Oklahoma Innovations Radio Show

Air Date: December 12-13, 2009

Guests: **Ann West**, professor of chemistry & biochemistry, University of Oklahoma

[Music]

From the OCAST Radio Network, this is *Oklahoma Innovations*, a weekly science and technology radio magazine brought to you as a service of OCAST, the Oklahoma Center for the Advancement of Science and Technology. OCAST is the state's only agency whose sole focus is technology, its development, transfer, and commercialization. OCAST mission is to identify and fund promising research in technologies that allow Oklahoma to compete in a global market economy from our own backyard. This program features some of the state's most gifted and talented scientists, inventors, entrepreneurs, manufacturers, and business leaders who all have one common goal, developing technology-based economic growth for all Oklahomans. Now here are your hosts, Gary Owen and Steve Paris.

>> Welcome to this week's edition of *Oklahoma Innovations*, Gary O and –

>> Steve Paris.

>> And we are delighted to have you as our listeners every weekend on this science and technology program. If it has to do with science, research, technology, development, education, commercialization, finance, and science and technology; we talk about it on this program.

>> Well, you just about covered it all.

>> I did, didn't I? Yeah.

>> Yeah, you did. You did a good job. Hey, it's almost Christmas.

>> It is?

>> Yeah.

>> Is that why it's so cold outside?

>> It's one of the reasons it's cold outside, and I understand you've been doing a little research.

>> I have. I'm glad you brought that up, because if you don't have a gift for that special someone whose got everything or you just don't know what to get this person because you don't know what they like, boy, have I got some good gift ideas for you. And they're all tech related, so stuff you'll find.

>> I won't know about this.

>> You will have fun with these.

>> You bet.

>> What's going on at OCAST this week?

>> Well, you know, Gary, we have a new member of our board of directors, Hershel Lamirand. I don't know if you know Hershel or not.

>> I do not.

>> Hershel has been around for a long time. He is a gentleman who is involved with the Oklahoma Health Center Foundation. He was appointed by Governor Henry just a few days ago and is the newest member of our OSTRaD Board. That sounds funny. We think of the OCAST Board, but it's the OSTRaD Board which is the governing board for OCAST, the Oklahoma Center for the Advancement of Science and Technology. And we were very excited to have Hershel on board. He's been involved for quite a while with i2E which is one of our strategic partners. He knows the landscape. He knows about RND from the standpoint of somebody who supports it and has played a major role in developing, being a part of the large group of people who have developed the health center in central Oklahoma, which has at last I heard about 16,000 people employed.

>> Wow.

>> And that's right here in central Oklahoma, so Hershel, I think, will bring a lot to our board of directors. We're anxious to get him started. He hasn't made a board meeting yet, but he'll be making the next one.

>> And you have quite a list of distinguished board members. We don't have time to list them all, but some names that I know most of our audience will recognize. You've got quite a list of members there in varied areas.

>> We do. We have a gentleman from Diamond, Oklahoma. He's a pilot, which makes him very dear to my heart. He is also involved in the agriculture industry in sales, and his name is Galynn Beer. He's been our chairman off and on for the last four or five years now. They don't usually stay more than one year at a time. They change chairs. That's kind of one of the things our board does just to kind of pass the hat around. And one of the people, Sherri Wise, who's with the Oklahoma Osteopathic Founders Foundation out in Tulsa, Oklahoma is our vice-chair and has been chairman in the past. You know a lot of the people on our board you'd recognize. David Boren, you know, president of the University of Oklahoma; Burns Hargis, president of Oklahoma State. Here's one that a lot of people in the Tulsa area would remember and know well; Steadman Upham who is president of the University of Tulsa. We also have another university president, Roger Webb who is the University of Central Oklahoma in Edmond. We have a lot of private sector people involved, and I'm going to leave somebody out I know. That's not what I intend to do.

>> Well, that's okay.

>> Dayal Meshri over in the Broken Arrow area; Ed Shreve who is out of Stillwater; Pageant Ferriabough; Rhonda Hooper; Dr. John Harley. And if you read any newspapers at all the last few years, he's one of the most prolific individuals who's been able to attract money from a national institute. He is like 12, 14, 15 million dollar chumps.

>> Wow.

>> It's because he leads a team that's doing a lot of work. He's involved with – has been involved with – OU Health Science Center, but his main area of operation is the Oklahoma Medical Research Foundation. Mark Ashton, attorney from Lawton, another one of the, you know, southwest anchors for our technology corridor; Terry Salmon who is a gentleman out of Norman, Oklahoma; businessman Tracy Shirley. We have some other individuals ex-official members like Terry Peach and Natalie Shirley who are members of the Governor's Cabinet.

And, you know, I know I've left out some, and we'll catch those later. But we have a pretty good board of directors with a lot of experience.

>> A diversified board, which I think is important.

>> That's who runs OCAST. You bet.

>> Alright, well, we've got some interesting news this week in the world of science and technology, and I want to get to this gift list because it's pretty cool. A couple of short stories, however. You know, the future of our lifestyle is going to deal with in-home robots. Now we have robots outside the home of course. Robots have been used in industry for quite some time; robots to detect bombs on the battleground. We've got robots that build cars in factories and deliver supplies and visit patients in hospitals; that kind of thing. Well, now there's seems to be concern in the development of living with robots, the potential to come across some pretty series dilemmas. Scientists and legal scholars are exploring the likely effects. Take for example, what happens if a robot crushes your foot, chases your cat off a ledge, or smacks your baby? While experts don't expect a band of terminators to attack or a 2001 space odyssey computer to take control, even simpler nine robots will have legal, social, and ethical consequences. And scientist say as they rely more and more on automated systems, we have to think about the implications that is part of being a responsible scientist. So they're looking at the what-ifs of using artificial intelligence. Okay, speaking of artificial intelligence, those of you that I know were wanting the Apple Tablet for Christmas, which was expected to launch in fall of 2009 and they thought, "Well, maybe December," I'm sorry to say now top industry analyst says the Apple Tablet is definitely going to arrive sometime next year. Oh, I'm sorry Apple folks. That's the way it goes. In health related news this week, colon cancer deaths could drop dramatically in the next decade according to some scientists because of better screening and treatment. And this according to an optimistic actually new prediction by top researches. The estimate was made in an annual report that shows that overall the US cancer death rate is continuing to decline as it has since the 1990s. The report released about a week ago focuses largely on cancers of the colon and rectum, which together are the third leading cancer killer in the US. An estimated 50,000 people will die from it this year. The battle against colorectal cancer has been a growing success story. The death rate dropped roughly 20 percent in the last ten years. That according to the American Cancer Society figures. New report by researchers at the Advocacy Group and other organizations predicts that death rates will drop even more over the next decade. By 2020 the rate could be half what it was in 2000. Wouldn't that be nice? And one other health story here. Measuring body mass index or waist size in overweight people can accurately predict the risk of heart disease. This according to Dutch scientists. A large ten year study found that half of all fatal heart disease cases and a quarter of all non fatal cases are linked to being overweight and having a high body mass or large waist line. That's what they say, yeah.

>> Okay.

>> Now, those of you that really looking for something cool to get that special someone. One of hardest, I think, generations to buy for are teenagers.

>> Of course.

>> Got one for you. Forget the Guitar Hero. Forget the Air Guitar. Now comes a t-shirt. Now hear me when I tell you this. Yes, a t-shirt with the image of an electric guitar on it that when strummed with the included magnetic pick actually plays fuzzy toney feedback and guitar

sounds. The dots on the guitar images neck turns the strings into the all major chords you'll find on a real guitar, so you don't have to fret about fretting as you chum or churn out those favorite riffs. It includes a mini amplifier, and it kind of goes on your belt. And you can actually check out, there's a video demo on this believe it or not at Thinkgeek.com. Thinkgeek.com. They've got some cool items on there.

>> Yeah.

>> And there's also a matching shirt for your drummer. The drummer actually has things he can actually touch. Yeah, it's very cool. I can hear the parents going, "Oh, I got to check this out." Now if you're one of those that has to walk your dog in the middle of the night or the wee hours of the morning before the sun comes up, listen to this. It's called the LuLu Leash. And it took a near miss while walking her Cocker Spaniel, Comet at night Betty Gottfried, a Fort Lauderdale dentist to come up with this ingenious "Why didn't I think of that" device; an illuminated leash. The battery operated leash, brand new as of this fall, lights up from end to end and can be seen a quarter mile away. Set it to blink or not to blink, and there's a mini version for pocket pooches. There's a canine on your list that probably could use this lifesaver. And you can find it at Lululeash.com. That's l, u, l, u, leash.com. Isn't that cool?

>> That's cool.

>> Yeah, alright, and let's see. I got one here for those of you pod people. There's the iPod. That's for music. There's the pPods for taste. Now comes the S-Pod for smell from Party Lite. The sleek clip-on or standup frame that's kind of shaped like an iPod holds a flameless fragrance unit that emits an adjustable fragrance of refreshing aromas for 40 days without electricity. Ideal for offices, bedrooms, litter boxes, and so forth. It costs about 19.95. And well, let's see. You can check it at lite – l i t e – .com.

>> Really?

>> Yeah.

>> I still like your guitar idea with the t-shirt.

>> I think the electronic rock guitar, that one gets me.

>> Well, the reason I like it is you can play your guitar and scratch your tummy at the same time.

>> Oh, boy. Oh, boy. Alright, Steve has our innovations in history. If we have time, I'll give you one more. Go ahead.

>> Okay, Gary. It was December fourth 44 years ago that Frank Borman and James Lovell blasted off in the Gemini7 spacecraft. The marsh pathfinder spacecraft was launched December 4th, 1996. And it was the same day 163rd years ago that they patented manila paper. And the folding chair was patented December fifth 153 years ago. Cruise control was introduced in American cars December sixth 46 years ago. And it was on December seventh, Pearl Harbor Day, 1972 that the last man mission to the moon was launched by Americans. The Electrolux Vacuum Cleaner, did your mother have an Electrolux?

>> I – absolutely.

>> Everybody's mother had it.

>> My mother still had that thing a couple years ago. A little tank, yeah.

>> The Electrolux Vacuum Cleaner company received a patent on December 7th, 1926. This is different. For the first household refrigerator, it was powered by natural gas.

>> Oh, my.

>> December 7th, 1963, instant replay was used for the first time during the Army-Navy game. CBS TV used the new video technique over and over and over again. And it was December 9, 1960, Sperry Rand Corporation, Saint Paul, Minnesota unveiled a new computer known as Univac 1107. The electric wizard employed what was known as thin film memory. December 9, was it 1963, the last American made Studebaker automobile rolled off the assembly line. You still have yours, don't you?

>> I do.

>> Yeah, right. In South Bend Indiana, the Studebaker Company has been in existence – had been in existence since the US Civil War when it made covered wagons. Levant Richardson of Chicago patented the first roller skates December 9, 1944.

>> Don't fly by that one. That's a great Christmas gift.

>> Yes, it is. And innovations soon became the Christmas gift that would bring joy to generations of children for years to come.

>> Okay, not anymore but used to be.

>> Well, used to be. December 11, 1967, the French prototype Concord 001 was rolled out in Toulouse, France. The joint British-French venture in the world's first supersonic airliner took two more years of testing and fine-tuning the powerful engines before it made its maiden flight. And those, Gary, are just a few of the wonderful innovations in history for the month of December.

>> When we come back, we're going to be visiting with Ann West, professor of chemistry and biochemistry at the University of Oklahoma. When we return on your science radio magazine, *Oklahoma Innovations*.

[Music]

>> The waving wheat can sure smell sweet when the wind comes right behind the rain, but what happens when the rain doesn't come? Wheat growers across Oklahoma know too well the impact that a poor-growing season can have on crops and markets. Drought, disease, and poor soil are just a few of the things that keep farmers up at night. But what if those issues were a thing of the past? In labs funded by the Oklahoma Center for the Advancement of Science and Technology, researchers are finding new ways for producing better plants that can withstand on favorable conditions. Creating opportunity and improving the economy, that's what OCAST is all about. OCAST is looking for small business owners serious about investigating new products, services, and processes. For more information, call OCAST toll free at 866-265-2215 or visit their website at OCAST.ok.gov. In a state deeply rooted in agriculture, plant science helps Oklahoma farmers grow their business.

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[Music]

>> I didn't get time before the last break to mention what I'm getting Steve for Christmas. It's the Ready Wrench. Black and Decker has got a new wrench out. It's kind of all-in-one wrench. In fact, they made its debut back in October, and Steve, it's just the right size kind of thing. It's got 16 of the most popular standard SAE and metric socket sizes on a handle. And you simply spin the rockets – sockets not rockets. Sockets. I've got rockets on my brain. Don't mind me, folks. Anyway, you simply spin the sockets until you get a match. And by the way, somebody emailed me and asked me what that t-shirt, the electronic rock guitar t-shirt costs. It's 29.99.

>> Really?

>> Pretty inexpensive when you consider it comes with an amp, yeah.

>> Really?

>> Yeah. It's pretty cool, so just some cool gift ideas.

>> So Black and Decker wrench.

>> Yeah, it's called the Ready Wrench.

>> You don't know how close I came to buying one of those for myself just like last week.

>>Really?

>> But I didn't.

>>Well, cool. See you got to leave the list open for people.

>> That looked like one of the sharpest things.

>> I guess so, yeah. Hey, listen, we're going to be talking about, you know, when it comes to drug therapies, there's got to be some basic science. And our guest today, Ann West, who is professor of chemistry and biochemistry at the University of Oklahoma, this seems to be her passion.

>> I tell you what, this lady has a unique history. We're going to hear a little bit about that in just a second, but she considers herself a biochemist who is interested in how cells sense and respond to environmental stress. We're going to hear more and more about that, but I want to hear more from Dr. Ann West. Ann, welcome to *Oklahoma Innovations*.

>> Steve and Gary, thank you for having me. It's very nice to be here.

>> We need to know more about you. You told us earlier that you came from the New Jersey area, New Jersey and school in Connecticut.

>> I did.

>> And Connecticut. Give us some of your history so the audience will know who you are.

>> Well, first, I have to tell you that I have two nephews who would be very much interested in that guitar t-shirt.

>> The guitar shirt, yeah. I think I've just sold a thousand of them.

>> They can scratch their tummies at the same time.

>> That's right. That's right. Yes, I grew up in New Jersey, northern New Jersey. You know, a stone's throw away from Manhattan.

>> Which is a hot bed for research.

>> It is.

>> You bet.

>> Although I was little young at that time. I didn't quite know what research was all about. But it was a nice suburban town called Montclair.

>> Okay, I've heard of Montclair, New Jersey. Sure. And you went to school in Connecticut, did you not?

>> I went to a small liberal arts college or university called Westland in Middletown, Connecticut.

>> Heard of that one too.

>> Wow. We're doing well this morning. I had a wonderful four years there. I did catch the research bug while I was an undergraduate student there and had a wonderful time learning about science and at that same time being able to do science in the laboratory. And that, you know, I think really set my career on the path that I took.

>> You know, I find that very interesting. And I'm going to ask you a question that I wasn't anticipating. You know, I recognize that some people go through higher education. They come out just being outstanding researchers. They're motivated. They're fired up, and they want to do it; kind of like you. A lot of people don't. What's the difference I wonder. Maybe that's not a fair question, but I just wonder if you could capture that. I wonder what that is.

>> Well, you know, I'm not so sure that you can predict your path in life. I mean, I think if I in retrospect look back on what kinds of things I was interested in as a young girl, as a teenager, you know, I was always inquisitive. I wanted to know how things worked. I think I got a chemistry set at some point, you know, a Christmas gift or a birthday gift.

>> She was like me. I mean, I was making microphones out of tinker toys as a kid. You kind of are born with that I guess.

>> That's right. So I you have any, you know, curiosity running the veins, I think science is a wonderful avocation to have.

>> There you go.

>> But can you predict that when you're young? I'm to so sure.

>> Probably not. At least with –

>> Follow your nose, and you take a path that interests you.

>> Which is one of the reasons we need outstanding professors and teachers to help young people find their way along? I mean, it'd be a shame for somebody who has a natural, you know, ability to do things like that.

>> So were you the math chemistry student in high school?

>> I enjoyed math. I was a biology major actually as an undergrad, so, of course, I had to take chemistry classes. It wasn't my passion at that time. And so, again, here's the prediction. I couldn't have predicted at that time I would end up in a chemistry and biochemistry department for my first real job.

>> Sure. Which, you're kind of a first. You're the first full professor to join. Go ahead and explain that and how that all came about.

>> Well, you know, I joined the Department of Chemistry and Biochemistry at OU in 1996. At the time there were two other women professors. Now in the 13, 14 years that I been there we now have six in our department, so that, you know, playing the numbers game, actually that's a pretty good reflection of the diversity that we'd liked to have. And, of course, we're not satisfied with six. It'd been nice to have even more.

>> Of course. That'll happen. That'll happen.

>> It will. It will. But, yes, I was actually surprised to learn that I was the first full professor in this particular department, and that wasn't too long ago.

>> Wow. Now when that happened, the guys didn't all throw their hands up and run off, did they?

>> No.

>> No, they formed a partnership here, and you all work together I'm sure.

>> They have embraced me, and they're wonderful colleagues. And I really didn't know that this was going to be a historic moment.

>> Well, I don't – well, I dd. I don't mean to make light of that. It's a very important breakthrough. It should have happened long before, but it happened. And it did happen, and that's the main thing.

>> That's correct.

>> And we're growing now.

>> That's correct.

>> That's wonderful. Let's talk about – let's talk about your student very quickly.

>> Sure.

>> That's a big part of what you do. We're going to get – well, this is our shortest segment, so we won't have long for this. Tell us a little bit about the kind of students that you work with.

>> Oh, I have wonderful students both in the research lab and in the classroom. And I've taught large classes and small classes. They're a little bit different from an administrative point of view, but the students are enthusiastic. They want to learn science. They come to office hours and seek extra help when they need it. I think that's been the best aspect of my job is teaching.

>> Highly motivated students. That's something we've not always had in the past. But we have it now. Do we not? And it's getting better. Very good.

>> Interesting. When we come back from the break, we're going to find you about Ann's research how she's dealing with yeast cells, which I find that kind of interesting. I don't know if we'll talk about bread or not, but no, I'm kidding. That's not the same kind of yeast, folks. Just kidding. Ann West our guest, professor from the University of Oklahoma in chemistry and biochemistry. More to come on *Oklahoma Innovations*.

[Music]

>> Now in its 14th year, this is *Oklahoma Innovations* on the OCAST Radio Network.

>> The stress of finding a job after college is compounded for recent graduates entering a tough job market, but thanks to the Oklahoma Center for the Advancement of Science and Technology, more students connect with the state's most advanced technology companies while earning income and valuable on-the-job training. Through the OCAST RND intern partnerships program, students gain experience in the industry, work with mentors, and operate specialized instruments. Intern training leads to staring starting salaries 12 percent higher than Oklahoma's average per capita income. OCAST is investing in Oklahoma's best and brightest, creating jobs, investing in our future. That's what OCAST is all abut. OCAST is seeking intern partnership opportunities that will allow Oklahoma students to gain hands-on experience in science and technology careers. For more information call OCAST toll free at 866-265-2215, or visit their website at OCAST.ok.gov. The future of Oklahoma looks bright.

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[Music]

>> Most people probably realize it, but it's painful at times. Drug development often takes years and depends on the long-term commitment of researches with a passion about science like our guest Ann West who's a professor of chemistry and biochemistry at the University of Oklahoma. And she's discovered her passion for science as an undergraduate research assistant majoring in biology. I just think that's cool. Anyway, Steve, she's out doing some work with yeast cell. Let us find out and uncover what that means.

>> Let's do. You know, Ann, I've read some of the material that we were able to gather about you. We did some research on you, see.

>> Excellent.

>> And while you were pursing your PhD, you were studying genetics.

>> That's correct.

>> And you became interested in how proteins are localized within yeast cells.

>> Yes.

>> Pick us up right there and take us through that process how you got to where you are.

>> Well, let me tell you a little bit about yeast as an organism. It's a wonderful model of what we call model organism, because it's manipulable in the laboratory. It's safe. It's innocuous. It's the simple baker's yeast that you can get in the grocery store or brewer's yeast that people use to brew beer. So it's a safe fungal organism. From a science point of view, its gene has been sequenced, so we know a lot about this organism, about the genes, and how many gene products are encoded. We know a lot about the behavior and how to grow this organism. It's not quite like bacteria. It grows a little bit more slowly. But it certainly amenable to laboratory research because of its growth duplication time, so in two or three days you can have a nice culture of yeast to study. And it smells good in the lab.

>> Smells like bread, doesn't it?

>> Right, right. But because of its history in genetics, you could work with mutants, and you can look at different behavior. You can isolate the gene products, the proteins, for example. You can study the proteins, and basically that's why we've been using yeast.

>> You know, I would imagine that some of the medical students at OU might be looking your class. I don't know if that happens or not, but, I mean, this field of endeavor would fit right in with some of the things they're going to be learning about.

>> Right. Well, obviously there are human fungal pathogens, right, that cause disease. And the yeast that we work on is nonpathogenic, but it can be used as a model just to understand how pathogenic fungi, how they operate and what we can do to possibly inhibit them.

>> Give me an idea if you can of some of the diseases or some of the issues that we deal with in chemistry where your study might have an impact.

>> Well, I would say first – you know, let me say that what we're doing is basic research, but it has applications that have biomedical importance. So –

>> I'm going to stop you just a minute.

>> Sure.

>> Because that's a very implant part. Basic reaches versus applied research versus other things. I'm breaking up your train of thought. But if you could, give us a little pre-tassel on basic research and the difference between other types of research.

>> Well, the way I like to think about this is if you have a disease state that you'd like to study or you'd like to inhibit in one or the other, you can't really rationally design a drug unless you actually know how that process works normally. So if we were to understand a basic biological process whether you're coming at it from alchemic perspective or a medical perspective or biology perspective, whatever it is, you need to understand the basic biology first.

>> Right.

>> Then you can think about applying that new knowledge for drug design. So –

>> And you can't miss that step, can you?

>> That's correct, and in a way you're setting the foundation for future research, and it is a long process as you've already mentioned.

>> Yeah. And some of the researchers I've encountered, not many mind you, but they all turn their nose up at a basic researcher. That's too preliminary. You know, that's not important. Well, it is very important.

>> It's a means to an end.

>> The second thing, the applied research doesn't happen till the basic research is done.

>> You have it exactly right. I think it's more difficult for the public to grasp. You know, why are we interested in studying yeast? But if you make – if you take them along and have them understand the steps involved in drug discovery, you'll see that you have to start in the beginning. You have to start with the basic science.

>> Very good.

>> A lot of times too for the average John Doe out there, this also helps explain why drug costs are so high.

>> Yes.

>> Because of the process it takes to develop, and so, I mean, it's a very, very, lengthy, lengthy process in most cases.

>> And that has some outcomes that have to do with regulatory process and I'm not sure if we're quite ready to go there. But we'll go there and come back if we need to. The regulatory process, it is something that you've been looking at as a professional, and it can just drive you crazy sometimes. But there's purpose for it, isn't it? Okay, talk about the regulatory process, some of the good things and the bad things that are challenges with it.

>> Do you mean like the FDA type of regulatory processes or the biological processes that were studying?

>> Well, both maybe. Let's talk about the biologic process, the things that you're dealing with here first

>> Well, you know, our research, we are indeed interested in regulatory processes, because we want to understand how cells are controlled, their behavior, and usually this is in response to environmental cues. I'll add something here that perhaps people can relate to that the state of a caner cell is situation in which a cell is ignoring external cues. In other words, it's growing uncontrollably, right. So it's ignoring regulatory cues. The process that we're interested in is called signal transduction. And it's how – there you go. That's the buzz word. Signal transduction. So how do cells respond to environmental signals that aren't, you know, external to the cell? How do they process those signals internally within the cell? And then how do they alter their behavior in response, you know, in an appropriate response to that cue? So there are, for example, growth signals that you might be aware of; for example, growth factors that tell cells, "You should divide. You should grow. You should differentiate." And a cancer cell is ignoring the stop signals. "Stop growing now. You know, you are already fully differentiated into a skin cell or something, or a tissue." So there's growth signals and stop growth signals. Those are a check and balance kind of thing, a form of regulation.

>> These occur in nature.

>> Exactly.

>> And they deal with all cells, all of our cells which is – it's almost mind boggling to think about, you know, how the scope of this process is. And you've picked an area to study, and this regulatory process that occurs in nature is – I mean, I want the one that says, "Cancer stop." We all want that. That's the challenge though is finding those types of things, right?

>> Well, it's interesting when you get down to the nitty-gritty of things. You get down to the chemical base of signal transduction. There are so many commonalties whether you're talking about a cancer cell or yeast cell or bacterial cell, because the chemical forms of messaging, you know, of information processing is actually very, very similar. And that's one of the things we're interested in. So, for example, if you have proteins that form a signal transduction cascade, they communicate with each other, and they pass the signal along the chain. That signal sometimes comes in the form of a chemical modification that we call phosphorylation. So it's a phosphoryl group in other words. That is ubiquitous. That is a ubiquitous form of information processing of all cell types whether you're a bacterial cell, a yeast cell, or monera cell. So when you do get down to the intricacies, the chemical basis, it doesn't really matter what cell you're studying, because the analogies can be made from an mechanist point of view to all cell types.

>> You know, this is probably not the best example of that. But ever since I was child, I wondered, you know, when I was injured; you get a scratch. You get a little cut somewhere, and over a period – very relatively short period of time, it heals itself. And you look down, and after not too long, it looks like it was never there. That's sort of the signals you're talking about.

>> Absolutely.

>> These cells that change. Anyway they get a signal. They're passing signals back and forth, and that's why we're able to get back to our original state, I guess after an injury. Is that a good example?

>> It is. That is a good analogy, because, you know, we're studying cells, yeast cells, that are responding to different environmental stresses. So whether that stress is a mechanical tearing of the cell wall like an injury, or in our case we're looking at changes in salt concentration or sugar concentration. That's important for yeast, because if you think about a yeast growing on grapes, for example, it can become quite dehydrated depending on the weather conditions. So we're looking at something called osmotic stress, and that has to do with how water goes in and out of the cell. And it's a lethal event for all cell types if you have, you know, if you dehydrate or if you swell. That's the two opposite conditions. You need to control the osmotic pressure in one way or the other, so there's a lot of regulatory steps along the way to maintain that homeostasis.

>> Yeah. You know, something we forgot to tell about you, you received the Joseph Brandt Professorship, the Edith Kinney Gaylord Presidential Professorship, the Irene Rothbaum Award, and many more. And you're applying your trade. You're teaching freshman level chemistry classes, undergraduate and graduate level biochemistry classes. The type of things you're teaching are going to benefit all of us down the road.

>> We'll come back and talk more with Ann West from the University of Okalahoma when we return on *Oklahoma Innovations*.

[Music]

>> This is *Oklahoma Innovations* on the OCAST Radio Network.

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[Music]

>> Welcome back to *Oklahoma Innovations*. Gary Owen and Steve Paris interviewing Ann West who is professor of chemistry and biochemistry at the University of Oklahoma. And here's a scientist who just has a passion for uncovering some interesting sciences that deal with yeast. And that's the baker's yeast that you're used to finding at the store, and she explained in the early part of the program why she's using that as a model for her research, Steve.

>> And she did a very good job of explaining that, I thought. You know, you're dealing with proteins also. I, you know, I have a question. How do you start to study the involvement of proteins and signal transduction? You know, we talked about signal transduction in the previous segment, and it's kind of what our body, our cells talking to one another. So they'll do the right things hopefully.

>> That's correct.

>> Give us an idea.

>> So many people refer to proteins in the cell as the workhorse of the cell. So in studying signal transduction, we want to underhand the proteins that are involved in that process. And we want to understand how they function, how they function together. because you have to have a faithful system that signals in a appropriate manner. This is where the chemistry comes in. We're interested in what those molecules look like. You know, what's a protein? Unless you can see it, you don't quite understand what the function is. And I often make an analogy to, for example, a car tire. You wouldn't be able to predict that is function was to be wheel, and it would have to be round in order to be a wheel. So if you don't know the structure or the shape of that object, you'd have difficulty in predicting its function. Right? So the relationship between the structure of something, of an object in this case a protein and its function is an intimate relationship. And so we'd like to know how those proteins function and what their structures look like; at an atomic level, three-dimensional atomic level. So we used, you know, a rather sophisticated technique called X-ray crystallography to determine their three dimensional structures. And this is, you know, why I have a very happy home in the chemistry and biochemistry department, because they appreciate structure. And we have the equipment available, and we have the students who have that kind of background.

>> Now when you talk about X-ray crystallography, give the listeners an idea of what this piece of equipment looks like and what it does. That's hard to do on the radio, but go ahead

>> Well, by name. So the X-ray part, you need an X-ray source. We have a small generator that generates X-rays. So the second part is crystallography, so we have to be able crystallize our proteins. So in other words, we have to nudge our proteins into a semisolid crystalline state as opposed to a solution state. And that's one of the bottlenecks. That's the major bottleneck in solving a three-dimensional structure. You have to get these proteins to form a crystal. Crystals are gem-like quality; although, they're semi-liquid. So they're fragile, very fragile. So one of the things that we've done recently is partner with a number of other researchers across the state that are interested in this field called structural biology.

>> Let me name the group. You've got OU Norman, OU Health Science Center, Oklahoma State University, Oklahoma Medical Research Foundation, Cameron University, Langston University, University of Central Oklahoma, the Noble Foundation, and CoMentis.

>> Isn't that an impressive list?

>> That's the reason I wanted to say it. It's a very impressive list. And you're leading the group.

>> I am. I have a lot of help. So Blaine Mooers at the OU Health and Science Center is sort of co-coordinating with me, but it's a group called the OSBN which is short for Oklahoma Structural Biology Nexus. The OU Research Cabinet sort of helped bring us together, and the idea was for us to discuss the needs for structural biologist across the state, to partner with each other, to share resources, share ideas, talk science together basically. So we're sort a flagellant group. We've been in existence for about a year and-a-half now. We have a website which is housed on our department website. We wrote a joint grant to the National Science Foundation to obtain instrumentation. It's actually robotics instrumentation, which would appeal to some of our high-tech audience, which will allow us to look at hundreds of crystallization conditions all at once.

>> Wow.

>> So it's a high throughput method. It uses nanoliter, so for those of you. Nanoliter volume, so, you know, a billionth of a liter.

>> Wow.

>> So its uses very little sample, which is great because some of our samples are precious.

>> Oh, sure.

>> And if you can screen hundreds and perhaps thousands of conditions in order to hopefully get that one fem-like crystal than you've overcome the major bottleneck in along the path of structure determination. So I really believe without the OSBN behind this and a self grant proposal we night not have gotten it, you know, because it was a good, you know, bang for the buck. We're appealing to nine institutions across the state of Oklahoma. We've got 22 research directors involved from those nine intuitions, and we're kind of a cohesive group now.

>> Ann, how was your research originally funded?

>> Originally it was funded by the National Institutes of Health and by OCAST, the Health Research Program. I've actually enjoyed two three year grants from OCAST. Very grateful for the funding, particularly in this extremely competitive climate that we're in for grant funding.

>> We don't just give that away do we?

>> No, no. It's a lot of hard work.

>> Well, apologize for that, but we have to do it that way.

>> Yes.

>> Well, you know, one of the things I'm looking at here and I'm seeing all the organizations and individuals involved, and you think there's some great things have to be coming out of this in the very near future. I know it's a long-term process. And this will be up and running probably for many years.

>> Oh, we're very excited about this.

>> Oh, yeah.

>> We're starting to plan annual symposium which will probably start this coming fall. Our department's moving into a new building, and so we hope to show off the new building at the same time as hosting our first annual OSBN symposiums.

>> Hey listen for our listeners who are hearing all of this, and some of it, you know, it can be a little heavy on the brain to go, "Wow, this is deep." But for the long-range goals, what do you hope will be the end result of this research?

>> So long-range goals. Well, first we'd like to understand something about the signal transduction process from a mechanistic point of view. How does it work? The biomedical importance, we hope that this will provide for drug discovery opportunities. So, for example, anti-fungal drug theory because we're working in a fungal system or anti-microbial, because many of the proteins we study happen to have homologues where analogist types of proteins and bacteria. So if you think about pathogenic bacteria, pathogenic fungi now that we hopefully will understand a simple signal transduction pathway, if we can inhibit that pathway and we can presumably –

>> Now what kinds of drug are we talking about? For what kind of diseases? Anything in particular?

>> So, for example, the most prevalent fungal disease is from Candida albicans. So Candidiasis occurs in compromised patients. I think, it's if I site this correctly, it's the fourth leading fungal infection. It's very often hospital acquired, but it can be lethal, because patients are already ill.

>> And already compromised human condition; it can make it much worse very quickly. And one of the things before we go any further, Gary, I don't think we're going to see this coming to any end. I think this is something going on for a long time, because there is going to be discovery here that probably will go on long after us are no longer around.

>> That's right. I'm hoping I can make a career of this, and then the students that I've trained can continue to pick up the ball.

>> Just list at couple of the objectives of OSBN. First of all, to promote interactions between structural biologists in Oklahoma. But down here, number nine to me is interesting, to educate the general public about structural biology. And that's something that a lot of people say, "Well, I've never heard of that." That's one of the things that's happening in Oklahoma. You know, we're no longer just the land of, you know, the pioneer spirit, things of that nature. We're a place where research is done. Now are there places bigger than us? Of course. But we are carving out our known niche. This is one of those many niches that we're carving out. And wait and see.

You're going to be hearing people from outside the state saying, "Well, I need to go to Oklahoma to find out more about this area of research or this area of endeavor."

>> Yes.

>> This is a building block right here, a major building block.

>> Exactly.

>> Very quickly. We have just a second. Let's talk about the funding process. When you apply for NIH funds, National Institutes of Health, with kind challenge is that?

>> A big challenge these days, and that's partly because there's fluctuations in what we call the pay line and the percentage of grant proposals that are actually funded year to year. And unfortunately there's been somewhat of a downward trend, and, you know, federal dollars are hard to come by these days. And so it's become – it's always been competitive, but it's become even more competitive lately. So it's a major challenge to those of use in the research field that are dependent on federal or state grand funds.

>> Ann, thank you for being our guest this week. Steve, we're out of time.

>> We are, Gary.

>> We'll see you next week on *Oklahoma Innovations*. Have a good week.

[Music]

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