Multi-Disciplinary Basic Research in the Science of Autonomy with Naval Relevance
BAA 09-008

QUESTIONS & ANSWERS 19 – 53
As of 18 November 2008

Q 19:	From the Q&A it seems to be that industry CANNOT be the prime. Correct?
A 19:	See Answer 4 of the "QUESTIONS & ANSWERS" dated 29 October 2008.
Q 20:	Is it permissible to include an industry (who are a Navy contractor) in the above team? If it is permissible to do so, could the industry member of the team be included in the estimated budget?
A 20:	See Answer 4 of the "QUESTIONS & ANSWERS" dated 29 October 2008.
Q 21	How is the structure of this BAA related to a MURI? It seems similar in scale, so are other features similar, such as: will only one be awarded, or possibly up to 3 (judging by the funding limit and total funds)?
A 21:	This effort is allowing proposals of a wide range of funding sizes up to the maximum amount. Submissions do not need to be as large as typical MURIs and could be fairly small.
Q 22:	Are multi-university partnerships favored or is that not relevant?
A 22:	Multi-disciplinary partnerships are of particular interest. Whether they are found within a single organization or multiple is not relevant to the evaluation criteria.
Q 23:	While the BAA clearly states an emphasis on basic research, how much system integration and testing is desirable? Do we need/want an integrator on the team?
A 23:	It's not just an emphasis on basic research. Funding will be provided ONLY for basic research. The focus should be on naval relevance and not on transition to particular naval systems. Though ultimately results from an effort under this BAA might transition to a naval applied research programs under other funding.
Q 24	What type of scenarios should we be working with, i.e., how domain specific should they be for the award end product?
A 24:	Scenarios should show naval relevance. The BAA lists some of the unique and relevant challenges of the naval problem domain that are of most interest.
Q 25:	The BAA broadly covers various levels of cooperation and collaboration. Is co-located peer-to-peer collaboration of interest, or is the weight of the focus on distributed teams?

A 25:	Both are of interest.
Q 26:	Is affect-related research relevant?
A 26:	Yes, as it relates to the topic areas in the BAA.
Q 27:	Please explain the IP rights the government expects to claim on technology that is brought to the program and technology that is developed under the program.
A 27:	As the BAA Section I.11 states, "No data rights assertions will be issued as part of the grant awards."
Q 28:	What's is the number of research areas a 'typical' team is expected to cover
A 28:	There is no specific number. As stated in the BAA "proposals for the maximum amount of $2M per year would need to show a very high degree of teaming across disciplines to justify that amount. Proposals at a much lower level of funding are also of interest."
Q 29:	I had a question from one of my faculty who does not have a green card, so I'm asking this in my capacity as Associate Dean for Research. Are full-time academic faculty who are on H-1B visas eligible to submit to ONR programs?(e.g., the General BAA, or specific programs such as BAA 09-008). I think they are - just want to confirm.
A 29:	See Answer 13 of the "QUESTIONS & ANSWERS" dated 7 November 2008.
Q 30:	We are planning to submit a white paper for the ONR BAA Announcement Number 09-008. For the curriculum vitae, is there a limit of how many pages it can be? Please advise.
A 30:	As the BAA states under Section IV.2.1.1, the page limit excludes the curriculum vitae.
Q 31:	Is "object detection and scene understanding" with in the scope of this BAA?
A 31:	Only to the extent that it may be part of a solution to the problems defined in the BAA. General advances in object detection and scene understanding are not the focus of this BAA. The focus of area 2 is really on those aspects of perception that are particularly relevant to intelligent decision-making by naval autonomous systems in some particular ways as called out in the BAA. Note that the focus 2 description lists as the main focuses to "learn the optimal tradeoff between exploration and exploitation in autonomous unmanned vehicle (AUV) sensing applications" and "learn the context of the perception task and then apply the appropriate recognition or processing mechanism or to select or adapt the appropriate recognition or processing mechanisms based on autonomously gathered in situ information."
Q 32:	Should the white paper focus on 3 years research effort or 5 years effort including two years extension?
A 32:	As the BAA states under Section II.4, an option is not necessary if the

	proposed work can be completed in less than 3 years.
Q 33:	Is the Navy interested in technologies that are outgrowths of neural nets?
A 33:	Neural networks could be a part of the solution of some of the problems in the BAA. However, ONR would expect the neural network algorithms to be developed within a rigorous mathematical framework and/or to relate to some underlying scientific principles, such as examining the role of some new theoretical result from neuroscience. Applied research using existing neural network technologies is not of interest.
Q 34:	What specific Navy applications will this research be applied to?
A 34:	This is basic research. So, the focus is on fundamental principles, theoretical developments, etc with naval relevance as defined in the evaluation criteria in the BAA. The focus is not on transition to a particular naval system. Though, transitions to naval applied research programs would be appropriate. The BAA defines key aspects of fundamental naval problems.
Q 35:	Is the intent to develop an "autonomous" system in the sense that decisions are made without a human in the loop? What is the extent of desired human interaction?
A 35:	Human interaction is an important part of this BAA and is discussed at length in the BAA in focus area 1 and elsewhere.
Q 36:	In the solicitation, does "agent" always mean "non-human agent"?
A 36:	Agent can mean human or autonomous depending on the context.
Q 37:	It seems that this BAA is seeking to fund broader research and experiments on autonomy theory that could have naval applicability rather than research that tests out the viability of a particular unmanned system that's in development. Is that an accurate assessment? Please provide any further explanation or examples of what the BAA does and does not encompass.
A 37:	Yes. This BAA is focusing on key challenges that impact on a wide range of naval autonomous systems and cut across traditional disciplinary "stove-pipes." ONR hopes this will enable some new research directions and teaming arrangements by researchers in fields that may not have collaborated previously. Another aspect of the BAA is to enhance training of students in these emerging areas to help support the future Navy and DoD R&D workforce. There are some great opportunities here to enable a wide variety of benefits for future naval forces. There is a potential to reduce the manning requirements for unmanned systems by developing the ability to task them at a mission level and making them much more reliable, robust, and capable. In addition, the research may improve the Navy's ability to get autonomous system services down to lower tactical levels than ever before. Instead of a complicated user interface between a highly skilled operator and an unmanned vehicle, to the research may enable collaboration between autonomous systems and individual warfighters.

Q 38:	In your own words, what are the most significant challenges with the current generation of autonomous system that this BAA seeks to begin to address?
A 38:	There is a fairly good list in the BAA. The following is a highlight of a few. First, current systems are not very robust and often require significant human intervention to deal with unplanned or unexpected situations. Second, these systems are not very scalable. To field a team of systems or increase the complexity or ops tempo of the mission, the user can wind up needing much more manning, communications bandwidth, computer processing, etc. This can put severe practical limits on what the user can do. Finally, there may have been some real weaknesses in designing these systems to best support the role of the warfighter. There may be a need to make these systems easier to use and more able to flexibly respond to the warfighter's needs.
Q 39:	What is the value to ONR in funding this kind of broad research and experimentation in the "science of autonomy?" What do you gain? Why not just offer funding for experiments on specific autonomous systems or sensors?
A39:	There are a large number of unmanned systems and sensors out there now and the number is growing day by day. There are many common problems in this field, and an effective way to address them is in a broad overarching program like this that cuts across quite a few of the different research areas that ONR funds. Further, by working on these problems in a multi-disciplinary way, ONR may enable major advances, new synergies, and wholly new mission capabilities.
Q 40:	What does ONR intend to do with this research? Will it be applied to existing programs to improve capabilities? Use it as a launching point for more in-depth research? Use it as the foundation for establishing new ONR research areas/projects/programs? In short, what's next after these grants are awarded?
A 40:	The long-term goal will be to move this research into naval applied research programs that will be the stepping stone to transition technologies into acquisition programs and operational use. However, another goal is to develop some wholly new research directions at ONR, and ONR want to maintain the flexibility to respond to critical naval problems as new naval needs are identified.
Q 41:	Is this BAA on the level of 6.1 research, or should it be more applied?
A 41:	The BAA is only for basic research 6.1 funding. There is no applied research funding associated with the BAA.
Q 42:	Since this BAA is for basic research , should our proposal address (solve) a specific, real world problem, or is it appropriate to investigate an approach for solving a class of problems, for example, task allocation, and study that approach on an abstract model of the class of problems?
A 42:	Either approach would be within the scope of the BAA. However, if you are focusing on an abstract model, it will be important that you abstract out some

	of the most challenging aspects of the real-world problem (and you may want to consult the list of challenges of the operational environment of the Navy and Marine Corps in the BAA). For example, the task allocation problem might include involve abstraction of some of the more problematic aspects of real-world communication or real-world sensing limitations.
Q 43:	Do you have some guidance for those submitting both MURI proposals and BAA responses? Is the BAA meant to provide opportunities for smaller (e.g., single investigator or small teams) proposals than possible through the MURI program.
A 43:	The BAA is broader scope than the MURIs in terms of both relevant mission areas and the range of relevant disciplines/problems that could be investigated within a common framework. It also allows for a greater range of size of efforts. ONR hopes to enable some new research directions as a result. A BAA and a MURI proposal do not need to be completely unrelated.
Q 44:	The BAA states that one institution shall be primary awardee for purposes of award execution. Does the awardee have to be an academic institution or could it be a business partnered with an academic institution? Is there a minimum workshare ratio for the Prime (e.g., 51% of the work)?
A 44:	See Answer 4 of the "QUESTIONS & ANSWERS" dated 29 October 2008.
Q 45:	Your BAA indicates proposals may address single or multiple Focus Areas, acknowledging the focus area interconnections. Does a proposal that addresses a focus area need to cover all aspects of that focus area or can it cover some subset of the technologies addressed in that Focus Area maybe combined with a subset from another Focus Area?
A 45:	It is unlikely that a single proposal would cover all the areas in a particular focus area in a meaningful way and it is certainly not required.
Q 46:	The proposal calls out design of appropriate experiments to validate theoretical developments. Does ONR think that simulations are sufficient basis of experiments, or do they expect field experiments with existing Autonomous Uninhabited Vehicles (AUVs) (since all hardware must be COTS)?
A 46:	As this is basic research, either approach may be suitable depending on just what it is you are trying to learn from the experiment.
Q 47:	Do you see a user interface based on ubiquitous computing (a la Weiser) as a central concept in user interaction with autonomous systems?
A 47:	No.
Q 48:	Can pre-planned scripts be part of the execution strategy arising from autonomous decisions, or must actions be synthesized uniquely by the autonomy?
A 48:	Pre-planned scripts are not of any particular interest. However, they could be part of some solution, particularly if they could be incorporated in some

	theoretical framework.
Q 49:	Regarding reasoning capabilities, should the emphasis be on employing pre-loaded prior knowledge, in situ extracted knowledge, and on-board synthesized knowledge? Is one area of greater interest than the others or are they equally important?
A 49:	All are relevant.
Q 50:	Is the goal to process sensor information on-board and pass only "actionable" information to human operators, or can the computing resources be located remote from the vehicle?
A 50:	As the focus of the BAA is on developing fundamental principles, theories, and methodologies, this would only be relevant if the algorithm precluded use in future on-board systems for some reason. In that case, the focus would be on-board capabilities.
Q 51:	What is the anticipated scope of collaboration - a single human user and a single AUV, a single human user and multiple AUVs, multiple human users and a single AUV, or multiple humans and multiple AUVs?
A 51:	Single or multiple humans with multiple autonomous vehicles.
Q 52:	Is it reasonable to extend the idea of intelligent agents embedded within a supporting software architecture to include the AUVs and human users themselves as special instances of intelligent agents?
A 52:	It is a potential approach. However, there are significant challenges that would need to be addressed.
Q 53:	Can a for-profit company be a subcontractor to a leading University under this solicitation?
A 53:	See Answer 2 of the "QUESTIONS & ANSWERS" dated 29 October 2008.