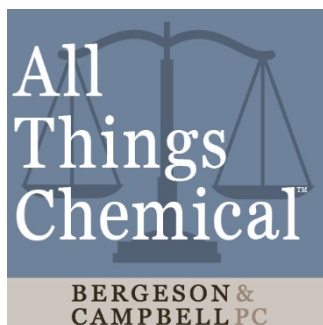




Episode Title: Accelerating Chemical Innovation: Inside Argonne's Chain Reaction Innovations Program -- A Conversation with Rachel Harris, Ph.D.

Episode Number: 20260108

Publication Date: January 8, 2026

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Lynn L. Bergeson (LLB): Hello, and welcome to *All Things Chemical*, a podcast produced by Bergeson & Campbell (B&C[®]), a Washington, D.C., law firm focusing on chemical law, business, and litigation matters. I am Lynn Bergeson.

This week, I had the pleasure of speaking with Dr. Rachel Harris, Technical Project Manager, Chain Reaction Innovations (CRI), at Argonne National Laboratory (ANL), and our own Dr. Rich Engler to discuss ANL's CRI entrepreneurship. We here at B&C truly appreciate the value and importance of chemical innovation, so when we learned of ANL's CRI Program, we wanted to share information about it with our listeners. Dr. Harris is a Technical Project Manager and speaks with Rich Engler and me about the CRI program, more about ANL, the technology CRI supports, and how interested entrepreneurs can learn more about becoming part of the next CRI cohort. Now, here's my conversation with Rachel Harris and Rich Engler.

Rachel, Rich, I am so happy to be in the studio with you today. Our listeners are well familiar with Rich Engler, our Director of Chemistry, but Rachel, maybe you can tell our listeners a little bit about yourself, your background, and how you found your way to ANL.

Rachel Harris (RH): Thank you so much, Lynn. I really am grateful for the opportunity to be on the podcast with you guys. My name is Rachel Harris, and I'm a chemist by training. I did my Ph.D. in chemistry at Northwestern University, and that's in Evanston, Illinois. I knew that Argonne was right in our backyard in the Chicago suburbs. After I completed my Ph.D., I started working in industry in research and development (R&D) at a company called PPG. I was there for about six years, working in both corrosion and in color science. I started out as a formulator, developing anti-corrosion coatings primarily for the transportation industry.

While I was in that role, I worked on two government-sponsored projects from the U.S. Department of Energy (DOE). One of them was through the Vehicle Technologies Office. One was through, at the time, the Advanced Manufacturing Office in high-performance computing. And these projects were partnerships between private industry and the public sector, government, academia. As I progressed in my career as an individual contributor, I started getting really interested in learning how to manage these types of projects, so I started pursuing certification as a project manager, becoming a Project Manager Professional, or a PMP. Then kind of by happenstance, I saw an opening for my current role from a former Northwestern professor, Dick Co, who's now the Director of the CRI program, and who is now my manager, so really very fortunate to be where I am.

LLB: I think CRI is very fortunate to have you in that position, given that wonderful background. Rich, how do you and Rachel know each other?

Richard E. Engler (REE): We both spoke on a panel at the American Chemical Society national meeting here in Washington, D.C. I heard her presentation, and she was talking about CRI. I got very excited about it and the opportunity that it presents to innovators, and I thought having Rachel come onto the podcast and talk to the broader community would be a good opportunity for Argonne to get the word out and for our listeners to learn more about what's happening.

LLB: An inspired idea. Absolutely.

Rachel, thank you for telling us a little bit about yourself. Maybe you can also share, for our listeners' benefit, a little about Argonne National Lab. I know a little a bit about it, and I certainly read up about it. I know it is affiliated, or is part of DOE, but maybe you can help our listeners understand more broadly what Argonne does.

RH: Absolutely. The origins of Argonne really date back to the days of the Manhattan Project and trying to create the first self-sustaining nuclear reaction, which is actually the namesake of the CRI Program. Following the conclusion of World War II, there was a lot of interest in harnessing that energy for peacetime applications. Argonne became the first national lab. It's now one of 17 national laboratories.

Today, it's really a multidisciplinary scientific laboratory for increasing the security and prosperity of the United States. It does focus a lot on energy materials. To give you a sense of scope, our annual budget is over a billion dollars. There are around 4,000 employees at Argonne, half of which are scientific staff. We also -- sorry.

LLB: That's just a lot larger than I thought. That's huge!

RH: Yes, and we're not the largest national lab by either budget or personnel. We also have a number of user facilities. Because we are funded by DOE, a number of our user facilities -- such as the Aurora Supercomputer, the Advanced Photon Source, our Center for Nanoscale Materials -- all of those user facilities, you can submit a proposal. If the proposal is accepted, those user facility are free of charge as long as you promise to publish.

LLB: Excellent. Well, as the Technical Project Manager at CRI, I know that's an entrepreneurship at Argonne National Laboratory. Maybe you can tell us a little bit about -- I'll call it ANL instead of saying Argonne National Laboratory repeatedly -- what the program is, provide some historical context, and what your intent is in having CRI.

RH: Yes, absolutely. As you mentioned, CRI is an entrepreneurial fellowship program at ANL. Zooming out a little bit, I want to talk about how our program is one of four similar programs at various national labs across the country called the Lab-Embedded Entrepreneurship Program. The mission of the Lab-Embedded Entrepreneurship Program (or LEEP for short) is really enhancing affordability, reliability, and security of the American energy economy by commercializing new energy and manufacturing innovations, bringing them to market at an accelerated rate. We do this by supporting entrepreneurs in providing training and business development, connections to the startup ecosystem, and access to the resources of DOE, or DOE national laboratories across the country.

The very first program was established at Lawrence Berkeley National Laboratory around ten years ago. It's called Cyclotron Road. That was followed up by CRI at Argonne and Innovation Crossroads at Oak Ridge National Laboratory the following year. Our program is nine years old. Then in 2022, they started a fourth program at the National Renewable Energy Laboratory, or NREL, in Boulder, Colorado, called Westgate. That gives you a picture of the history of the program. I really want to highlight that this program is more than just a jobs program, it's more than just a professional development program, it's real economic impact. Collectively, across these four labs, we've launched over 180 new businesses. Our startups have received over \$4 billion in follow-on funding, created over 3,800 jobs, and over 90 percent are still in business, which is huge.

LLB: Yeah, sorry. Remarkable metrics. I mean, good for you. That is a true indication of the success of the program to have such a high longevity rate for the startups. That's fantastic. Congratulations.

RH: Thank you so much.

LLB: We come at innovators from similar but different perspectives. One of the reasons Rich is here is because, Rich, you do so much work trying to promote new innovations and actually get them into commerce, which is a regulatory process, but nonetheless an arduous one that maybe the innovation program at Chain Reaction might want to consider. We can talk a little bit more about that as we get into the podcast, but getting people ready for developing their innovation, scaling it from lab to commercial is a fabulous opportunity for your cohort members, Rachel, the folks who actually go through the innovation program. We pick it up when something is ready to rock and roll on the commercial level, and I'd like to explore how you two are a continuum. Rich, any thoughts on that?

REE: Yes, certainly coming out of an academic environment, your focus is on the innovation, on the technology, making it work. Getting into a program like CRI helps bridge that bench to commercial -- it's that jumping-off point. Rachel, I'd be interested to hear more about how ANL provides that, the facilities and the support, to be that launching point. But in all of my years since working at the U.S. Environmental Protection Agency (EPA), and certainly since I left EPA and been here with B&C and The Acta Group (Acta®), I've noticed -- and it's based on my own experience as well as an academic -- there is an underappreciation for regulatory review that stands between the innovator and the market. It depends on, of course, what you're commercializing, how you're commercializing it, where you're commercializing it. But there may be some pre-market review that's required, there may be something that you have to do, some base you have to touch, or some i you have to dot to make that leap, because at some point -- really across statutes and across countries and jurisdictions -- there's a lot of flexibility for R&D, but at some point, you're no longer doing R&D, and you're doing something commercial, and at that point, you do have to be compliant with whatever and wherever you're operating.

RH: Yes, absolutely.

LLB: Exactly. When we started planning this podcast, Rachel, your call for applications for CRI had just, I think, gone out and now has recently closed. I think it closed earlier this month. Can you tell our listeners about CRI and exactly the type of really innovative support the program provides? I think I'm using the right terminology: high-impact technology. A little bit about the program, who might be interested in applying, what you prepare them for, and what are high-impact technologies?

RH: Yes, absolutely; I can dive into that. Our program provides support in a number of different ways. First of all, there's a fellowship. That provides two years of salary and benefits to the selected innovator to pursue their startup full time. I think for a lot of people, there's a real challenge because you have to be employed, and you have to pay the rent. When you're founding something like a startup, particularly a startup where you're creating a physical thing, it can be really challenging to figure out how to support yourself. This I think is a really key contributor to success where they can really dedicate themselves full-time to launching their companies.

We also provide funding for their project. This is essentially a research voucher to spend at Argonne on materials and scientific expertise for a two-year collaborative project. Rich, as you mentioned, going from bench scale, to pre-pilot, to pilot, and to commercialization, that's not a trivial process. The goal of a lot of these projects is really trying to cross that valley to reach more of a commercial launch point. In addition to the fellowship and the project funding, we have a lot of programming that the cohorts participate in throughout the time that they're with us.

We have business development programming. That is headed up by my colleague, Deena Wright. First we ask the innovators to do a self-assessment, and we do some interviews with them to determine where their greatest needs are in terms of business development. Sometimes it could be marketing, or sometimes it's legal concerns, but we really try to hear from them so that we can tailor the programming accordingly. There are a few mainstay workshops, things like financial modeling, media relations, pitch practice. Those we have pretty much every year with every cohort, but sometimes we need to bring in more tailored or specific expertise. We also have monthly all-hands meetings; these are branded as Chain Link meetings. This is a really important part of the program because it really allows a lot of peer-to-peer interaction. You're hearing from founders who have been through a similar problem before, who have been in your shoes before, who might be working on a complementary technology upstream or downstream, and fellow scientists really. That's a really key part of our programming that we prioritize.

REE: I imagine you have this valuable network of graduates from your program. How much do you rely on them to come back and interact with your current cohort?

RH: Yes, that's a great question. We have done a lot of work to build that community and to continue to engage our alumni after they've quote-unquote "graduated" from the CRI program. We have a very active Slack channel that all of the current and previous innovators have access to. Often, people can post a question in Slack; they'll get a ton of great responses there. We've also done a couple of field trips, so once some of our startups have outgrown the lab space at Argonne, they might open their own lab space somewhere else in Chicagoland, and we've been able to go visit them, tour their labs, see how they're doing. That's been really great alumni engagement.

LLB: In addition to alumni engagement and peer-to-peer, it also sounds, based on my research, Rachel, that there are opportunities for access to investors, to more mature scientists and innovators in an area that is similar or related to the cohort classes' innovations. Just the hands-on support, the ability to network, your access to investors -- sounds like a fabulous, fabulous opportunity. How many people or scientists do you have in each cohort? You've got about nine cohorts already, and you're looking for your tenth in 2026. Is that correct?

RH: That is correct. Yes, it's usually around five startups per year. Sometimes it's more or less. Yes, four to six, pretty much generally. Because it's such a small group, we are able to provide a lot of tailored opportunities. As you mentioned, beyond the scientific world of Argonne, there's a really incredible ecosystem that is embedded in the Chicago area. I'm thinking of World Business Chicago, and mHub, and the Polsky Center for Entrepreneurship and Innovation at the University of Chicago, many other partners that we've worked with over the years that provide great networking and, as you mentioned, access to venture capital.

LLB: Which is huge. It's the entire ecosystem, the network, the opportunities. I would imagine your call for applications is always successful. If you pick five, six, that's a very discrete class. These must be exceedingly coveted. What types of application numbers do you get, and how do you go about selecting candidates for this wonderful program?

RH: Yes, it's very competitive, and this year we received over 100 applications. That's about 30 percent more than we usually get from past years. I will say that a human looks at every application.

LLB: Good to know. AI (artificial intelligence) hasn't replaced the review process.

RH: Not entirely, no. So myself, my colleague, our Program Manager, and the Program Director -- we're currently reading applications. Once we're finished reading them, we'll send them to Argonne scientists who are more closely related subject matter experts for their review. I'm a chemist by training, that's really the central science. I have a good sense, but I'm not an expert in everything, obviously, so we really need that feedback from the scientists there.

After we read all the applications and the scientists read the applications, we usually have around 30 or so semi-finalists that are invited to pitch to us virtually, and that will be in February. And of those 30, we might invite 10 to 12 to pitch in-person at Argonne, and that we'll be at the end of March this year. We usually announce who the Fellows are the following summer, so that would be summer of 2026 for this tenth cohort.

You might be wondering who are these innovators? Where do they come from? We do have some technical requirements. We want them to have five years of hands-on technical experience. We do not require a Ph.D., but many of our candidates have a Ph.D. that fulfills that five-year technical experience requirement. We do require that you must be a U.S. citizen or a legal permanent resident. We require that you relocate to the Chicago area for the two years of the Fellowship and that you are committed to building your company full-time and that it's really your main gig, and that it's not just a side gig.

LLB: A hobby, yes.

REE: It's not -- a lot of these things -- it's hard to launch out of your garage. The idea that you can add this to your stipend, but then that also helps justify the move. You'll be there, so that

you can be in Argonne in person, but you'll have that -- in addition to the program support, you'll have that financial support. I can see how that is a huge benefit.

Rachel, tell me a little bit about what industries you focus on with the program and what technologies you prioritize.

RH: Yes, this is a good question, because I would say we're pretty agnostic as far as industries. Many of our founders, they're former grad students or post-docs. Sometimes it's people who are mid- or late career, who have worked in industry for a while and decided to strike out on their own. I think the key defining feature is that we're looking at science-based innovations across a number of different industries that align with the science we do at Argonne and the mission of DOE. Some examples of industries that we see a lot, certainly manufacturing and industrial efficiency types of projects. We see energy of all kinds, quantum and advanced computing, transportation, buildings and construction, and many others.

LLB: Rachel, to what do you attribute the 30 percent increase in applications? That is a surprising uptick. Is it because of the enormous focus on energy technologies today, or is the word getting out over this fabulous program? That's a big uptick.

RH: It is a big jump, and I don't know exactly what the answer is. It could be that the outreach that we've done attending professional conferences -- and our e-mail campaign has really started to get a lot of traction. I'll say that a lot of our applicants come to us through word of mouth and through our current innovators and our alumni who are telling their friends and their connections about the program.

REE: I'm going to credit the ACS conference, where we spoke.

LLB: Rachel, in reviewing your fabulous website, I was attracted and impressed by just the sheer diversity of technologies that you have considered and promoted over the years. Have you identified any past technologies that you and your colleagues at Argonne would consider your greatest successes?

RH: It's so hard to pick one.

LLB: Choose among your children, right?

RH: You tell each one that they're the favorite and not to tell the others.

LLB: "You're all my favorite technologies," right.

REE: Are there any that stand out to you as -- that our listeners might be particularly wowed by because of the potential applications, or their impact, or as a chemist, wow, that was an enormous chemistry breakthrough and that was --

RH: I can talk about it in terms of commercial success. We had one startup at the time that was called Super.tech, and they were acquired by ColdQuanta. This is a quantum technology. ColdQuanta later rebranded to a company called Inflection, which recently announced their intent to have an initial public offering (IPO). They're planning to IPO. The CRI innovator Pranav Gokhale will be the CTO [Chief Technology Officer] of this publicly traded company. That's rare; that's really exciting for us. In terms of just overall success rates, I

think it's exciting to me that so many of our startups are still in business today. That is a success to me.

LLB: Rich, you and I chatted before recording here about just generally what alumni do once they are commercially on their own. Do they tend to license their technology to larger Fortune 10 established companies, or what's the usual trajectory, or is there a usual trajectory? It could be very diverse.

RH: Yes, I would say it's all of the above. Many of our companies are still -- even after CRI -- at a fairly early stage. Our program's nine years old. Sometimes people do license out their technology. I think across the LEEP, generally, there have been a couple of exits. But a lot of them are continuing to stay private and to grow, with customers with non-dilutive funding programs like the SBIR [Small Business Innovation Research] and STTR [Small Business Technology Transfer] program, those types of follow-on funding.

LLB: Got it.

REE: Great.

LLB: Yes, it is great. Circling back to the topic we began talking about, my narrow world in chemical innovation is getting the innovation registered or accepted by EPA in a way that enables it to go from bench R&D to commercial application. Does your program ready your applicants for that reality? Because it is arduous, challenging --

REE: -- unpredictable --

LLB: -- and unpredictable, and often takes easily a year or two. But recognizing what the criteria are for approval by EPA, for example, in the chemical space, having an entrepreneur design a technology in a way that accommodates and anticipates those criteria is very helpful. How do you navigate around that space? Or is the program -- does it navigate around those eventualities?

RH: Yes, honestly, I think we should have you guys come in and give a workshop.

LLB: Oh no, it'd be all Rich, all the time. You don't want a lawyer in the room.

RH: Yes. In terms of regulatory, what we've seen in some of the self-evaluations is that they haven't really thought about it because they aren't yet to the stage where it would be a huge concern for them. They're more focused on really just more basic: is it technically viable? Do the numbers work? Does the techno-economic analysis seem reasonable enough that we can get investments to continue to scale our technology, maybe to build out our facilities? Things like that. Yes, I do think it will certainly be a concern for all of them at some point.

REE: Yes, you remind me -- I was approached to write a chapter in a sustainable chemistry book, a book about growing sustainable chemistry into commercial success, and they wanted me to write about regulations. But they wanted to write about regulations as -- forcing phaseout or bans.

And I said, "What are you doing about pre-market review for chemical innovations?" And they said, "What you talking about?"

LLB: Ha! Pre-market review!

REE: So I explained -- I said, "There's TSCA [Toxic Substances Control Act] and there's REACH [the European Union's Registration, Evaluation and Authorisation and Restriction of Chemicals], and there are all these other things." I said, "Why don't you get someone else?" And I suggested another author to do the ban and phaseout chapter, and I'll write the chapter about pre-market review, because it's very much -- I certainly knew nothing about it when I was an academic.

It's an underappreciated aspect of that commercial launch if you're doing anything in the chemical space. If you're developing software, you don't need a chemical review by EPA, but if you're developing a physical object, you need to make sure that you're satisfying your obligations, whether it's under TSCA or the Federal Food, Drug, and Cosmetic Act (FFDCA) because it's a medical device. And additional things, like if you're working in the building space, if you need ASTM (formerly the American Society for Testing and Materials). There are a lot of potential touch points where you need someone to look at the technology and bless it in one way or another.

RH: I will say ASTM is one that comes up quite a bit.

LLB: Yes, I can imagine ACGIH [American Conference of Governmental Industrial Hygienists], ASTM, all kinds of different aspects, so it might be a good add, Rich. Lots to say there.

REE: Yes.

LLB: I think you mentioned this already, Rachel, but the cycle for applications, for listeners who were not able to participate in the 2025 cohort, what is the normal cadence? When does the call go out? Where does it go out? And what do applicants need to know in order to ready themselves for considering getting a slot at CRI?

RH: We put out a new call for applications every fall. We have an annual application cycle, usually starting early September, closing in early November. As you mentioned, our application cycle for this year just closed. We do require U.S. citizenship or legal permanent residency. Those five years of lab experience could be in the form of a Ph.D., could be work experience or other hands-on laboratory experience, and we require relocation to the greater Chicago area.

I think when we think about technologies and different priority areas, our priorities are very much aligned with those of DOE. We're really fortunate to have multi-office support. When you think about manufacturing, industrial efficiency, advanced computing, basic energy science, buildings, bioenergy, fossil energy -- all of those offices have supported one innovator or another. After finals, there's often a matchmaking process between the innovator in their technology area and the funding offices that support us. We also look at alignment to Argonne's areas of technological expertise. We have a very broad portfolio in terms of scientific expertise and also incredible facilities and just the technological equipment that's available. We look for people to make a strong connection between the work that they're trying to commercialize and how Argonne can be a value added to their projects.

LLB: For listeners wanting a little more information, is the actual application online -- just to get a sense of what would need to be readied? I know that the cycle doesn't start up for about another ten months or so, but I know lots of people in different incubator programs, and sometimes the application process can be quite arduous, and rightly so, if you've got five

coveted slots here and you want to be able to truth test the integrity of an innovation and the suitability of a candidate for the slot. But is the application online?

RH: Yes, if you go to our Apply page, we do have a PDF template that has all of the questions. You can use it to sort of pre-fill the application out before submitting it into our portal. But all of the questions are pretty straightforward. It's not a super-long application. We're not trying to trick anyone, but we'll ask folks to tell us about their technology: What does the market look like? What are the risks? We want to hear about why you want to work with us and why you want to embed at Argonne specifically, how the technology fits with Argonne, and we want to hear from them about what is motivating them to pursue entrepreneurship as a career, what motivates them about their technology or their solution that is driving them to really take this step.

That's really what we're trying to get at. I'll say that when we select the innovators to participate in the program, we have a very low character risk. First and foremost, we're funding the innovator because 90 percent of startups fail, and that's just the reality. We're investing first in the person. Then in addition to that, we have, I'll say, a moderate risk tolerance for their technology, and we have a fairly high risk tolerance for the marketplace because many of our startups do pivot to a new market or a new sector while they're in the program.

LLB: I've asked a lot of questions, Rachel, and you've shared a lot of information. Is there any other point that I neglected to ask or Rich neglected to ask that you'd like to expand upon now?

RH: In terms of how we measure success, I think I talked a little bit about the LEEP program and those numbers. I want to highlight that we have an incredible rate of return for this program, something close to 20x.

REE: Wow!

LLB: Oh, that's impressive.

RH: In terms of the more qualitative measures of success, I mentioned that we care about investing in these individuals. We love seeing people become serial entrepreneurs and future business leaders. Some of them become startup advisors or scientific advisors to other businesses, so we've seen a little bit of that over the years. That's really exciting because we know that our innovators are continuing to give back and continuing to have an impact. It's also a win for Argonne, and it's a win for the national labs, because it's bringing new ideas in. These are collaborative projects, so the scientists I think often appreciate working on science that's very applied.

LLB: Just out of curiosity, do you have any two-fers innovators that have responded to an applicant request and have come in with two technologies at two different times?

RH: We do get repeat applicants. Often, people who are not successful the first time around, try again. Sometimes they are successful the second round. Usually, it's that they had an extra year to get the technology a little bit more mature, to think about product market fit a little bit more, to really zero in on who they're targeting for their customer. Often, their pitch skills have improved. We encourage people to absolutely apply again if they don't make it the first time.

LLB: I've talked a lot about your website because I think it's just so impressive, and so informative, and user-friendly, and intuitive. Not all websites are all that intuitive, but perhaps you can direct our listeners to your website address and add any other sources of information that might encourage them to take a look and perhaps consider becoming a part of the program.

RH: Thank you so much. Our address is chainreaction.anl.gov. In addition to our website, you can absolutely follow us on LinkedIn. We're very active on social media. On our About page on our website, you can scroll down and you can sign up for our mailing list. We often provide -- not a ton of e-mails. We're not spamming people, but you can sign up to get regular updates from us. Also on our About page, we have a fairly extensive FAQ [frequently asked questions] if folks want to learn more. What I definitely recommend is if you want to get a sense of who these innovators are, the kinds of work that they do, head to our Innovators page. Read their bios, read their technology summaries. It's really great stuff. You could also reach out to me directly to learn more.

LLB: Thank you, Rachel. This was so informative, and I really urge our listeners to take a look at the website. I found just watching the pitches just fascinating. The work you do, the work that you promote, the hope that you give to the world of innovators, I think, is wonderful. You're just great at your job. We very much appreciate the opportunity to learn more about CRI at Argonne National Lab. Thanks for being here.

RH: Thank you so much. Thanks for having me.

REE: Thanks, Rachel.

LLB: Thanks again to Dr. Harris and Dr. Engler for speaking with me today about Chemical Innovation, ANL's CRI Program, and the wonderful opportunities the program offers to chemical innovators.

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