAL SCIENCE FOUNDATION
**Review Analysis**

More ?

**Proposal:**1548772 **PI Name:**Mazzucato , Anna

This EAGER was submitted in response to a DCL from IIS in collaboration with Dept. of Treasury Office of Financial Research. EAGERs are exempt from external merit review according to the PAM. According to the MOU and DCL, OFR and NSF considered first the white paper and then, for invited submissions, the full proposal for match to OFR mission and NSF computing innovation. The OFR analysis is uploaded in EJ in CORRESPONDENCE.

This proposal was one of set of EAGERs requested following submission of white papers in FY15. The funding for success EAGERs would be provided by OFR and the consideration of the proposals involved both OFR experts and NSF. The program director associated with CIFRAM has left the Foundation in January 2016 and the current PD is clearing the jackets. No indication of correspondence with the PI was provided by the previous PD.

his proposal would use a new mathematical tool to value complex financial derivatives inn realistically complicated economic environments. The proposal intends that this would be much faster than tools commonly used in finance.

Intellectual Merit

The earlier work of the PI was a significant advance for pricing European options in a special setting. While the new work is a more realistic instrument, reviewers thought that the match was less relevant and that the overall affect would not be an advance on the standard tools.

Broader Impacts
The anticipated increase in speed would be transformative but there was no sense that more than simplistic price behavior would be possible and thus the tool would have no OFR impact.

Given the negative assessment by OFR, agreed by NSF, the decision is to decline this EAGER.

Sylvia Spengler
CISE/IIS/CIFRAM

**NCS 2016 Award and Decline Processing** July 6, 2016

**Divisional and Program Officer Assignments:**

The NCS 2016 competition was organized around four themes. Divisional and program officer assignments are indicated according to the following chart:

| **Solicitation theme (indicated by proposer)** | **Divisional assignment: panel phase** | **Panel assignments** | **Divisional assignment: post-panel** | | **Program officer assignment: post-panel** |
|---|---|---|---|---|---|
| | | | ***Declines*** | ***Awards*** | |
| Neuroengineering and Brain-Inspired Concepts and Designs | CISE/IIS | Determined by PO team according to scientific topics and approaches | ENG/ECCS | Mostly by theme, with some exceptions to balance load and align projects with divisional interests | Assigned such that most proposals are manged by the program officers who paneled them |
| Individuality and Variation | | | SBE/BCS | | |
| Data-Intensive Neuroscience and Cognitive Science | | | CISE/IIS | | |
| Cognitive and Neural Processes in Realistic, Complex Environments | EHR/DRL | | EHR/DRL | | |

**Context Statement:**

NCSFY16 should already be associated with all FY16 NCS jackets. If it is missing, NCSFY16 can be added in e-jacket under Data Maintenance... Review Summary... Context Statement ID.

**Boilerplate Declines:**

Boilerplate review analyses should be used for all proposals that were Not Competitive or Not Discussed. If there were any Excellent ratings, they must be specifically addressed. A PO Comment is also required for proposals that were not discussed.

Standard boilerplate documents will be uploaded before these proposals are transferred to the program officer for action.

Program officer is responsible for **checking and releasing** reviews and panel summary, **editing the COI statement** as needed, signing the RA, and clicking through the decline recommendation in e-jacket. This process and the boilerplate documents are the same across all divisions.

The boilerplate documents, based on last year's NCS documents and 2016 guidance on triaged proposals, are as follows:

*Not Discussed*

In case a panel summary was uploaded by mistake, **mark it unreleasable**, then use boilerplate...

PO Comment:

This proposal was reviewed by a panel that placed it in the NOT DISCUSSED IN PANEL category in accordance with the procedure described below.

Each of the proposals under review by the panel was considered, one at a time, as a candidate for detailed discussion, based on the panelists' individual review ratings. Each proposal with (a) at least one review rating of "Very Good/Good" or better, or (b) with all review ratings of "Good," or (c) with at least one panelist who wished to have a discussion (regardless of reviewer ratings) was retained for in-depth discussion. Reviewers with a conflict of interest on a proposal did not participate in determining whether a proposal would be discussed in depth. Each proposal that was not chosen for in-depth discussion by the panel (i.e., with no review rating of "Very Good/Good" or higher, with at least one review rating of "Good/Fair" or lower, and for which no panelist asked for discussion) was placed in the "Not Discussed in Panel" category, by unanimous consent of the panelists who did not have a conflict of interest with the proposal under consideration. Verbatim copies of individual reviews are being provided to the PIs for those proposals that were subject to abbreviated discussion as a result of this process.

Review Analysis:

NATIONAL SCIENCE FOUNDATION
Arlington, Virginia 22230

Directorates for Computer and Information Science; Education and Human Resources; Engineering; and Social, Behavioral and Economic Sciences

Solicitation NSF 16-508 - Integrative Strategies for Understanding Neural and Cognitive Systems (NSF-NCS)

This proposal was reviewed by a panel that placed it in the NOT DISCUSSED IN PANEL category.

*[CHOOSE/MODIFY AS APPROPRIATE:]*
*None of the panelists or NCS program officers assigned to this panel had a conflict of interest affecting this proposal.*
*One/two/... panelist had a conflict of interest with this proposal. The conflict flag was set in the system and the panelist did not participate in any way in the review and decision process.*
*An NCS program officer assigned to this panel had a conflict of interest affecting this proposal, and did not participate in any way in the review and decision process.*

Each of the proposals under review by the panel was considered, one at a time, as a candidate for detailed discussion, based on the panelists' individual review ratings. Each proposal with (a) at least one review rating of "Very Good/Good" or better, or (b) with all review ratings of Good or (c) with at least one panelist who wished to have a discussion (regardless of reviewer ratings) was retained for in-depth discussion. Reviewers with a conflict of interest on a proposal did not participate in determining whether a proposal would be discussed in depth. Each proposal that was not chosen for in-depth discussion by the panel (i.e., with no review rating of Very Good/Good or higher, with at least one review rating of Good/Fair or lower, and for which no panelist asked for discussion) was placed in the "Not Discussed in Panel" category, by unanimous consent of the panelists who did not have a conflict of interest with the

Commented [WKC1]: DELETED TEXT ON NOT PARTICIPATING IN THE (NONEXISTENT) DISCUSSION

proposal under consideration. Verbatim copies of individual reviews are being provided to the PIs for those proposals that were subject to abbreviated discussion as a result of this process.

On behalf of the program, I recommend that this proposal be declined,

*Name*
Cognizant Program Officer

***Not Competitive***

If any of the reviewers rated the proposal Excellent, briefly address that review as indicated below.

Review Analysis:

NATIONAL SCIENCE FOUNDATION
Arlington, Virginia 22230

Directorates for Computer and Information Science; Education and Human Resources; Engineering; and Social, Behavioral and Economic Sciences

Solicitation NSF 16-508 - Integrative Strategies for Understanding Neural and Cognitive Systems (NSF-NCS)

This proposal was reviewed by a panel that placed it in the NOT COMPETITIVE category.

*[CHOOSE/MODIFY AS APPROPRIATE:]*
*None of the panelists or NCS program officers assigned to this panel had a conflict of interest affecting this proposal.*
*One/two/... panelist had a conflict of interest with this proposal. The conflict flag was set in the system and the panelist left the room before the discussion began and did not participate in any way in the review and decision process.*
*An NCS program officer assigned to this panel had a conflict of interest affecting this proposal, and left the room before the discussion began and did not participate in any way in the review and decision process.*

The panel and/or the individual reviews (as applicable) discussed separately both the intellectual merit and broader impacts of this proposal, and judged that it was deficient. Issues of intellectual merit could include a failure to advance knowledge significantly within the field or poor organization of the proposed work. Issues of broader impacts could include weakness of educational aspects or little benefit of the proposed activity to society.

*[IF NEDED, INCLUDE AND EDIT THIS PARAGRAPH:] A reviewer who rated the proposal Excellent (or Excellent/Very Good, etc.) commented on.... XYZ. These strengths and weaknesses were discussed by the panel and factored into the panel's consensus recommendation.*

The resulting panel summary (where applicable) and copies of all individual reviews are included as part of the jacket. The recommendation was based on substantive comment from both individual reviews and the panel summary. It has taken into account both the peer recommendation and the availability of funds and considered the other proposals reviewed in this and other panels. The recommendation has also been

made taking into account the specifics of the program scope, the need to maintain appropriate balance among subfields, the availability of other funding for the topic area, the total amount of funds available to the program for new proposals, and general Foundation policies.

On behalf of the program, I recommend that this proposal be declined, because of one or more of the above factors.

*Name*
Cognizant Program Officer

**Awards and Competitive Declines:**

We do not have a rigid required template. For examples, see:
1631550/Bassett (award recommendation)
1533547/Pestilli (decline recommendation)

Here is a suggested format based on those examples. Feel free to use or adapt as needed, or to use another substantively similar format:

Review Analysis:

NATIONAL SCIENCE FOUNDATION
Arlington, Virginia 22230

Directorates for Computer and Information Science; Education and Human Resources; Engineering; and Social, Behavioral and Economic Sciences

Solicitation NSF 16-508 - Integrative Strategies for Understanding Neural and Cognitive Systems (NSF-NCS)

This proposal was received by NSF for the January 26, 2016 Integrative Strategies for Understanding Neural and Cognitive Systems (NCS) deadline and was reviewed by an NCS panel on *April 18-19/21-22, 2016.* Individual reviewers assigned to this proposal evaluated its intellectual merit and broader impacts according to NSF's standard criteria, as well as solicitation-specific criteria as outlined in the program solicitation. At the end of the panel meeting, the panelists reached a consensus recommendation to NSF (Highly Competitive, Competitive, Not Competitive, or Not Discussed in Panel). The panel recommendation for this proposal was based on substantive comments from both individual reviews and a collective assessment of the proposal by the panel.

Individual review ratings and panel recommendations for this proposal were as follows:
*X, X, X*
*COMPETITIVE*

*[CHOOSE/MODIFY AS APPROPRIATE:]*
*None of the panelists or NCS program officers assigned to this panel had a conflict of interest affecting this proposal.*
*One/two/... panelist had a conflict of interest with this proposal. The conflict flag was set in the system and the panelist left the room before the discussion began and did not participate in any way in the review and decision process.*

*An NCS program officer assigned to this panel had a conflict of interest affecting this proposal, and left the room before the discussion began and did not participate in any way in the review and decision process.*

Summary of Proposed Work

*The PIs propose to...*

Intellectual Merit

*Strengths, weaknesses, evaluation*

Broader Impacts

*Strengths, weaknesses, evaluation*

Solicitation-specific criteria *[if not already covered above]*

*Strengths, weaknesses, evaluation*

Data Management Plan:

Post-doc mentoring plan (if applicable):

Evaluation and Recommendation

*Brief rationale as needed*

Based on the reviews and panel summary, the program solicitation, availability of funds, and the review analysis described above, I recommend...

*Funding table if applicable*

*Name*
Cognizant Program Officer
*Date*

**Other General Considerations:**

When you check reviews and panel summaries for inappropriate material, use redaction only to protect identifying information (about reviewers or proposals). Use strike-through any other unacceptable material. (More at PAM VI.B.3c (4) Reviews Requiring Special Handling.)

Include a PO Comment in cases **where discrepancies in reviews may need explanation** and/or **where innovative ideas could be discussed and possibly encouraged** for a future NCS proposal.

Rather than writing lengthy comments, feel free to invite further discussion by using a minimalist PO comment such as:

| |
|---|
| Program would welcome further discussion of the project and reviews. Contact the cognizant program officer to schedule a discussion. |