Part 1 - Building a Biopharmaceutical Industry in NC

Phil Mintz: *Bill, can you give us an overview about the biotechnology industry, what it means to the state, and what it is all about? What are life sciences, as opposed to something else, and how is it manufacturing?*

Bill Bullock: You know, on the manufacturing focus side, there are a lot of different places one could go but I will talk mostly about pharmaceuticals and what I'll call biopharmaceutical manufacturing because that's really what's exploding right now in North Carolina.

There are certainly lots of other areas of manufacturing around diagnostic products, and companies like LabCorp who are more service oriented and don't do a lot of manufacturing.

North Carolina, pre-pandemic, was really putting a stake in the ground globally, becoming probably one of the top five locations in the world for the manufacturing of biological products.

So let me just give you my initial Biology 101 speech. There are two categories to consider. There is the traditional pharmaceutical product for one - so think of a pill, like Tylenol. You know that is a pressed pill. The process of manufacturing is fairly straightforward. You put a bunch of chemicals together and you press them in a pill. I am not doing the process any justice at all, but there is definitely a skill set that's required for that.

The second category is where you use a living organism to either be the product or make the product. So, you're dealing with a living system. Just think of making beer - it's the same process except, instead of the fermentation process converting alcohol and sugars into alcohol, you generally do genetic manipulation of an organism to make it into what you want either some type of protein or other product. Then you purify that product out, not dissimilar to beer manufacturing where you have big fermenters.

With biopharma, you have got some cell type that you've developed, and you then crank out a protein product that helps MS or helps Alzheimer's, and in a best-case scenario, that's the breakthrough product. So, the skill set to make those products is on another level compared to traditional pharmaceuticals.

North Carolina invested very specifically in these skill sets at the Community College level and at the University level, roughly 20 years ago, not just around pharmaceutical manufacturing, which were good in North Carolina, but also bio-pharmaceutical manufacturing. There is a manufacturing NAICS code classification for this and it is 325414 (biological product manufacturing). If you look up the employment data for that six-digit NAICS code, the state in the US that has the most employees in that area is North Carolina. We are number one in the country in that six-digit classification, and it is exploding.

So, in that space a few years ago, there was a kind of transformational event where the FDA finally approved a whole new class of therapeutic products. Instead of just using a yeast cell or mammalian cell or a bacterial cell to make your product, what we've started doing now is taking these monogenic diseases like sickle cell anemia and some of these very rare but very debilitating diseases that just have a very identifiable genetic mutation that's associated with it and creating a way that you could essentially insert in one application a corrected version of that gene and essentially cure somebody in a one shot deal. It is not often that you can talk about a magic bullet and science, but this is one if you are a person or have a kid that has one of these diseases.

That technology has been evolving for 50 years, and in 2017, we finally got approval and it's called gene therapy. You have heard of some of the companies like Novartis Gene Therapies, AskBio, Pfizer, and Adverum. These are all announcements that have been happening over the last two to three years and the reason for that is because they just got approved.

There is a big backlog of these products and there are probably 200 of these different therapies that are in clinical trials right now. This is going to be around for a while, and I just wanted to paint the picture of biologics manufacturing versus pharmaceutical manufacturing.

We are good in both of these sectors, but we are *really* good at biological manufacturing, and it is because of the investments North Carolina made 20 years ago with building the Biomanufacturing Training and Education Center (BTEC) at NC State, building the Biomanufacturing Research Institute and Technology Enterprise (BRITE) at NCCU, and putting together the Bio- Network with the Community Colleges teaching Bio-work. By doing all these things, North Carolina has just jetted out in front of other states, from a workforce development perspective, and industry understands that.

So, take all of this, and then put a pandemic on top of it, it just exacerbated everything. Coming into the pandemic there was already starting to be a global crunch around manufacturing for biologics. If you went back 25 years and you looked at the top 20 drug pharmaceutical products, they would all be well, maybe one or two of the early biologics but most of them would be small molecules or baby pills. If you look today at the majority of the top 25 drugs being sold by revenue, they are all biologics. They are monoclonal antibodies. They are peptides. They are all these things that require manufacturing.

Because of that trend, there was a capacity crunch pre-pandemic. There were not enough facilities to make products to meet demand. The pandemic hit and you got gene therapy coming into the fray. Then suddenly there is a demand for manufacturing to make vaccines. There is a demand for manufacturing to make Remdesivir. There is just this big crunch. All the companies that are in gene therapy or the kind of emerging space that already were concerned and had funding thought, “oh my God we have got to go out and find a place to build a facility!”

Some of the bigger companies or contract manufacturers, like Fuji or KBI, saw the opportunity but they needed more space. Then, you have got companies that are in the pill finish space, who are just supporting all of this growth.

So, in my opinion, what happened was they all looked around and said, "it's a speed to market

issue now." The old, traditional building site selection process that involved starting with fifteen sites in the selection pool, taking it down to ten, then seven, then three and then to two. Now they were just calling us (NC) and two other places. They did not have time. There was no capacity in the market to sit around and try to figure this out. It was a risk mitigation and speed to market issue.

The interesting thing is a lot of the people that run these kinds of facilities, there are not 20,000 of these facilities across the globe, there are 400 of them. Many of these people know each other and a lot of those people have started going through North Carolina. There is a reputation in a small group of people who know how to do this, and North Carolina has a phenomenal reputation in that.

So, all of that has gotten us to today where we have just seen this unprecedented level of growth around pharma and biopharma manufacturing and North Carolina continues to win those projects. It is creating some challenges in meeting some demands, a little bit around infrastructure and certainly around talent.

John Loyack: *Let me add something to that, because this is not something that we all see on a daily basis. All those companies that Bill just mentioned, most of them are in Durham County and Wake County. We are seeing lots of opportunities there. There are still opportunities to do something in northern Durham or in RTP. Also, in the Holly Springs area. But those are places where investments have been made and the infrastructure is there.*

Phil Mintz: *It sounds like quite a specialized workforce involved here, and so, what are the challenges? I know you say that we have a good infrastructure for training, but are we getting the amount of people that we need through the system?*

Bill Bullock: I have been through a few inflections of this, you know the early versions go back a long time. Probably back to when Burroughs Wellcome came, and even though Burroughs Wellcome was not doing manufacturing, it really put North Carolina on the map around this. I have tried to trace this back. I think there was Cutter in Johnston County at a facility way back in the day, and then that became Bayer Biological Products, then Talecris acquired, and now it is Grifols.

Because of this, and inherently having a great Community College system, was the 'ace in the hole' that started all of this. We just have a bigger and more robust Community College system than most folks. As the Cutters came and then Wyeth came to Sanford and a few others came, the Community College responded pretty well. I think what has happened is as business inflections companies will come, then they started competing for employees. Then the state responds a little bit and they are good.

Then about 15-20 years ago, there was a big inflection point because Biogen was here, and you were starting to see some companies coming in and they had the same issue again. Like "hey, you guys are doing a good job, but we need more specialized training." So Phil, to your point, this is very specialized. Yes, I can hire a biology graduate from NC State, but I have to train them for six months, and soon as I do, somebody at Merck steals them from me. So, the investment the State made, and all that infrastructure 15 years ago did a really good job to meet the demand until now.

The Biotech Center surveyed industry and produced something called the Window on the Workplace, about two years ago. In 2019, we essentially articulated what we thought would be a need for 5000 new employees in this Biopharma space between 2019 and 2025.

So here we are, coming up on mid 2021, where we have barely started that five-year cycle between 2020 and 2025 and there's already been 5000 jobs announced. So, we have already hit that threshold.

I think we are right there again. I think companies are starting to get concerned. In fact, I know they are getting concerned, because I talk to them every week and I am sure John talks to them as well, about where we are going to find our folks. It is making its way into the site selection community. There are a lot of the site selectors who are locating these new projects. They know us as there are ten of them that do these projects in Life Sciences. They are starting to ask this when they show up in North Carolina. The question is not, can you build a training infrastructure, it's where do I find my people?

What is exciting to me about that is, it creates a massive opportunity for North Carolina to really double back down in this space if we do this well and we do it right. I am a science guy by training, so I appreciate the global value of whoever does this. It is important to do because you are making products that are saving people's lives. Part of me wants to just make sure, for humanity, we figure this out. But I get paid through the legislature, so my job is to make sure as much of that is happening in North Carolina as possible and that we are hiring people here.

We have a really big opportunity to do that, but it is going to take some work, and I'll tell you why we built the infrastructure. We have the basic infrastructure, and we are way ahead of everybody else in that regard. It is strange because we need some more equipment, more space, and more instructors. I think just the sheer magnitude of the growth right now is straining the system, as good as it is.

What I am realizing, and you all probably knew at the beginning is to bring somebody into the community who's a displaced worker or somebody who never even thought about the idea that they could work in a biopharma industry, it can sound like rocket science to them. However, they can do it. There are a lot of different jobs for people, for example, operators can be high school graduates with a certificate. There is a lot of upscaling that I think we have to do if we want to meet those folks where they are and get them on a pathway where they can get in and do a certificate program or take a bio program. We have the programs. We just need to expand the capacity of the Community Colleges to offer them and work with some of the partners in the State to provide that upscaling and build awareness.

That is the other thing. I think everybody believes that you must have a four-year degree from NC State to work in this, and while they certainly hire every single four-year degree person that comes out of BTEC, that's only 200 people. We have to hire 10,000 of them in the next five years, so we have to figure out a way to bring more folks in.

Jeff DeBellis: *Bill, where do you see the strength in North Carolina around this? Is it more manufacturing and infrastructure we have created around the actual manufacturing of biologics and pharmaceuticals, in general, or is it more on the research side? I am sure you will have a combination of both and that's what really gets us an advantage, but what is our core strength?*

Bill Bullock: All the university people will yell at me, but let me put it this way Jeff, there is not a demand for 10,000 people in research and development right now. We are really good at all of it and that is one of the beauties of it, but we are still competing. Take some of the companies – Grail, Audentes, Adverum - these companies are all headquartered in the Bay area, where they do their research and development. They're not bringing their R&D to North Carolina; they are bringing their manufacturing to North Carolina. We're good at innovation, but we don't have a reputation like some other locations do in research and development.

Now we do better in the agriculture space, but that's a little different beast. So, if you break this up into three buckets: research and development (when I say development that's kind of early development), and then the next section, which is kind of product evolution. How do you, if you are on the ag side, how do you perform field trials and get it to an application for approval? If you are on the human health side, how do you do human clinical trials and then do a biological license application (that's middle development), and then manufacturing? North Carolina is good in the R&D stage, but we are not a leader. In that middle section of development, we are huge in clinical research for clinical development and in contract manufacturing. I lump into that medical and diagnostic testing (the LabCorps, the Q2s, the Grails). We are really good at that and we are really good at manufacturing.

Right now, the growth is happening in R&D really on a more of a "grow your own" basis other than ag and ag is a little stagnant right now, because it is just a totally different conversation than this one. The middle development stage - clinical development, medical and diagnostic testing, digital health - all that stuff is booming in North Carolina and manufacturing is booming. If you made me pick one, I would pick manufacturing, no question. That is what is exploding right now, it is manufacturing.

Jeff DeBellis: *I know, the biologics, that's really kind of expanding and there have been a lot of technological advancements in that space, and you see that as being a real leader for North Carolina in the near term. But for the pharmaceutical industry, we had a rough patch. What I'm kind of curious about is if there is something new, with the biologics that we really see a long-term growth trajectory or are we going to see some expansions and then kind of leveling out in maturity of that where there's going to be more efficiencies.*

My understanding is that there are around 40,000 nationally for this industry. It's great that we are a leader in anything, and we certainly have thousands of jobs here, but it's not huge like some of the other industries that we compete in. So, is this an area where we really can see some long term and sustainable growth potential, or are we seeing a real step up in the short- term, and then you think we will probably level off?

Bill Bullock: That is a great question, Jeff. There are some different competing things going on here. There is this little bubble in gene cell therapy, and I think it will be here for a while. With these rare diseases where you don't have a solution, and suddenly, you have one, you could run up two batches and meet the world demand for a rare disease. As soon as you get that product approved and you make it, you are going to meet all the backlog demand, and then the next year you are just meeting the new demand.

I do think there are people out there who are questioning the long-term sustainability of this gene therapy bubble for manufacturing. I think that bubble is going to be here for at least 10 years because it's brand new technology and there are so many unmet needs. The other thing is this will start to address not just the tons of monogenic diseases that can be addressed, but also the big ones like sickle cell. So, there is a relatively big unmet need, but it's the transformation of the whole pharma industry, I think, except for some really big areas like Alzheimer's and Parkinson's, where there are massive unmet medical needs.

Precision Health is moving into healthcare and it is moving into the pharmaceutical industry, so I think we are seeing a new dynamic period. I thought the days of the big billion-dollar projects were gone. I thought they were going to be the Bluebird Bios of the world to come in and open a gene therapy facility in North Carolina, hire 75 people and do single-use bioreactor kind of stuff.

That is all happening, but I think the thing that is catalyzing it now is the pandemic. We are one variant away from going through this all again. Even though we are cranking a lot of vaccines out, I think pandemic preparedness is something that will be with us for a while.

There is some growth potential in that. There are already some challenges in regular traditional medicinal product limitation, so it's hard to say. Every time I think we have topped out, there is a new technology, there is a new approval, and then there is a new wave. I don't think everybody is going to get to play in this space. I think the rich are going to get richer in this space and we are one of those people if we continue to meet the demand.

Is this a transformational area for the whole state of North Carolina? No, I do not think so because we have a demand for 10,000 new people in the next five years. But I think North Carolina will be a leader in this if we continue to do what we have been doing. We will be capturing a lot of those jobs going forward.

Part 2 - Addressing the Workforce Challenge in the Growing NC Biopharmaceutical Manufacturing Industry

Phil Mintz: *Is it fair to say, Bill, that even if you do have the plateaus in some of these the employee skills can be transferred over to what's new that may be coming out, going forward? So, there could still be opportunities for people, even if their particular product wanes.*

Bill Bullock: Phil, I think you are right on with that. The foundational part of this is people need to eat, people are going to get sick, and the population is growing. This is a space that won't go away. I think this is both a state question as well as a national and international question. I think the barrier to entry is big in this space, and I think it's going to get harder. Unless they put a lot of money into trying to build this infrastructure, it is hard to replicate, in my opinion, what North Carolina has done.

Because even though the technology is evolving to be more flexible, and more disposable, they are regulated facilities. When a company like Fuji makes a commitment that they are going to spend $2 billion in Holly Springs, that means they are going to build infrastructure and that infrastructure has to get validated by the FDA. You just don't want to move that stuff. It's not Dell where they could move tomorrow. They are not going to do that because it is so tightly integrated. The labor pool and the talent are part of your validation process. Once they have that in place, they tend not to move. They tend to grow. If you look at the companies – like Thermo, or Mayne or go to Wilson and look at some of those companies - there is always an outlier. Then there is Purdue Pharma where something blows up and that's just part of business.

For the most part, these companies have commonly grown, such as Merck, Griffols, Novo, and Biogen (among others). Go down the list, they grow. As long as they've got talent and you create an environment, they tend to stay, and I think that will continue to be the case for a while.

John Loyack: *And I think the other thing that we haven't even scratched the surface on, Bill, is the supply chain for this particular industry. When it comes to basic pharmaceutical manufacturing, you need a lot of white bottles and caps, and that's enough. We are seeing expansion now of businesses that have been working. All of this, I believe Bill, is largely injectable. This requires a totally different supply chain than traditional pharmaceutical manufacturing. We are seeing companies like West Pharma out in Kinston, who make little rubber stoppers that go at the end of a vial, expand. We are seeing the likes of Apiject, who's coming in here with new injectable technologies that people will be able to use from their home, rather than going to a nurse or any clinician.*

There are some interesting opportunities from the supply chain of this because it must be closer. I mean cold storage opportunities, there's so much that this opens to us that if this were just a traditional, generic pill manufacturing, it wouldn't be in play.

Bill Bullock: I think the other thing, John, which I don't know enough about how this group could help is building, from a national security perspective, a more robust domestic capacity to go from beginning to end on supply chain and production.

How we include the military and their veterans in that so we don't get here again. We need to be right in the middle of the conversations going on at the national level. Given the military presence in North Carolina, training infrastructure in North Carolina, and our logistics capability in North Carolina, we need to not only be in the middle of that, but we need to be part of driving some of those conversations.

One of the programs that we did in the last year and a half is a veteran's outreach program, it's built very much on the same concept. There were a lot of ad hoc things going on, where individual companies with individual programs with no individual installations. What we didn't see was a broader program. And yet, the question we asked the center was if we are a global leader in bio manufacturing and one of the largest military states, how are we not the first name mentioned when someone asks "how about the military working in bio manufacturing?" People should see North Carolina as a reference point.

It sounded really good, but the logistics of putting it together - working on the bases, building a relationship with the transition offices, understanding the idiosyncrasies of their transitioning military, what they can do, what they can't do, working with the local community college – was challenging. It is regulated, so you can't just bring somebody in and tell them to go out on the shop floor and figure out how to do that.

We built a pilot program between Fort Bragg, Central Carolina Community College, and Pfizer in Sanford, and it worked great. We placed eight transitioning military. The opportunity here is that these are folks in transition. They are 12 to 18 months from leaving, but we are pumping out 20,000-23,000 of those folks each year. It is a really good skill set. These are folks who are inherently passionate about what they do, which fits well with the ethos of pharmaceuticals. You are making something that's going to help somebody out. Lots of SOP (standard operating procedures), rigor, and the regulated environment of biologics manufacturing. These are folks that are very familiar with following standard operating procedures. They have a really great work ethic, so the connection is really good, but you have to line that up and make that work.

I think we have that same opportunity to do that in so many different populations. We have got the infrastructure with the Community Colleges. We have been working with the workforce development boards in the NC Work Centers. We got some CARES Act dollars, so we did an interesting program where we worked with a sub segment of the workforce development boards through the NC Works Career Centers. We identified a series of folks that had been displaced due to COVID, and we paid them a stipend to attend a webinar. The Biotech Center put together a five-hour webinar series and asked for interested parties with any type of transformation skill set (background or industry experience did not matter). We did a five-hour webinar with them, and we had 454 folks show up.

It provided an introduction of what biopharma manufacturing is, and let them know if they were

interested, they could have a career in the industry and here is the pathway to get there. Seventy percent of the people that showed up actually had four-year degrees.

Part of what we've started focusing a little bit more on at the Center is how to expand these types of programs. We don't have enough funding to go do these programs, so we've been piloting ideas. We have a K-12 program out in Pitt County. We took graduating seniors that had no idea what they were going to do and provided a pathway for them to go through a three-day training course because you know Mayne Pharma and ThermoFisher need to hire 600 people in the next few years.

Lots of this stuff is out there, we just need to scale it. That's my personal opinion. We probably need to tweak a few things. Maybe we need to do a few things a little bit differently, but the big advantage for the state is all the infrastructure is sitting there. We just need to coordinate it a little bit better.

We probably need some resources to invest in this because, it's one thing to take somebody that was waiting tables with a Biology degree from UNC Chapel Hill and say go take BioWork and we'll get you an interview. It's another when taking somebody who is a single mother in a rural county who has never even thought about it. We must meet all these folks where they are, but we can do that. I think we can do it if we resource it.

Jenni Harris: *What was the response rate for the 400 people who participated in that webinar? Was there any follow up? Were jobs offered to some of those people? Were they put in training?*

Bill Bullock: That's a great question. I could spend all day with you guys on this conversation for sure, because they are all really good questions. We did limited follow up because we had limited funds. We basically had a restricted amount of time to use those CARES funds, so we kind of put this together pretty quick. We had a little bit more money and we realized we get a little bit longer to spend it, so now we are actually in the process of doing that.

What I noticed is we are not great at tracking these things. So far, the limited amount of data we have says that, at least through Durham Tech, the response rates have been pretty small. Of the 454 folks that did the webinar, how many of those signed up that we could track and went into a BioWork program at Durham Tech? It's not that many right now.

You know where I think we missed the boat, because we didn't quite have the resources to do it, was to do that webinar and then get the participants on a pathway right after they came out of the webinar. To come right in and say okay, now that you have done this, let's go do this and then let's go do this - we are not quite there yet.

Phil Mintz: *Bill, you talked about having the funding to do these types of things, and I guess you are using CARES Act funding, and obviously there's been some state investment. But what do you see as the future? Are these companies that have all this need, are they investing in this development and training like they should? What is your outlook on that? It seems like they would want to do that.*

Bill Bullock: I will give you my perspective. I think what is happening is they're individually dipping into programs. If you are Merck, you've got a relationship with Durham Tech and you're doing some stuff. You might have some customized training dollars from one-year expansions. What I have found is when I have this conversation with these companies, they nod, but they want the easy button. They say, "I don't have the capacity to build the program you're talking about…you need to build it. You build it, show me an easy way to get involved in it and we will do it. Keep asking me questions as a company, because I want to let you know what it is we need." We have good traditional programs through the Community Colleges and a lot of these companies sit on various committees to provide input around curriculum.

But honestly, I think it is why I was excited about John's request to come talk about where we are. I have been in conversations with Scott Rawls, about what they are doing at Wake Tech. We have a meeting in mid-June with Fuji about their expansion. The companies aren't looking and saying you don't have this, or you don't have that. They're looking and saying "you have so much stuff, I don't know how to use it all. Package it up in a way that meets my needs and make it easier for me to go do the thing you want to do."

They are in this mode of growth and they get into the talent acquisition mode, and their talent acquisition people are simply hiring people. They are getting a list and they have to hire 100 people in nine months. They're not in a position to be saying, hey Bill, why don't you work with the community and build a program where we can get more folks from tier two and tier one counties working in my business that are in a 50-mile radius? They are not going to build that program. But, if we took a candidate community to them and said, "we know what you do, we've upscaled some folks, and we put people through BioWork. You, company A, B and C have to commit to doing interviews. If we are going to do these things, you need to commit to interviewing them." That is working in the small pilots, our K-12 pilot we did in Pitt, and our veterans outreach program.

There was another flavor of this that we did partner with Durham Tech and Made in Durham, where we put a subgroup of folks through a workshop. We had a couple of companies and said if we screen these folks, we get them into BioWork, when they come out, we are going to do a hiring event - not a job fair - a hiring event, which involves prescreening all the folks that are going to come into the event, and then you get to interview them during the event. This event went really well.

Phil Mintz: *But all that is still State funding activity, right?*

Bill Bullock: It is cobbled together Phil. Some of that is Biotech Center funding, which is State funding. A little bit of that is CARES funding that we had. We had a meeting last week with representatives from the Department of Commerce Division of Workforce Solutions (DWS) to have a very similar conversation around how we work more closely together. BTEC can provide the linkage to the companies and the expertise and knowledge around the bio manufacturing business. But we don't have access to people and we, frankly, don't have a lot of funding. I know there are federal dollars, so again, trying to take stuff that's kind of like this and move it a little bit more like this where we're being able to leverage some of the existing programs and funding and

just get more people into the system.

Dominick Stephenson: *Bill, just a quick question. Has the topic of apprenticeships come up very much with these types of companies? I know there are a lot of different levels of employment possibilities, but has that been on the table, or has it been more short-term credentialing?*

Bill Bullock: Great question. It definitely has come up. I know the Community College has some really good programs and that's a big focus for them. It is a good program and there are definitely some implemented apprenticeships at some of the companies.

I think the challenge around apprenticeships is a couple of fold. One is there is some misalignment between how apprenticeships work in this industry sector. First of all, because of FDA regulations, you have to be 18 years old before you can actually go in and work in one of these facilities.

And because of the skill requirement and the requirements to make a commitment early, in an apprenticeship environment, that you are going to hire this person, companies are somewhat reluctant to do that because of the skill set requirement and training requirements.

It is really good on the trade worker side. So, there's a big demand for a lot of these facilities on the trade side and that's a really good fit. It is harder on the operator side. The other issue is even with all that said, if we did it really well, you might have 30 people in apprenticeships across the whole thing. When you are in a mode where these companies are collectively looking at hiring 2000 people, it's a good idea but it's not going to meet the need and it's not going to solve the problem. I think that that's part of it.

Jeff DeBellis: *Bill, Commerce, along with the University System, DPI, Community College, Workforce, DHHS, etc., launched a website in June called NC Careers. It's a career information system for anybody from middle school on up through adulthood and an enhancement to that just launched last week. If you are looking to reach out to folks, particularly those of school age, the goal is just to get good career information out to folks and not really to steer them towards one industry over another. It is not to put our thumb on the scale, but to just show opportunities. It's only been up since July, but we've already had 145,000 users, over a million page views and the Governor's announced it.*

We are about to start marketing it, but there may be an opportunity to just experiment with an industry to see what additional information we can have. Whether it's here's a day in the life of a worker in these occupations, because we focus on 900 occupations in there. They could pick a few of them and say here's real life examples or some other opportunity. So, if you guys are trying to market to students, unemployed workers, or people who are trying to look at careers, take a look at the site, get in touch with me and maybe we can explore something creative to market it.

Bill Bullock: Jeff, that's a great suggestion. One of the things that we did with some of the CARES dollars that might be a really easy thing to do, relative to this, is we created something in

partnership with WRAL digital solutions called Bio Jobs Hub. It's not a jobs page, but it is a page that says if you don't know anything about these types of bio manufacturing jobs and you just want to get a clue, it's got some videos. It provides some very basic information and it is our early easy version, given the fact that we had a restricted amount of time and restricted money to just get something up that we could send people to in the populace. Anybody could go there because it is designed to say if you're here, you can do this. I wonder if there is a way to link that to something that you've got on NC Careers, because that's our early version of trying to build just a little bit of awareness for folks who don't have familiarity with this at all.

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Bill Bullock focuses on facilitating life-science company expansion within, and attraction to, North Carolina.

Since 2008, his group's efforts have led to the recruitment or expansion of more than 70 life science companies representing more than 7,800 jobs and $4.3 billion in investment. He leads the team that implements international activities and programs. As senior vice president, he also oversees NCBiotech's statewide offices, agriculture sector development team, and corporate communications.

Prior to joining the Center, Bullock served as international business development manager for biotechnology within the North Carolina Department of Commerce. He was also vice president of the biotechnology consulting firm BioAbility, where he directed numerous studies and client consulting projects in North America and abroad, including international biotechnology competitiveness benchmarking, economic development strategic planning, business plan development, technology assessments, and market research/analyses. He has also done business consulting for global pharmaceutical and biotechnology firms and spent six years in research, development and marketing at Stratagene Cloning Systems in San Diego.

Bullock has written and presented extensively on a variety of topics related to commercial biotechnology, including economic development, business strategy, market research, regulation, emerging technologies, workforce development, strategic alliances, and more. He received his undergraduate degree in cell biology and biochemistry from the University of California, San Diego and an MBA from the Kenan-Flagler Business School at the University of North Carolina at Chapel Hill.

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