JGIota: The Algae Nicknamed ‘Chlamy’

Allison: And when you have a lot of questions about plants — like, say, how to maximize their potential as alternatives to fossil fuels — that’s a huge plus. Even though *Chlamydomonas* isn’t itself a potential source for biofuel, it can teach us a lot about other organisms that are. For example, Chlamy is a model for studying lipid production in other algae. Added bonus: It’s very well-studied.

Sabeeha Merchant: It’s a single cell organism. So it means that when you have a million cells there, they’re all identical. So when you study something, you get a good response that you can measure. So that’s why we study *Chlamydomonas*.

Allison: Sabeeha has been working with *Chlamydomonas* for almost her entire career, and mainly, looking at the *Chlamydomonas* genome. And, like many genomes, it takes a bit of decoding work to figure out what each *Chlamydomonas* gene actually does – what protein it eventually makes.

Sabeeha Merchant: So *Chlamydomonas* is eukaryotic, just like our cells are eukaryotic, meaning that most of the genes have introns. So when you look at the DNA sequence of the gene, you don’t actually know what the protein looks like because the bits that are the exons that code for the protein have to be stitched together by removing the introns.

Allison: To tackle that intron problem early on, **Sabeeha** and other researchers looked beyond the DNA sequence. They used other genetic materials as a way in – sequences that were downstream from the DNA, and involved in the process of going from a DNA sequence to messenger RNA, to a protein.

Sabeeha Merchant: People would try to sequence what were called cDNAs or complementary DNAs that are copies of the messenger RNA. And the whole community was really interested, because of course the cDNAs tell you something about the sequence of a protein you may be interested in.

Allison: And naturally, the JGI was involved in work like this for the *Chlamydomonas* genome. When that genome was being sequenced, the JGI got about thirty scientists together for a big event.

Sabeeha Merchant: Which they used to call, uh, Jamboree where they invited people from the community to come to JGI.

Allison: Their mission was to take a look at the genome. And then, based on what each gene in that genome looked like, and using previous research, they set out to figure out what different *Chlamydomonas* genes could do. They were annotating those genes.

Sabeeha Merchant: We spent a week at JGI annotating genes. It was so exciting because by then, of course, I think we already had, you know, the yeast genome was already sequenced. There was a cyanobacterial genome sequence. And so everybody was like hungry to get the *Chlamydomonas* genome.

Allison: And it paid off! That work completed the original reference genome. It was published in 2007 and it's fueled lots of other research since.

Sabeeha Merchant: Much of what we know about sort of chloroplast based photosynthesis. Those proteins were all discovered originally in *Chlamydomonas*.

Allison: And this work still continues – **Sabeeha**'s lab, on its own or working collaboratively with other researchers, has used Chlamy as a reference in sequencing four other green algae genomes. One recent publication out of **Sabeeha**'s lab shows that *Chlamydomonas* actually carry a special kind of gene called a polycistronic gene. Polycistronic genes are special, because while most RNA that comes from eukaryotes produces one protein, RNA from polycistronic genes can produce two, three, or even four proteins.

So it may be single-celled, but *Chlamydomonas* is pretty special, and we can learn a lot about all kinds of different organisms and biological processes by studying it.

Sabeeha Merchant: In terms of meeting our energy needs. *Chlamydomonas* is probably not an organism that we can grow like in bulk. Right. It's more like a lab rat, right? So we use *Chlamydomonas* for discovery.

Allison: And that's what makes this little algae so vital to the JGI's Fungal & Algal Program. That's a wrap on this JGIota. But you can find out more about *Chlamydomonas* – and other discoveries the JGI has made in its 25-year tenure – on our website. There's a link in the show notes!

This episode was written and produced by **Menaka Wilhelm**, and hosted by me, **Allison Joy**! We had production help from **Massie Ballon** and **Ashleigh Papp**.

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Thanks for tuning in – until next time!