

Srna Vlaho's Attraction to Molecular Genetics

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When senior Srna Vlaho from Pasadena, CA engaged in a casual chat with her TA about her interest in molecular biology, she did not expect to be on her way to getting a research position at the end of the conversation. “My TA told me about a talk and discussion on strengthening the link between graduate and undergraduate research at USC. I went to the discussion and got in contact with a postdoc working in Sergey Nuzhdin’s lab.” Since then, Vlaho has been hard at work decoding the effects of cis-regulatory elements on gene expression in the early development of the fruit fly *Drosophila melanogaster*.

Role of Regulatory Elements in Genetics

Genes are controlled by activating or deactivating portions of a chromosome so that the gene is either expressed or not. Regulatory elements are regions of DNA or RNA that control the expression of genes. This determines whether or not you will exhibit the characteristics of the gene that you carry. Cis-regulatory elements are located on the same molecule of DNA, and often on the same chromosome, as “cis” means “same side” in Latin.

Vlaho's Project

The project Vlaho is a part of entails setting up 140 different crosses of true breeding male and female *Drosophila melanogaster*, collecting the heterozygote eggs from each cross, and extracting the RNA from the eggs. The mRNA (messenger RNA) is then purified to obtain the cDNA” (complementary DNA – the strand that is “opposite” of the original strand.) Vlaho needs

to then isolate the mRNA molecules in the eggs to determine how the different alleles are expressed, and to determine how much of the genetic material from each parent was passed on to the offspring, and the role of cis-regulatory genes in the expression of the genes in the offspring. This is exhausting work, however, Vlaho loves, “doing molecular work in the lab and being exposed to recent discoveries in qualitative and population genetics,” she says, “I am fascinated about what we could discover about gene expression in our project and how that information can be applied to understanding gene expression in humans.”

While there are constant advances in the field of molecular genetics, there is still much to investigate. As cis-regulatory sequences specifically control the development and physiology that is behind gene expression, by understanding them we can gain a better understanding of why some physical qualities are passed on in evolution, while others are not. By studying cis-regulatory activity, we can gain a better understanding as to why certain branches of the phylogenetic tree occurred and can gain a better understanding to the genetic mechanisms behind evolution¹.

Running, hiking, volunteering – Vlaho’s Many Talents

Outside of the lab, Vlaho enjoys going on hikes and long runs in addition to being active in the community. Vlaho is currently involved Expanding Horizons through Mentorship at USC that works with students at the local Jefferson High School. Outside of community service, Vlaho also enjoys attending art festivals around LA in as well as watching many of the theater productions at USC, not surprising due to the fact that in addition to pursuing a major in biology, she is also pursuing a minor in theater.

For those with an interest in research or the sciences, Vlaho encourages them to get in touch with their professors early and often – “I don’t know if people realize how many opportunities they have at USC. It is just a matter of getting into contact with people. You do not have to be an expert in the field or have any prior lab experience.”

¹ Wittkopp, P. J., & Kalay, G. (2012). Cis-regulatory elements: molecular mechanisms and evolutionary processes underlying divergence. *Nature Reviews Genetics*, 13, 59-69. doi: 10.1038/nrg3095