Careers in primary industries – synthetic biologist (with Hugh Goold) – transcript

My name is Hugh, I am a Professional Officer of Yeast 2.0 at the Department of Primary Industries.

What is Yeast 2.0?

[00:16] Yeast 2.0 is the world's first designed organism We use DNA sequences to come up with an entire DNA sequence for a whole organism and ten laboratories around the world are all getting together to put them together inside a living cell as the World's first designed organism.

What are some of the projects you are working on?

[00:40] I'm working on a few different projects that span different industries from fisheries and forestry to agriculture but there's some very interesting ones about making things that plants normally make in new ways that gives our industries in New South Wales agility and security that they don't have at the moment.

How does your research support agriculture?

[01:03] Well DNA is relevant to any living organism from plants and trees to people to small microbes like e-coli and yeast. So a lot of the skills that you pick up working on different organisms is completely transferrable. So a lot of the work that we did for instance in the immune system of mice and humans still has relevance to a lot of the things that I did in algae to make biofuels and is relevant to what I am doing trying to put together large pieces of DNA inside a cell.

Why do you love your job?

[01:43] It's a very fulfilling role and sometimes it's very frustrating but when it does work and you get an excellent result and you know that you are the first person to achieve something that's going to have global impact it's very, very rewarding.

What could you do without?

[02:05] The biggest problem in the job which I think we just have accept but I wish wasn't the case is repeating things over and over again. I wish that it worked perfectly the first time every time.

What personal qualities are good to have in this role?

[02:19] It's a very, very challenging position and you need to be able to deal with a lot of unexpected problems and you need a lot of patience you also need to be able to work in a team in difficult situations which last quite a long time and a lot of the time without breakthrough results but it's very rewarding.

What qualifications do you need to have for this role?

[02:44] You definitely need a bachelors and a PhD degree to do the kind of work that we do in the laboratory a lot of the things are very routine and simple but when it doesn't work that's when you need to really be able to figure out what's going on.

What qualifications do you have?

[03:03} I did a Bachelors degree in Biochemistry and Biology and then I moved on to a Masters degree at Macquarie Uni on fungal cell factories which is a kind of fungal biotechnology and then after a while I came back and did a PhD on algal biofuels at Sydney and also with the French nuclear energy agency who are interested in renewable energy.

Where did you study?

[03:30] I went to high school in Newcastle then I went to uni in Sydney. I then did a masters in Sydney. I went overseas to London and worked for a few years at a research hospital then I came back and did part of my PhD in Sydney and part of it in the south of France.

What career opportunities do you see in the future in agriculture?

[03:52] I think that Australia is going to be a global leader in agriculture moving forwards and I think that the agriculture industry is a growing industry in Australia especially moving forwards with the World's problem with food security so I think there is a lot of opportunity for young people in agriculture.

Do you have any advice for young people interested in scientific research?

[04:20] I'd say persistence is what really pays off if you are absolutely passionate and dedicated those are two of the main qualities you need to succeed and you need to find a way of following your dreams and be very open to chasing opportunities and making opportunities and you'll get there.

Can you tell us about some of the technology you use in the lab?

[04:45] This is one of the robots we are using in the genome foundry which will automate the processes that we do and give us a lot more productivity and allow us to spend more time doing intelligent designs. So if you look in here ... this robot will look in a petri dish like this and will find where the colonies are and this nozzle will find a yeast cell and transfer it from one of these plates to one of these liquid plates and then we can take this liquid plate and transfer it to this robot. And from this robot this pipette here will dispense liquid into other plates and we can do DNA extractions and we can do multiple growth tests. And then from this robot we can transfer to that robot and we can use this to set up DNA experiments and do tests and we perform those tests on this robot over here. So together these form the start of the genome foundry.

So if you think this protocol here I can kind of do, this is an example of a manual one, but if I was to then individually pick each of these colonies and then grow them up and individually do 96 extractions that's already a week's worth of work with the analytics and downstream applications. If I use a robot to automate those 96 transformations and extractions on this kind of platform, I could get all of the extractions done in a day and possibly some of the analytics as well. And so, you really increase your turnover time and you can also automate that you do not just one set but this one's got enough space for ten sets of experiments. And so, you can really increase the amount of productivity you get out of the workday by a magnitude. And a lot of that data will feed into AI systems and then figure out what DNA does what to a cell and feed that back in to the next lot of experiments.