IARPA: Disbelief To Doubt Podcast

Episode 3: High-Risk/High-Payoff Part 1

Guest: Rob Rahmer

Dimitrios Donavos: IARPA sponsors research that tackles the Intelligence Community's most difficult challenges and pushes the boundaries of science. We start with ideas that often seem impossible and work to transform them from a state of disbelief to a state of just enough healthy skepticism or doubt that by bringing together the best and brightest minds, we can redefine what's possible. This podcast will explore the history and accomplishments of IARPA through the lens of some of its most impactful programs and the thought leaders behind them. This is IARPA, Disbelief to Doubt.

Dimitrios Donavos: Welcome back to IARPA: Disbelief to Doubt. I'm your host, Dimitrios Donavos. In this episode, we sit with outgoing Office Director Mr. Rob Rahmer, who leads the Office of Analysis, which is aimed a maximizing insights from the massive, disparate, unreliable, and dynamic data that are, or could be, available to analysts. In part one of our two-part conversation, we talk about Rob's journey to office director, the role the Heilmeier catechism plays in shaping IARPA research, how Rob defines success in the Office of Analysis, and much more. Take a listen.

Dimitrios Donavos: Rob, welcome and thank you for taking the time to talk with us today.

Rob Rahmer: Dimitrios, thank you.

Dimitrios Donavos: You have been supporting the Intelligence Community in various roles now for over two decades in areas such as cybersecurity, security engineering, and cyber intelligence training, and hold multiple degrees in computer science from Johns Hopkins University and the University of Maryland. What sparked your desire to pursue a career in the cyber domain?

Rob Rahmer: That's a great question. I've always been sort of a math geek when I grew up in South Florida and I was in the mathematics education for gifted secondary school students. That was a transition from fifth to sixth grade and I was tested for it. And this was an advanced math program going through a summer camp and then moving to a magnet school to focus on things like logic tables, looking at proofing things that at the time did not understand why we were doing these things. I mean, we were looking at advanced algebra and heading from fifth to sixth grade and always had a keen interest in math. And then coming up and growing up in the eighties, we had Atari and then Nintendo came out. And so video games were always of interest to many of us as a break from advanced math classes and science.

So, I think that's where a lot of my problem-solving skills and pattern recognition skills evolved. In fact, some of the many brilliant analysts I've worked with throughout my career, especially at NSA, many of them were gamers. And coming from a single console through PC and streaming now, there's many varieties. But some of the best and brightest were problem solvers through gameplay, whether it's individual or sort of cooperative gameplay.

But I always had an interest in math and problem solving. So, when I was getting out of high school, trying to decide what to do next and focusing on university or military service, I chose military service and tested into the Naval Nuclear Power Program. And given my math background and passed the test, and I guess the rest is history. I went to the Naval Nuclear Power Program through a school, power school, and then advanced prototype training and then deployed to the fleet. And so toward the end of my Navy career was looking at what to do next. And so, I really didn't have a path. I knew I didn't want to, and God bless them, work on shifts at a nuclear power plant. I wanted to do something different. And given my math background, I...talked to an advisor at the University of Maryland Baltimore County as I was getting out of the Navy and they said, yeah, if you're interested in video games and math, computer science and problem solving, computer science may be the right fit for you. And so that piqued my interest into the computer science field. I had done some programming back through basic way back when on, I forget which system was back then, what, Apple IIes?

Dimitrios Donavos: Apple IIe. Yeah, that's dating us a little.

Rob Rahmer: Yes, yes. And yes, it is, it is. And I always had an interest in automating and automating things and creating graphics. That was back at the end of elementary school and middle school. So given that, I said, let's give it a shot. So.

Looking at computer science and ways to automate and make, we call it the lazy way, but making things easier, whether it's math formulas, computations, then you learn all the algorithms.

But still at that point in time, I didn't know which field I wanted to go into and apply computer science to. So, I think it was my senior year, there was a security course and you learn in a crypto course and learning all of the different ways, the different ways you can apply cryptography. And what really got me going as a competitive person and coming up from the video game console area, the video game console era, was the way that the professor set up the course was we learned about the different types of cryptography, but we had a competition and every week or so he would release these codes and whatever we were learning at the time, we had to break them and it was based on time and it was extra credit.

So, we were given like an hour timeline of when it would be released and it made us very competitive. And I think you can probably see my name still posted on the UMBC website for some of the math competitions, the crypto competitions. But I tried to rank as high as possible and there were different levels of difficulty, medium, high, and tried to go for the high ones for the most points. So that sort of pushed my interest into security and then cybersecurity because, in cybersecurity, one of my first jobs was looking at systems that sort of, we'll say security appliances that, that, were protecting networks and made all these claims about how they protected networks. And so as a new person working with those more experienced, trying to understand how you can break them and prove that those claims are false. And so you bring it in the lab and you test it. And that's sort of the start of my introduction into cybersecurity. And that expanded more into the...the operational side, which I can't talk too much about here, but it was a very nice journey, especially within the Intelligence Community.

Dimitrios Donavos: So, I can certainly relate to that era of playing video games and learning problem solving. I was playing Atari and Nintendo when it came out. There was a part in the Super Mario Brothers that I never could get past, so I might have to talk to you offline about how you managed that at some point.

Rob Rahmer: Dimitrios, I think I still even remember, I don't know if you remember, but the Contra code, it was up, up, down, down, left, right, left, right—

Dimitrios Donavos: That's right.

Rob Rahmer: B, A, start or something. I don't know if I got it right.

Dimitrios Donavos: No, no, but it's muscle memory. If you put a controller in my hands, I might be able to redo it. So, along the way, you've touched a little bit on this, but who were some of the people that were most influential in your life and impacted you both professionally and personally?

Rob Rahmer: I think as I came on board IARPA as a technical SETA, I worked with Ed Baranowski, Jason Matheny, who then became the director, and then Dewey Murdick. And they helped mentor me to put my first Newstart pitch together, especially Jason and Dewey. And I think they were ones that initially, saw the value and the ideas that I had. So, looking back, transitioning from operations to research and dabble a little bit on the research side in cybersecurity, we were always looking at reactive responses. When IARPA stood up the Office for Anticipatory Intelligence, I had some ideas for how to build a more proactive and predictive cybersecurity program called CAUSE, Cyber Attack Automated Unconventional Sensor Environment. And just talking through it with Jason and Dewey, they helped mentor me on the IARPA way, the processes, some of the lessons learned when they developed their programs. And I think that helped get me on the right track to be able to put my own new start pitch together for that program. And I think some of the best practices from both of them with how to manage expectations for your research performers, how to report results was definitely valuable and beneficial to both my role as a program manager and office director here at IARPA.

Dimitrios Donavos: Your perspective at IARPA, because to my knowledge, you're the only person in the organization's history to serve as a technical SETA, a program manager, and now currently in a leadership role as the director of the Office of Analysis. Talk to us about that journey. What initially attracted you to IARPA, and describe to our audience the ways you were able to make contributions to IARPA's mission in each of those different roles.

Rob Rahmer: The first program I supported at IARPA, I cannot speak about here, but what attracted me to the role was they needed someone who understood cyber operations. And I had a background in cyber operations and was able to provide my expertise to the program manager. Didn't know what to expect when I arrived at IARPA. I only knew of DARPA, which... I think that's common for many folks within the Intelligence Community and Department of Defense. IARPA at the time was not as well known. I think it was late 2011, early 2012. And it was always, we get the name, the IARPA is just DARPA for the Intelligence Community. I think that's changed quite a bit, but that's a way to remember it wonderful. So when I arrived, I did not know what to expect, especially a role as a technical SETA.

And as being given that role, I was empowered to review and assess progress on behalf of the program manager and provide my analysis to the program manager to make decisions for that cyber operations program. And what drew me here was the potential value to the Intelligence Community and not at the time, but what could happen in a few years.

And I was like, wow, this is really, really game changing coming from an operational side. This is how we do it today. And what we're trying to do or what this program was trying to do is get us to the next couple of years or get us somewhere to begin in the next couple of years and advance us rather significantly. So that is what sort of drew me into IARPA and then supporting other programs and studies.

And coming from that operational background, I had a lot of ideas on how to move away from this whack-a-mole strategy that many agencies conduct, at least back a decade, more than a decade ago. Things have changed significantly, but always chasing things after the fact. And yes, we need to gain intelligence on those things. But there really was very little proactive strategies that would also allow the users to fully function. So, looking at that problem, I had some ideas. And I mentioned cause, which then led me to work with my office directors and mentors to pitch an idea. And I think that's what drew me into becoming a program manager. And when given going through the new start pitch process, very difficult. It's not easy. You get, you get beaten down by many different, and beaten down in a good way. You're given, this isn't gonna work, and you're told why, and then you have to correct, course correct, course correct, and it's almost like it's a never -ending battle, and you never see the finish line until you do. But that's the ARPA way, the ARPA way in general, to build a program based on the Heilmeier Catechism. And... that just that robustness and being able to say, hey, yeah, I went through this pretty

rigorous process and I made it through. And then you're pretty much by the director given a budget, a check to then put out a broad agency announcement to then solicit the proposals from some of the world's best researchers. It's pretty empowering. And the fact that you know your idea can possibly change the way we do things, especially in the cyber operations field, cybersecurity field.

So that was my path to becoming a program manager. And as a program manager, a lot of travel, a lot of decisions have to be made. And I think that I, so I took over the CAUSE program. I started the cause program. I also took over, I always say the wheel of trust from Jason Matheny, Dr. Jason Matheny, who became the director at the time. I took over his FUSE program and, after leading both of those programs, I had a good understanding of how IARPA worked and how things worked and was able to help mentor some of the other program managers during my time here. And it's just a wonderful place to work, a wonderful place to, you know, seeing transitions happen, even if your program isn't successful. So CAUSE we had to effectively kill because we lost some of our data, our ground truth for a forecasting program, which is an instant killer and some of the metrics were below. We could have maybe advanced them, but it is what it is. Data wasn't there. So we got our data cut off, and then we had to end the program. And being your baby was tough, but we make data-driven decisions here. So being as objective as possible with that, I think Jason had a lot of respect for the fact that I had.

Because as a program manager, we typically, and as an office director now, you constantly see the fights. Well, we got to keep this. This is why we need it. But the data says otherwise. And yes, in our guts, maybe it will work out. But we have to maintain budgets and start new programs. So we have to make those tough decisions. So I made that for the director, recommended it, and Jason appreciated it. And then as we moved on, advanced during my role as a program manager, looked at trying to transition components of both of those programs. And then toward the end of my time, we moved facilities. We moved from College Park, where IARPA was for the last, I don't know, was it maybe a decade at that point, maybe longer and we moved to the Intelligence Community Campus, Bethesda. And that was a big hit because we had a group of program managers and support staff from Virginia and some from Maryland.

And as anybody that knows that drives the beltway every day, the Capitol Beltway, that nine or 10 miles could mean 45-minute commute. And we had lost some great talent during that time. People tried to make it work, both on the government side and contractor side, but it was a big hit. And we sort of knew that, but we didn't know, the scale of that. So there were challenges.

And that was in the summer of 2019. So as a more senior program manager, I took on some additional programs to see them through for program managers that left. And many of us had to take on those programs to help see them to the end or help transition. And so that was summer of 2019. And then advance maybe six months later, and then COVID hits. And then I'd say, you know much of the U.S. and the world shut down quite a bit. We were in a new world, given we were in Intelligence Community. We couldn't come in the building, but we have an enduring mission. Most of our work is on the unclassified side and we were able to maintain operations. We were able to maintain much of our mission at IARPA working remotely. And it was tremendous, but during this time it was difficult to start hire new program managers, to see ideas through. We had transitions in leadership.

And so Dr. Marsh came on board around the end of 2019 and the beginning of the COVID era. And we had no offices at IARPA. So historically at IARPA, we had three offices, then we went to four offices when we added the office for anticipatory intelligence. And then every director has their own philosophy and approach to things. And then, Dr. Matheny wanted to flatten the structure so we had no offices. And so when Katherine Marsh came on board, Dr. Marsh came on board, she created two new offices in line with the two main IC missions for analysis and collection. So I applied for that position and was able to help sort of rebuild IARPA because we were struggling to hire and start new programs given the changes in leadership, given the changes in location, given COVID, very challenging.

And so I took on that challenge and it's been a wonderful time starting so many new programs. It's been a whirlwind, I'll say in the last three to three and a half years.

Dimitrios Donavos: Rob, you touched on this a little bit in your answer, but when you were, when IARPA was transitioning back to having offices from this period where we essentially flattened the organization, what were your priorities coming into the position and what kind of office culture were you looking to reestablish?

Rob Rahmer: Our main priority was we need to start new programs. We need to, you know, we all have a budget and as we know in the government, oftentimes if you don't spend your money, you have to send it back. And we didn't want to do that. So it was a challenge to find new program managers or take the existing program managers and start new programs rapidly. And so that was one of my first challenges from Dr. Marsh was, Rob, you need to start several

new programs this year and next year. And here are your goals. So part of that was hiring new program managers.

And so given the goals of starting new programs and hiring new program managers, we needed to set a culture that was unique. It was different because we came from almost always and having no telework policy and being in the building as much as possible when we weren't traveling to support our programs and outward engagements. We had to develop a new model because to hire new program managers who had been working remotely or from other areas of industry or academia that had the ability to work remotely, it was tough competition coming from industry to government. And we had to evolve. And given that we had a telework policy during COVID and still do today, I think that was one of the things we had to set in stone was what is the right balance for bringing people back into the workplace for collaboration, but also giving them the ability to work remotely and transition from that several months to almost a year of almost working entirely from home and having no travel. So we wanted to make sure we set a culture of having both and being understanding for those transitioning back, because it was a tough time, I think, for everybody. But one of the other things, aspects, that I tried to set forth was quality.

I'm not saying there wasn't quality beforehand, but without office directors, there was a direct line to the program managers, to the director. And when you start to scale, that just, you can't do it. And so some things were waiting in the queue. And so the director had to prioritize things. And so when we came on board, we were the quality checkers and we were the prioritization.

We were empowered to have some oversight of the decision making that was delegated to us as far as starting new programs and decisions that were going to be recommended to the director during program reviews that occur every six months. And so, setting the expectations for quality, I think, was key. And there's always change. We all deal with change in different ways. We all go through and having someone now put in place between the program manager and director when there used to be a direct line was tough for some. But I think that we worked through that and were able to become successful because we wanted to make sure that the director could focus on the things that she needed to focus on. And we can work on the day-to-day and also the program development aspects and making sure that we had the quality and by quality, how we're reporting progress, but also quality of technologies to potentially transition.

Dimitrios Donavos: Rob, you've been credited with helping start what will be 14 programs in the Office of Analysis, which is a really impressive milestone and legacy. At the core of IARPA's process for developing high-risk, high-reward research is the set of questions known as the Heilmeier Catechism. You referenced them earlier, developed by former DARPA director George Heilmeier. Can you describe for our audience that may not be familiar with them what those questions are and how they serve as guardrails for helping us decide which risks are worth taking?

Rob Rahmer: So that's a good question because it's what they are and how we interpret them so you look at Heilmeier question one, what are you trying to do? And what we're looking at here is sort of the elevator pitch of what your program goals are, how is it going to impact the intelligence community if successful, and really how is it unique to the IC's mission versus a DoD mission and therefore possibly could fall under DARPA. This is the very high level. Here's the goal of the program and how it's applied to an IC problem. So that one's very simple, oftentimes very short. It's just a quick way to articulate, here's what I'm trying to do. And hopefully the problem solved is definitely and should be in line with the IC's mission. So the second Heilmeier question is asked generally, and I don't have these in front of me right now, but...

Who's doing it today? And what are the limitations of those approaches? And so this is one I hold very highly because I'm not an expert in every domain. We have programs in the biospace, biointelligence, biosecurity, and other areas that I haven't taken courses in many, many years. So here's where I asked the program managers to do their diligence to understand what does the literature say? What is the current state of the art and state of the practice? Who's doing it today? What technologies are there and what are they measured by? But also, because we want to look at overlap here. We want to make sure there are many ARPAs. There's DARPA and I think there's ARPA-H now. We want to make sure that we're not either overlapping with the current program or redoing something that we already have results from in the past.

So this is where the program manager really needs to do their diligence to provide references to papers, highlight technologies that are currently being used, both unclassified and classified, so that we can get a really good picture to make sure that, yeah, we're in the right space for this program. Because there's one thing that Dr. Heinem told me when I was developing my program. And he's like, Rob, you need to have people on both sides. You need people that are very skeptical, like, yeah, it'll never be done. And then you have to have some people that say,

yeah, we're already doing this. And if you don't have enough on both sides, you have to meet really in the middle there. And I've always taken that to heart and used that to bake that into my philosophy with my program managers. You need to have the skeptics, but you also need some that think that they're already doing it. And as you pull the layers back, and do that diligence for answering our question two, you find out it actually is somewhere in the middle. But sometimes it's not. And then we stop development because we find out maybe DARPA has done this in the past, maybe the recent past, or they're currently doing it. And so that sort of tells us where we are. And it's a lot of literature. So I do review some of the papers, especially in areas I'm not familiar with, like a biospace. So I like to see if somebody is a full of it, so to speak. I'm not saying that somebody would try to sneak something by me, but sometimes there's misinterpretations of papers there on what they're actually, the conclusions that they came to and may not apply to what the program is trying to do. But yeah, I'm not going to read 50 papers, but I'll pull some where the assertions made or cited don't make sense to me. So that's what I look at for Heilmeier question two.

And so Heilmeier question three is an interesting one, and is an interesting one as well. It's important because this is really how your program, what, what, what's novel about your program and why is now the right time to do it? And I look for a good program structure, take these program goals, take the challenges and current limitations of the state of the art. And it kind of wraps it. That neat thread starts to get pulled and you have, here's what my program is. Here's what I'm trying to do. Here is more recent literature that is the groundwork, the basis, the building blocks for where this research is headed. Yes, we can actually do this. Here's some work, work in maybe the, you know, in the cybersecurity domain that has advanced, take maybe cyber psychology, for example, and we're looking at, yeah, there's been some recent advances, but it hasn't been scaled to this point yet. And here's what they've proven, say, for certain cognitive vulnerabilities, but we need to look at a broader set of cognitive vulnerabilities, let's say. We'll look at the percent program, for example. Yeah, the percent program, for example.

So this is where the program gets structured. We look at what the challenges are within each phase, what the performers are going to have to overcome. And that's basically Heilmeier question three. And you have to prove that this is the right time, that we're not trying to time travel or change the laws of physics. That yeah, there are building blocks here that maybe it's from another domain, maybe it's within domain, but we can actually do this

Heilmeier question four and five? And four, we want to look at who cares, what are some of the risks of the program, but we really want to see how it's applied to the IC and IARPA's mission

and understand that separation from, say, DARPA or ARPA-H and IARPA and really look at some of those usually classified use cases and how we're going to sort of...change the needle. And so this is where the program manager, excuse me, this is where we're gonna see we have to push the needle to make a mission impact. And so oftentimes this is a very sensitive information and we have to work with our partners to make sure that we do have buy-in because one of Dr. Marsh's philosophies is that we have to have our partners, meaning our transition partners across the intelligence community have to have buy-in immediately.

So they are part of our program development process at some point as they're developing their new start pitch. And this, when we get to Heilmeier question number four, this really tells us that the program manager is speaking to the right people. I mean, there's so many different, we joke about stovepipes in the Intelligence Community. We're not going to talk to everybody. And even as we move forward with programs, somebody will come out and say, yeah, we want to hear more about this, which is wonderful but they just have to do enough diligence and talk to enough people at a variety of agencies. And we really want many of them to come to our new start pitch. That's one of the sort of the rules of engagement for Dr. Marsh in the last five years.

And so then we get to the core. Once we have proven that it's the right time, that there is a real problem here, that we're not reinventing something, we're not doing something incrementally, we're actually looking at revolutionary research. We have a structure in place and this is where we look at metrics timelines, costs, risks associated with those costs, how you're going to evaluate the program. And it's very important to us to have this independent test and evaluation. So this is where program managers oftentimes take metrics from literature. And looking at the Office of Analysis, we have to take into account sort of these operational metrics and blend those in with what data scientists are using today. And maybe we use both, maybe we use a combination, but they really work, they sort of work in a silo at first and here's what I see. And then once they begin speaking to partners in the IC and other researchers at some of the brilliant minds at FFRDC's, Yorkshire National Lab, they develop these into some, into metrics that will be most beneficial to measure success for the program.

Dimitrios Donavos: So Rob, you're anticipating my next question. A hallmark of IARPA research is our emphasis on rigorous and independent test and evaluation, or what we call T&E. Against a backdrop of a reproducibility crisis in the scientific community, can you describe to our audience from your perspective as an office director why T&E is so critical given the scale of

IARPA research investments and how IARPA prioritizes rigorous T &E throughout its entire portfolio of programs.

Rob Rahmer: Catherine's famous comments are trust but verify. We all know that, knowing Catherine for a long time. And I look at it in two ways. One is we get to the end of the program. Do we meet these metrics? Have we proven it? And we can maybe have tested it in various scenarios that are relevant to operational missions. And we can put our stamp on it and say, these are the results. Whether they were, met those phase stretch goal metrics or maybe not, we can tell an organization that here's where it works best and here's where it doesn't work best and help them decide how they're going to use these technologies operationally. Another aspect that I look at, especially with some of the modular programs we develop, we have oftentimes different focus areas or technical areas, FAs or TAs, depending on what the program manager decides. It's always a fun time going through those different structures. But nevertheless, we want to provide rigorous testing because even if the program isn't successful, so take, for example, a forecasting program, maybe the end result isn't useful, the entirety of the system, but maybe there are components as we perform this rigorous testing, the components are, and we know under test, the system under test, that we can take this and then it may be applied to a different problem or maybe something tangential, and we can actually make use of it. So there's a secondary sort of, definitely a secondary benefit to this robust T&E, and I believe it's anywhere from, you know, Catherine had mentioned every...one out of every $4, one out of every $3 goes towards investing in independent test and evaluation. But our partners want this. They don't want to spend more money to test. Obviously, when we move into the operational environment, there's different data sets and different needs. But at least they know and can trust this. And it's a less investment for them to take these technologies on and continue testing.

Dimitrios Donavos: You know, one of the things that makes IARPA truly special is this really rigorous focus and investment, as you said, on T&E. One of the other things that I think makes IARPA very unique is this implied permission to fail. And I want to unpack that a little bit, especially in your own experience since you had to end the CAUSE program early.

Can you talk to our listeners about what failure means to you in the context of an IARPA program and how the community might actually benefit from failure?

Rob Rahmer: So failure means we didn't meet program goals. And that's, simply put, the research that we undertook and invested in, we didn't meet those, or at least mid-phase goals or whatever phase we were in. It doesn't measure up. So the way we look at failures is from those metrics -driven, excuse me, we look at failures from those metrics-driven, data points. And the key part of failing is really understanding why. Was it maybe, was it, should we run a different scenario experiment? Was it because the technology was too soon? Wrapping up those lessons learned and then sharing it to our transition partners and the Intelligence Community is critical. And which could allow them to maybe continue investing in a space or maybe even IARPA in a future program, learning from it and then reinvesting as technologies advance because maybe it was a little bit too soon. And that's sort of the transition from the Heilmeier catechism to this. We do our diligence and yeah, maybe we're just not there yet. Again, I mentioned earlier that there's components of a system that may be useful for transition and even if the entire system fails, we know where it's successful. We know what works, what doesn't work. And I think the documentation is key because we don't want to fail programmatically. And that's why we have program managers and SETA support. We want to make sure that it's the research itself that at some point just doesn't get us the results we need and capturing everything and moving forward and making those tough decisions.

Dimitrios Donavos: Thank you for joining us. For more information about IARPA, and to listen to part two of this two-part series, visit us at iarpa.gov. You can also join the conversation by joining us on LinkedIn and on X, formerly Twitter, @IARPANews.