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Good afternoon or good morning everybody depending on where you are. Welcome are. Welcome to the seminar. We're going to focus on Harnessing the on Harnessing the Data Revolution institutes and station NSF 21-519. Before we get started would introduce Dr. Margaret [Indiscernible] with NSF Assistant Director for computer information information science and engineering. Margaret is [Indiscernible] University and along with Juan with NPS is Chair of the student group for HDR.

Thank you so much, Manish, and thanks everyone for joining and good morning, good good morning, good afternoon. It's wonderful to be here today. As Manish mentioned only the computer engineering and science cause science directorate and FF and IP a rotator here at NSF. I directorate and FF and IP a rotator here at NSF. I joined in February from [Indiscernible] University where I retain my tenure and I'm a Computer Science researcher and have been there 26 years. The role of being NSF [Indiscernible] is really a wonderful chance for the full breadth of [Indiscernible] and to be an advocate for the field as we set the direction for future research funding as well as education workforce action needs. I'm also happy to speak today on to speak today on behalf of my colleague from the math and physical sciences directorate [Indiscernible], Sean, who had a last-minute conference. Together NPS and science work very collaboratively on HDR efforts overall. Too start in on that it goes without saying that data is essential to scientific and engineering process. This Big Idea, this webinar is is all about that. NSF harnessing data of revolution is intended to be a national scale activity 2018 we'll new [Indiscernible] that will allow fundamental questions questions to be asked and answered at the frontiers of science and engineering. HDR has been for several years been for several years now a substantial cross foundational [Indiscernible] with four separate Solicitations being issued in 2019 resulting in 52 projects and investment of over \$80 million. While 70% of the funding is provided to the stewardship funds associated with HDR itself, the big idea itself, initial big idea itself, initial 30% of funding was normatively invested by [Indiscernible] which goes to show you the across the nation engagement we see in the supported ideas. The current competition and why you you are on the webinar today is particular interest because it will be based on substantial partnerships among the maids that use this data this data intensive technique. The goal is to establish a group of HDR institutes with intensive research and science and engineering that can accelerate discovery and innovation and a broad set of [Indiscernible]. These HDR institutes will enable [Indiscernible] and science engineering across the foundation through collaborative co-designed programs for innovative [Indiscernible] approaches to address critical, national challenges. I appreciate the time and the energy of my colleagues across NSF that Abbe to [Indiscernible] today. I appreciate their time and care in the due process we we are undertaking here. I look forward to the competition. With that I hand it back to Manish. Have a great webinar.

Thank you, Margaret. Appreciate the comments. Can we go to the next side -- slide please? Is an overview of the webinar. We just had the welcome remarks from Dr. Margaret [Indiscernible] but before we handle over to the program officer I would [Indiscernible] a little bit about the HDR big idea. Thank you so much. My name is Juan Meza [Indiscernible]. Just to give a little bit of context Harnessing the Data Revolution is one of the ideas that were started about three years ago at the National Science Foundation. Six of which we're research and [Indiscernible] process focused. You will see the six at the top Harnessing the Data Revolution, The Quantum Leap, work and human technology Frontier. These we're intended to to be large very bold ideas [Indiscernible] topic. Harnessing of data evolution as Manish and Margaret indicated focuses on data science aspect of what is going on today. Think of this crowd there is no need to belabor data science aspect of what is going on today. Think of this crowd

there is no need to belabor the point that [Indiscernible] has fundamentally changed the way [Indiscernible] science and engineering. Harnessing the data is really to try to take a look at how we might address these changes through fundamental the data is really to try to take a look at how we might address these changes through fundamental advances in data science and the application of those data science the theory and foundation of application.

I think I said most of this already here, and it's really the vision was to be able to ask those questions that we could most of this already here, and it's really the vision was to be able to ask those questions that we could now ask because of this wealth of new data, [Indiscernible] and also to be able to take different data together to be able to ask these different kind of questions. Looking at being able to [Indiscernible] for example [Indiscernible] forecasting by taking a lot of different [Indiscernible] a models to try to develop more predictive and more accurate modules. The same able to take different data together to be able to ask these different kind of questions. Looking at being able to [Indiscernible] for example [Indiscernible] forecasting by taking a lot of different [Indiscernible] a models to try to develop more predictive and more accurate modules. The same would be true as [Indiscernible] statistics, engineering systems and genotype and phenotype as part of the activities. The activities [Indiscernible] activities. The activities [Indiscernible] design, human technology all areas we now seeing in new and innovative and innovative ways of addressing science through the ability of being able to do discovery through data-driven activities. For HDR we broken down into three different areas. One is the foundations, systems and cyberinfrastructure. For programs like tripod fell into this area. With education and workforce component because we understood as we were changing the way we were doing science we also needed to train the way we were doing science we also needed to train the next generation of scientists to be able to deal with these new ways of doing science. And then there was the data science, data intensive science and engineering of this is what we will hear about today. Too now then take the foundations of the educational workforce and apply them to very intensive data intensive types of applications within science and engineering domain. This is where the conversion science really comes engineering of this is what we will hear about today. Too now then take the foundations of the educational workforce and apply them to very intensive data intensive types of applications within science and engineering domain. This is where the conversion science really comes into play. Manish, do you want to take over from here?

Yes I thank you, Juan. Is Juan mentioned we have these three pillars and each cause to activities, programs and [Indiscernible] of these are listed on the slide. The foundation area is covered by the tripods as mentioned. The learning a Workforce Development and workforce area or cover by data science core, build capacity for HDR by providing practical experience, teaching new skills, and offering new all those learning opportunities. In data science and engineering is being addressed for institutes of data in science and engineering. The goal is to create an integrated fabric of interrelated institutes that can accelerate discovery and innovation. This is the focus of this webinar which you will hear in more detail in this session. Then finally we envision HDR central which coordinates these efforts and amplifies the impact by forming connections in different activities as well as externally. With that I'm going to hand it over to the working group, program officers and over to Amy Wilson, Co-Chair of the working group. Over Over to you Amy.

Thank you very much, Manish, and both you, Juan and Dr. Martonosi for the opening comments. I'm going to take I do about one do about one slide of history then dive into this solicitation. As you see in this table and as you heard heard from the prior speakers in 2019 there was a huge amount of activity

across all three of the areas. The tripods for foundations, data science corporation workforce and a pair of different ways of trying to look at precursors to an Institute. Ideas labs where new ideas were being developed and frameworks were perhaps the Team is already in existence. As you can see across the different areas, over huge amount of activity across all three of the areas. The tripods for foundations, data science corporation workforce and a pair of different ways of trying to look at precursors to an Institute. Ideas labs where new ideas were being developed and frameworks were perhaps the Team is already in existence. As you can see across the different areas, over 50 different projects with a basically hundreds of awards and about \$82 million worth of research was going on. The thing that was interesting here is the funding that was allocated for HDR has been co-founded across basically a wide variety of directorates within the foundation. About 70% of the funding for existing activities have come from HDR funding, but a significant amount has come from various directorates that are interested. In the results coming out this is truly a disciplined and data science collaboration activity. What I am going to do now is transition into discussion of the solicitation which is the focus of today's activity. It's the HDR institutes. I'll take a quick moment to talk about the goals is that overall this is basically addressing science and engineering discipline problems and questions that are at a tipping point, meaning some investment in data intensive approaches could data intensive approaches could have a big impact. Secondly, that it is indeed interdisciplinary in nature. It's that both the disciplines and the new data techniques or use of either emerging or existing data techniques are extremely important to answer those tipping point questions. And certainly as the third point is that these represent the investment priorities of the NSF Director it's, both during the time of these awards are made and beyond the lifetime of this big idea that we are setting in place a fabric of capabilities that will be responsive, as Dr. Martonosi said. We're all using data and to find ways to find ways to better integrate, utilize, share, and support the research enterprise. What are we looking for? We have several things we have funded in the past. What are we we looking for now? We're looking for activities that have breath and our comprehensive in their scope, that they bring together both science and engineering communities and the various computational, mathematical, statistics data capabilities that can perhaps turbocharge the ability to do science what to do new new kinds of science. I would stress and will continue to stress throughout the discussion that the competition is open to competition is open to any team that can put together a proposal that will meet the specific criteria of this call the division called the scope and the readiness that is called for in the is called for in the program description. There is six ways we are measuring that, looking for that, and I will be the focus throughout this talk and and throughout the solicitation. There is in addition to the usual NSF criteria there is six things you need to get right if you are interested in there is six things you need to get right if you are interested in this activity. Here is A1 slide summary of the attributes that are being sought by the HDR Institute. First of all, what is of the attributes that are being sought by the HDR Institute. First of all, what is the vision for this activity? What kinds of seriously transformative outcomes are being leveraged, utilized or made possible through data intensive research? Secondly, how to the various domain scientists and Data Scientists work together to solve these problems, because there are problems the data as well as problems in the domain? How does this Institute coordinate and manage. It's very likely to cause institutional and [Indiscernible] boundaries in new ways. How is is that happening? How does this group intend to collaborate not only in the Institute that is under d evelopment, but as you heard those heard earlier from Juan and Manish there's a wide variety of activities going on, and number workforce activities going on, they're going to be other institutes at other existing NSF activities. How does this Institute intend to fit in? And also to create new capabilities for the community? When it exists, how does it also

intend to affect those communities of practice? How do these approaches make it different top a different way of doing the science and engineering? And then, certainly, best practices, new techniques, how with these capabilities be shared openly and across all of the different organizations? So over and over again those six activities are going to be the ones that we will be looking for, and it's like a [Indiscernible] plus one is there are six things we will be looking for in this solicitation subsist dose specifically of there they are. Some basic information, these will be a Cooperative Agreement. These will not be collaborative awards that they will be basically a point of contact and there will be another slide a little later about some of the things to think about for Cooperative Agreements. We expect to another slide a little later about some of the things to think about for Cooperative Agreements. We expect to make a hand full of awards, four to seven of them. Total anticipated funding as you can see is \$70 million. The more you ask for, you better have lots of backup to support a larger request. Again more compulsory's. There is two categories of organizations that can propose, universities and colleges or non-profit and a non- academics. You will see a little bit later bit later that it is possible to have other organizations involved but they would be through sub-awards rather than as the lead on these activities. This is an important one called the limit on number of proposals per P I, called PI or Senior Personnel, one. Whatever your role in a proposal, you basically are choosing the organization or the activity that you will be participating in this time. A couple of overall things. First of all the proposals will be developed in line with what is normally done with the National Science Foundation as a document the PAPPG which is basically line with what is normally done with the National Science Foundation as a document the PAPPG which is basically your proposal work policies and procedures guy. This is the website for further information for further information on that. Again the second thing to note is this will not be a time we will be asking for collaborative activities for were several PIs been together and project is made up of multiple proposals, that even if it's a multi- organization activity the proposal has to be submitted as a single integrated proposal by proposal by the lead organization. And the other collaborations will wind wind up being sub-awards with the other [Indiscernible] organization.

Again, there is a couple of detailed slides coming up here. Please include HDR Institute at the start the start of the title of your p roposal. That minimizes the amount of time the proposal might drift among the various organizations when it might arrive at NSF. Also, please, include a list of keywords and a brief overview of brief overview of the proposed activities in your project summary. This is an important one. In addition to the 15 pages, which is the limit on the project description there well also be a request for three-page, up to three page supplementary document that will cover management and coordination plans. If you don't have that document in your proposal, your proposal will be returned without review. Here is the six things that will be part of that. It's exactly what you would expect in management and [Indiscernible]. What are the specific roles of the various participants? How it will be managed across the organizations, and coordination mechanisms that will make that will be part of that. It's exactly what you would expect in management and [Indiscernible]. What are the specific roles of the various participants? How it will be managed across the organizations, and coordination mechanisms that will make it easier to have the cross disciplinary interactions, how do you measure success, and then what are the budget line items supporting items supporting each of these various categories of management and coordination. Then overall the strategic plan for how you are going to integrate the research, education, participation, and other activities across all the levels of what will obviously be a very complicated proposal a potential project. I am switching now to the Review Criteria. Again, like all NSF activities Reviewers, Panelists, Panel Discussions, panel summaries will include discussions of intellectual merit and broader impacts, but this solicitation also has a number of a number of solicitation specific

criteria. We talked briefly about what we were looking for at Institute. This is the six criteria and they exactly mirror what was discussed earlier. There will be criteria about the vision of your Institute, about how you intend to support some convergence or collaboration among the domain scientists and Data Scientists so they work together to provide new approaches that had not been possible through each of their individual efforts. We're looking for the provide new approaches that had not been possible through each of their individual efforts. We're looking for the coordination and management that had been involved in the project. Those are the first three. Then the last three, how well-defined is your collaboration strategy? How did you make them work together, not only within your Institute, your proposed project, but across some of the other activities that are already in already in place both for HDR and for the National Science National Science Foundation in general? The fifth one is what you see as the ability of your proposed project to transform the community that it's going to be working with? How will it make things the community that it's going to be working with? How will it make things better and different? And then the final criterion is, we see this as one of several nodes in a widening fabric of activities that help us to share outcomes and best practices, to share and encourage development of new skills and new capabilities for the community as as a whole. We just discussed the six criteria. The contenders in this solicitation we'll have good answers to all six of those, as well as the usual criteria of intellectual merit a broader impact for those, as well as the usual criteria of intellectual merit a broader impact for the foundation. I am going to take a moment to talk about cooperative agreements. Of these are different from the these are different from the kinds of awards many of you our familiar with. Grants, usually you receive your funding and do what was suggested in your proposal. Here there will be some negotiation going on because we see this being a continuance provider of value to the foundation for the lifetime of this award and beyond. So, there will be some custom Terms and Conditions in each award that between the time that if your project makes it this far, between the time the review is done and the time this goes through the goes through the foundation for award there will be discussion about sort of about sort of ways of interacting, reporting to the foundation, to updates on your deliverables, on your activities that are going on, funding increments are not automatic. There is usually a step involved before increments are applied. There will be a discussion in advance of what the terms and conditions and the specific deliverables will be for your NSF project, and any additional reviews or deliverables that might happen along the way as this activity becomes, again, an important investment by the foundation. There is basically two kinds of Terms and Conditions, your Administrative Officer's will be very interested in the f inancial/administrative Terms and Conditions. You as PIs will be more interested in the Programmatic Terms and Conditions which is the second bullet here, but the Terms and Conditions which is the second bullet here, but the blue highlighted link will give you overall information on both of those kinds of Terms and Conditions, but basically you will need to be ready to say something about the project basically you will need to be ready to say something about the project description, governance reporting, and deliverables, which you probably will have done many of those things in your proposal that you submit. But there will be some discussion about the exact activities that will be done, timing of deliverables and next steps between when reviews are done and when when something is going to go on to become an award. Cooperative Agreements, folks.

Overall schedule January 21st of next year is the due due date for these activities. They will be reviewed through the spring of next year. There will be probably a couple of weeks is usually what it takes to do Cooperative Agreement negotiations and discussions after reviews are completed, and the announcements will happen weeks is usually what it takes to do Cooperative Agreement negotiations and discussions after reviews are completed, and the announcements will happen at the end of this

coming Fiscal Year FY2021. In a few minutes we will be taking questions but I did want to take one moment and recognize a marvelous group of colleagues that I have on the the working group. These folks are representatives of every directorate in the foundation and have been deeply involved in in the previous and current activities associated with Harnessing the Data Revolution. Again, they come from all of the different backgrounds. If you have particular questions for directorate in the foundation and have been deeply involved in in the previous and current activities associated with Harnessing the Data Revolution. Again, they come from all of the different backgrounds. If you have particular questions for a particular discipline, you will see that some of them are listed here, but certainly, feel free to ask any of us if you have questions. In fact, I think on the next slide we have a little bit of slide we have a little bit of contact information that we are about to go into questions, but I did want to take a not only thing those wonderful take a not only thing those wonderful people that will be with me today to answer questions, but then also to let you know on the next slide that during this webinar we will be taking questions via zoom in the chat. I think some of you have already started to put questions in. Thank you very much, but after the webinar there is a mailbox we have set up you can send questions taking questions via zoom in the chat. I think some of you have already started to put questions in. Thank you very much, but after the webinar there is a mailbox we have set up you can send questions to that mailbox and then we will make sure that it gets to the correct folks so so we can answer your questions. We will come back to this slide in a few minutes but we are about to take questions. What I would like to do for a couple of more slides is to let you know a couple of the questions that have come up already in this mailbox. Perhaps that will start to answer some of to take questions. What I would like to do for a couple of more slides is to let you know a couple of the questions that have come up already in this mailbox. Perhaps that will start to answer some of your questions. One of the questions that has come up a number of places: Is the HDR institutes solicitation solicitation and open solicitation?

The answer is, yes. You are going to have a team that can put together a proposal that meets the two usual NSF criteria and six criteria that we have been discussing through these earlier graphs, the vision, scope, and readiness called for called for in the program description. But it is an open solicitation. There are activities that have been going on that has some very valuable results that have come in, but it is an open solicitation. This slide is so that you minimize the number of enemies you make if you are the PI or the Co-PI or Senior Personnel on the proposal that comes in two proposal NSF 21-519 you cannot be a PI, Co-PI or Senior Personnel on any other proposal to this solicitation. Anyone that does that, they basically we have the process here is that we clock them in and whichever one comes in first is a proposal that stays, and if there is a later proposal with your name on it, it is returned without review. Please, choose, I know that that it's tough but we are asking you to choose wisely in this competition and choose one. We have had a couple of questions about: How are HDR institutes related to or different from artificial intelligence institutes? I guess here is a simple answer. There is more detail that some of my colleagues have put together that we can certainly talk about but I talk about but I think the overall goal of HDR institutes is to advance the science and engineering. We see that the that the data intensive capabilities are and enabling element of that but, again, once the new science or engineering that can happen in conjunction with these new or existing tools and techniques. And then AI institutes although target specific research areas, it's basically to inform and to and to expand foundation artificial intelligence advances and to drive those innovations those innovations using those target areas. If I had to put a simple answer to gather that would be a start on that question. Let me then go to the final slide. Certainly I want to thank my IT colleagues for helping with this today. I will leave this slide up again because it has the website so that you can ask questions after zoom questions, but what we are going to

do now is to start try and respond to your questions throughout the remainder of this call. I want to thank all of you for your time today, and we will look forward to talking with you in the future about some of these questions. I think we have had a few of these that have been answered already.

McCartney did you want to take a moment to sort of talk about the question, there was one I think he was answering, and it did you want to take a second to talk about that one and respond take a moment to sort of talk about the question, there was one I think he was answering, and it did you want to take a second to talk about that one and respond to it?

Could you remind me what the question was?

And, thank you. I think it was sort of an overall kind of a question. Give me just a second here. I think it was, how does NSF envision projects from the first phase? Again we have had several ideas labs and frameworks, transition into HDR institutes, HDR institutes, and what examples of convergence to NSF expect from the first phase or conceptual phase to the phase to the second phase? Do you want to take a second to answer that, Peter?

You answered answered part of it already in that people were previously plundered under the first round of HDR as well as of those were all the first round of HDR as well as of those were all equally welcomed. There is no bias toward one pool or the other. But I think the main consideration that I have been telling people when they have called is that the reality is we supported 27 some odd projects in the first the first round, and there are a great many other projects with other mechanisms out there but the the math is simple. There is going to be a small number of awards appeared to the number of projects that would like to get in on this. So, So, too me the challenge whether partnering up with people previously funded with HDR, coming from the outside or or a mix of the two, I think to me the challenges how to define the scope scope that is broad enough to justify getting one of a relatively small number of awards meant to serve what NSF does in science, and yet narrow enough that you don't lose the thematic essence of what brings you all together in terms of your scientific interests. You don't wind up being data science, the machine learning or whatever it being your being your only common denominator. We like to see some conversions, if you will, and the kinds of questions that are being addressed that are being addressed from a science perspective as well as in the technical approaches. Too me that is the challenge I see as how to pitch that scope just right so that if you are a science driven project, but also broadly scope and can justify one of a small number of awards.

Great, thank you very much, Peter. Sylvia, there was another more general question being asked as well, and I don't know if you would like to, I think the question what's: How much emphasis should be put on outreach on outreach and education compare to a standard NSF proposal? Is it helpful to have a dedicated a dedicated PI responsible for the outreach and education part? How much budget to go into that? I think they were asking for percentages.

I think that is far to precise. I think that is all far to precise. We tried very hard to give you, and Amy also reiterated today the six specific goals and criteria by which we will have panelists review the proposals. And then use to help us decide which are most likely most likely to be funded. There is an effort to enhance participation in science as part of it, but it's not called out on that level and there is no way we are going going to give you a percentage or say which is the better approach to managing your research.

Thank you very, very much, Sylvia. I think, [Indiscernible] you have answered a number of these pick one was on how many institutions can participate in an Institute? Is there a limit? I think you gave good answers on that.

Thank you, can participate in an Institute? Is there a limit? I think you gave good answers on that.

Thank you, Amy. There is no explicit limit but [Indiscernible] as we entered in the Q&A there. Only one proposal per team. They're not to be collaborative proposals for multiple institutions. It's a single single proposal from a team that can have any number of institutions within that team proposal. In fact I think you also also answered another general question if I can ask you to stay on again. How does NSF White-Domain science versus data science in the Institute solicitation? I think that is an important question. Go ahead. Great, so this question goes along with several questions submitted about stay on again. How does NSF White-Domain science versus data science in the Institute solicitation? I think that is an important question. Go ahead. Great, so this question goes along with several questions submitted about the difference between HDR institutes and AI institutes, and let's see if I can find it. The answer, the specific question, the specific answer is goal of HDR to do this this to advance science and engineering enabled through intensive research. That is the focus of HDR institutes. I believe there is an answer to follow on about AI research Institute's pick that would be target using [Indiscernible] research era to both inform foundational AI [Indiscernible] and drive innovation in targeted areas.

Thank you, and I think Hector, you had also had expertise with both of those solicitations. Did you have anything that you wanted to add to what Vyacheslav had to say?

Davis is his [Indiscernible] and areas to 23. We had the [Indiscernible] science and engineering in [Indiscernible] approaches [Indiscernible - muffled].

Very nice. Thank you.

And then I think just some different areas of questions, some of the different specifics. Someone had said, can you point as to the NSF definition of Cooperative Agreement, please? I think [Indiscernible] had included there that there are some specific, both in PAPPG specific, both in PAPPG and in the document, this document that we just presented some links to Cooperative Agreement information. Maybe I will take a 2nd and mentioned that I think several people have said, well, are these slides going to be available? Are they discussion going to be available? Within a couple of days to one week there will be three things things that will be posted on this solicitations program site for your use. One is the slide that we have just been showing. Asecond one is basically, I can't imagine how exciting it's going to be to be to listen to this but that does basically it's going to be the verbal transcript of both audio of what has gone on and a transcript of the audio presentation today. So three different things will be available within anywhere from a couple of days to a week for your use. So, you can go through and get additional information. Other questions that folks have? We're their other questions that Peter, Sylvia, or [Indiscernible], any of them you had answered you think makes sense because some of you have been answering multiple variants of the think makes sense because some of you have been answering multiple variants of the same question. I think that shooting, those ideas a framework awards would be applying too, I think you had answered that one and some others that were variants of that. Did you want to speak up on anything here?



Sure, think there's a lot of questions about how whether how you had to connect with a current or up on anything here?

Sure, think there's a lot of questions about how whether how you had to connect with a current or former [Indiscernible] project. No, that is not a requirement. Certainly solicitation does open solicitation for those currently in the ideas frameworks [Indiscernible - low volume] projects that are not. Look at this as an open solicitation and welcomes projects that have no restrictions as to whether you have to be connected with any current funded ideas or frameworks.

Very good. Thank you, tran 12. Appreciate that. Peter I think there was one specific was one specific to phenotype genotype questions of that have come in. Should I read that and then you answer the question life? What that be okay?

This basically was explicitly about phenotype and genotype but a broader version of the question is will we support data collection in these projects Rex I will get the answer that I give my regular Cyberinfrastructure program that we support in bio and that obviously the bulk of the funds here are to advance the science with data analytic technologies and the presumption got the reason we're doing is assumption is we are under daily root of data and we need these tools to get ourselves out of it. That said, if reason we're doing is assumption is we are under daily root of data and we need these tools to get ourselves out of it. That said, if it turns out there is some amount of data collection needed in order to develop the tools, develop methods or validate the methods data collection needed in order to develop the tools, develop methods or validate the methods or whatever, we typically do justify that but be be conscious of the fact if it's an excessive amount of the budget, it may be difficult to justify spending HDR money. So, just be, use your judgment as to how reasonable that is relative to the overall purpose of the program which is to develop and apply the computation approach is.

is relative to the overall purpose of the program which is to develop and apply the computation approach is.

Great. Thank you very much, Peter.

There was one question and now of course I lost it. Does the HDR ecosystem include some of the apps scored TrackBack pivotety's that are based on HDR kinds of efforts?

I can answer that.

Very good. Sylvia, go ahead.

The answer I gave was that one talk about the HDR ecosystem we are actually describing what is currently been consider the elements of the ecosystem that Amy reiterated that of the ecosystem that Amy reiterated that are considered part of the big idea for Harnessing the Data Revolution. However, that does However, that does not mean that a EPSCoR Track two activity around HDR would not be an appropriate lead, or participant in a proposal.

Great. Thank you, Sylvia. Appreciate that very much Rick I'm going to ask Darrell to maybe listen up here, that there was one question question and it is more of a scope of the project question is that it was ask, would it would it be possible to cover multiple areas such as materials and [Indiscernible] design design plus realtime engineering systems in one Institute, or at least the major aspects of it? With Abby perhaps to broad? If harvesting the synergies and data science methods. I think either Trenton or

maybe we will start, Darrell, if you have something that is trying to go not only materials a catalysis design for realtime engineering systems, it's starting to get broad. Is it still likely to be a contender? Do you want to take that one?

I think it useful to first appeal to common sense. At the end of the day you want to have an Institute that does cover broadly the kinds of science or group an Institute that does cover broadly the kinds of science or group of institutes together to cover the sides and the foundation so far so far as we can. But on the other hand these are all finite investments, and I think you have to also understand what the interactions are to touch on the on the synergies among the discipline science involved and the potential interactions with the data science in this as well. And to be able to put together a big enough team and the right team of bright people to be able the data science in this as well. And to be able to put together a big enough team and the right team of bright people to be able to do that.

I would not limit or make any comments on what the possible domains could come together. The world is your oyster, so or make any comments on what the possible domains could come together. The world is your oyster, so to speak.

Very nice. Thank you, Darrell. Shooting, do you have anything you want to add to that?

In the proposal you want -- tran 10. We think about institutes the broader impact has to be beyond a single domain or single disciplinary area, but at the same time as mentioned these are [Indiscernible] funds. You think about this in terms of what are the outcomes and how does that impact broadly the [Indiscernible] in general? The overlap between science and chemistry certainly something that would be broadly impactful in my view.

One other thing I might also toss in there is among the three goals that you like that were presented in a much earlier slide there is a question two of connected to things that are that are in a set priorities, and so that overall may also be something to figure out.

Thank you, gentlemen. Good answer. Here is an interesting question, team. Can you define Institute in a bit more detail? Thesecond part is what additional collaborators be able to join Post-Award? Who wants to step on that one first?

you, gentlemen. Good answer. Here is an interesting question, team. Can you define Institute in a bit more detail? Thesecond part is what additional collaborators be able to join Post-Award? Who wants to step on that one first?

Can additional what, collaborators?

Yes, be able to join post- a ward. Start with an Institute and if you have other and if you have other collaborators joining afterwords.

I will take a stab at it. This is Vyacheslav here. In general, yes, there should be no expectation of additional resources if you have additional team members joining. As [Indiscernible] states this would be cooperative agreements. These are flexible but also be cooperative agreements. These are flexible but also have additional [Indiscernible] from NSF once made. Again the answer in general is, yes, but should be no expectation of additional resources to go along with it.

the answer in general is, yes, but should be no expectation of additional resources to go along with it.

And if your institution is very heavy and [Indiscernible] would probably make naturally other collaborations as well.

Great. Okay.

The question is question is on the funding though, which Vyacheslav quite adequately covered.

You guys did a great job of answering.

I was in the middle of typing in the answer to a question and maybe I will speak up.

Great.

A very long question about smaller awards being made and is a desirable these span multiple directorates or [Indiscernible - low volume] single directory? I think this is sort of of getting back to what I said before. We do believe there are questions out there that can crosscut the traditional NSF Director it's. This is the kind of convergence and science questions we hope will emerge. And so, we are encouraged if someone can find a common thread on for example forecasting that cuts across interests in geosciences biology, social sciences or whatever that makes sense. That's wonderful. That's a great way of scaling the scope of the project up. But it multiple disciplines our each of there is a unique and distinct use case and don't have a strong connection to each other, in my opinion that would not be as strong a proposal and I think it would start to evolve into just a Computer Science proposal with a traditional NSF Director it's. This is the kind of convergence and science questions we hope will emerge. And so, we are encouraged if someone can find a common thread on for example forecasting that cuts across interests in geosciences biology, social sciences or whatever that makes sense. That's wonderful. That's a great way of scaling the scope of the project up. But it multiple disciplines our each of there is a unique and distinct use case and don't have a strong connection to each other, in my opinion that would not be as strong a proposal and I think it would start to evolve into just a Computer Science proposal with a lot of distinct use cases and would not be as competitive in my opinion.

And also the strongest institutes will have convergent activities among the domains as well. Thank you. Another my opinion.

And also the strongest institutes will have convergent activities among the domains as well. Thank you. Another question was, 's synthesis science or transformative manufacturing and as a party and appropriate party and appropriate theme for institutes? Tony, are you still online? What that be one you would like to take Anando? Is synthesis science or transformative manufacturing a priority?

I can address Advanced Manufacturing. That could be a topic. That's part of industries of the future so, yes, definitely, that could be a topic and definitely many different areas we could construct a proposal around the topics that you mentioned.

I am not sure what is meant meant by synthesis science.

Manufacturing events.

The synthesis for thinking it might be first synthesis and might be first synthesis and discovery, materials, and so forth and certainly fall within the domain of the materials genome initiative, which is also a priority at NSF.

Great, thank you both.

Amy there is a question which I would like to address which is, I think attempting to parse the requirement that you maybe PI, co-PI, I believe it says or Senior Personnel on only one Institute proposal. Is that correct?

Say that again.

It may be API, a Co-PI or Senior Personnel?

Correct.

This person would like to kind of like skate between Senior Personnel, which may be key personnel. They are key are key personnel. That the definition, and other personnel, but other personnel tend to be restricted to two kind kind of categories. One is professionals such as programmers, et cetera. And postdoctoral Associates or students. It is not meant to be a category that generally covers researchers.

Thank you for answering that, Sylvia. I appreciate it Rick let me ask as long as I am there, any other questions of those of you that have been going through the Q&A that you would like that, Sylvia. I appreciate it Rick let me ask as long as I am there, any other questions of those of you that have been going through the Q&A that you would like to answer live rather than spending time typing on it? That you would just like to answer it verbally now? Vyacheslav, do you have one?

I've been answer this in various forms in multiple ways and about possible future solicitations, and I will say it's very difficult to make predictions, particularly predictions, particularly about the future, so we cannot tell you whether or not we will have a renewal of these opportunities, whether or not there will be another solicitation a solicitation a year from now. As soon as we have a solicitation out you will find out because we will advertise as a community.

Amy, I would like to take the one although although I expect my colleagues to help me on there are several of the phrasing collaboration strategy with other HDR institutes. What we're looking for here is in your vision of how your Institute is successful, plans to interact as equals with other kinds of institutes that may or may not overlap with you not overlap with you in specific d omain, but may have technical or computational insights, or may overlap in domain but have domain but have entirely different perspectives. We're looking to build a collaboration environment that reflects the entire ecosystem so that two years from now it will be a functioning whole. What you want to do is talk about how about how you would position your Institute to do that.

Very nice, thank you, Sylvia. Anyone else want to dive in in on that one.

Peter?

Tony, go ahead.

Go, Toni.

HDR ecosystem is not just Institute is meant to be for but also tripod, which is a fundamental data just Institute is meant to be for but also tripod, which is a fundamental data science for Mark part of workforce training education two. That one area also be able to work with the whole entire ecosystem

of investigators, so just keep in mind that fundamental education workforce, and also the community of institutes too.

Very nice.

Marta, since you are leading, you and Sylvia are lead in the DSC, data science course solicitation that is out on The Street do you want to add anything to what has just been said?

I encourage to read the [Indiscernible] carefully. I answered one of the questions. We're not seen the [Indiscernible] educational activity. They are very distinct solicitations. Will be [Indiscernible] solicitation that we're looking for is different from the Institute. We expect [Indiscernible] too think about ways Institute can contribute to a broader Institute that does include the DCR.

Thank you, nice answer. Sylvia do you want to add anything or, Toni, add to that one?

Lovely as always.

We'll done, nicely done, Martin. Thank you, Toni. Any other answers of folks? You can see folks that have signed in today that I have a marvelous working group of colleagues that are very good at answering these questions. Do any of you have questions of that are there you would like to go ahead and answer verbally rather than spending the time typing?

Darrell?

Let me add something to the discussions about the interactions with the ecosystem. I think we should also be aware as you try to carry out the science you are trying to do at the end something to the discussions about the interactions with the ecosystem. I think we should also be aware as you try to carry out the science you are trying to do at the end of the day that you should feel free and leverage other NSF investments that are out there, whatever facilities and so forth that you need. In so doing may help you in reaching between other institutes in the ecosystem and other activities.

[Captioners transitioning]

Data scientist is a phrase that is used but what a data scientist is is highly variable. I pass as a data scientist. Usually I pass as a computer scientist. Data science generally includes computation, mathematical or statistical insights, programming insights coupled with some amount of domain science, understanding. But you don't have to be any one or the other of any of these to actually be part of the institute. I think this feeds into the question of whether or not you should come into a single directorate or multiples. The person who asked had gio as an example. I don't know if my gio colleagues are on but gio to my mind is very diverse and certainly not a single kind of domain. So I think what we are looking for is the utility of the science will be broadly applicable to at least one domain. But we're looking for the long range goals of science that Amy explained were the bread and butter for the national science foundation.

Thank you very much, Sylvia. Actually while we are on this topic, it is top of the hour, we'll probably go for another 15 minutes. Juan Mesa is online for a moment. Juan, in addition to leading HDR steering committee is also the head of the DMS so all the various mathematical sciences at the foundation and has been a leading as is Tony cue for some. I think Chris stark is online as well today, though he is on the road right now. But that some of the tri pod activities, they're underlying foundation AI, various kinds of

science that are involved. So I don't know if you wanted to say anything, Juan or also simply because it's been an hour, did you want to have any sort of general or sort of closing words for the session now although we will maybe stay on for another 10 or 15 minutes to take additional questions until everybody is just all burnt out. Did you have any comments on your part?

Sure. First, let me thank everybody for being online. The number of participants, this is something that's a great interest to the community. Thank you all. I thank everybody on the HDR working group because they've done such a good job of answering the questions coming in, you can see the working group has been working closely to come up with a good set of answers to your questions. The questions you have raised are things that have been discussed at length here. Here are three things to take from this, not to over step what's been said because it's been said better and I think the slides have good material too. I encourage you to look through those carefully. From my perspective, key points. This is about advancing science and engineering. It's enabled through data in terms of point of view. But I think Peter said that very well already. It's really about advancing science and engineering because of the data intensive technologies. Number two, convergence is really important. You have heard this for many of the working group already. Certainly Sylvia just mentioned it quite nicely too. We are really looking and hoping to have applications across single discipline. This is really about convergence research enabled again by data science. Three, there is an entire ecosystem we have developed through HDR. There are tri pods. There is data science. These are activities that we are hoping as you think about your proposals, look to see what's out there and look to see how you will interact with the components. We see this as all coming together in a nice cohesive way. As you think about it, think about that ecosystem. Those are the three points I would say from my point of view and certainly the tri pod Amy pointed out is lying out the foundation. We are hoping that something that comes out of there could be used in institute and we are hoping problems out of the institute can be turned around and applied or be studied by the tri pod. It's all one big community from our perspective. With that, let me stop because I know you have other questions. Thank you for the opportunity to talk and good luck to everybody. Thank you.

Thank you so much, Juan. I appreciate you being here for this session. We'll be happy to take additional - go ahead.

I would like to circle back on a couple questions that have been already answered but I would like to link them together. There had been a previous question about what do tipping points mean and that was answered by Tricia. It ties into the question I dealt with about can we fund data generation? Let me say the reason we put that tipping point metric as one of the high level goals was there are some areas out there where there just happens to be a large amount of data or some other change that's going on that has resulted in putting discipline at a point where if we put focused effort on getting handle on how to deal with the data ordeal with this new type of data if there is instrument change that's resulted in a new type of data being collected that's opened possibilities and now we need a handle on it like instructional biology then those are the things we are looking for. That precludes the need to invest in data generation. We are looking for problems where there is a problem to be solved now because of a significant data challenge. I think rather than trying to wiggle to see can we justify some data creation, I would concentrate on framing the question in such a way that it does have the characteristic of being a problem that with a little push we can really make a big difference. Tricia put that very well answering that question. I would like to also call attention to the third bullet Amy talked about at the beginning which were the questions aligned with NSF directorates. I have seen questions, one about aligning with NIH. The reason we put that was we can't afford to fund all the science activity with the HDR awards. We

hope these aligning with where there are already investments going on to fund the basic research. Hopefully those projects will adopt technologies, approaches, methods out of the projects so the impacts will amplify. That's only going to happen if you are working in an area where there is a lot of activity and that it is clearly a priority for NSF. It's sort of trying to put context on the three bullet points Amy identified before.

Great. As always, many thanks for that, Peter. I think what we are doing is we are heading toward 3:15. If there are other questions that people would like to answer or if there is any synthesis like just done or any points that you think maybe weren't touched today, this would be a valuable thing to know if you were a potential PI, I am looking to my working group colleagues, are there any things you would like to bring up? Okay. Slava, Sylvia.

Question about members for the institute, [ indiscernable ].

You are not prohibited but you are discouraged informally.

okay. You two are in alignment.

There are questions about what are expectations of institute for conducting resurgence research and education by the team verses enabling and supporting broad communities to do leading edge research and education? We anticipate that the institute will conduct convergence research and education.

Okay. Great.

We do not see them as supporting a broader community.

Great. Thank you, Sylvia. Other comments, questions. I think we have answered most of the variants of what's still there as questions.

On Sylvia's last answer, I agree that we want the institute to conduct research but as part of its outreach, it is going to benefit a broader community.

Yes, I agree. I am sorry if that was unclear.

Cheryl, our colleague from SBE with Tricia, thank you for speaking up. Anything else that you wanted to bring up while your mute button is not on?

Sorry, my mute button is back on.

Anything else that you want to bring up? Okay. Anyone else? Great job, working group. Many thanks to all the participants that attended today, excellent questions. Again, welcome to discourse where your questions are helping us to make our answers clearer as we go. Thank you for that. I also wish to extend my heart felt thanks to the II team that's done a marvelous job of putting this together. There were many hundreds of you online today, lots of very good questions. I gather there has been some weather issues in a lot of the country, so everything pretty much stayed up. Most people were very clear, able to be heard. Nice work. To all the time that has been working with us, thank you very much for that. If there are no further questions, so that we will get you out in a timely manner, I am happy to declare victory and thank you all for your participation today. Okay. We can stop recording. Philip, if you would like to end it now, this would be terrific. My understanding is we will be providing this group with the slides that they have seen today, audio, not video, an audio version of the discussion today, and a

transcript of that audio. There won't be a lot of editing done to the transcript. it will basically be sort of realtime transcript. So there will be spelling and grammar errors, things like that. Basically you will be able to read it or to listen to it as well as to see the charts. I think we are done with that. You guys did a fabulous job. Thank you very, very much for your time. Peter.

I was going to think a bit retrospectively. I don't know how to say it without sounding ideological.

We may still be live. Let's not be too retrospective.

Has recording session ended?

I thought we were just NSF at this point.

I will end the meeting. You will have to meet separately.

Okay. Hang on a second. I will set up a meeting for all of us momentarily. If you guys would like to sign off, I will be very happy to start setting that up now and then we can all meet there. Thank you again, Philip, and elaina for your kind help. I will be sending you a note in a moment. Thank you Edgar. Always appreciate your help.

Have a good night.

You too. Thank you everyone. [ Event concluded ]