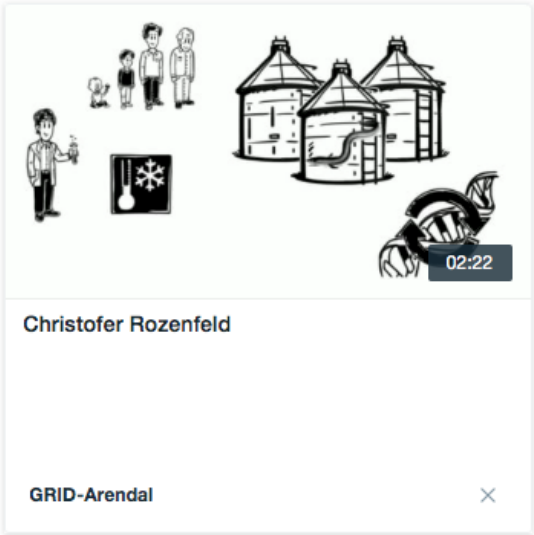
An unexpected discovery is made while laying genetic bricks

By Christoffer Rozenfeld

On the first day of my PhD I held an informal meeting with my supervisor, Dr. Juan Asturiano, or Johnny as he likes to be called. Here I presented him with a plan of three experiments each building on hypothesized findings of the previous, with the goal to greatly advance the field of European eel reproductive research.

Obviously, I had a lot to learn about research. Johnny told me to relax, take one step at the time and focus on settling in to my new environment. Unknown to me he and his team had already set the wheels in motion for my first and, as it turns out, most important experiment.

The experiment involved analyzing every piece of RNA in tissue samples, which is like looking at all the pieces of brick found after a house is demolished. For this you need a genome to serve as the assembly manual of the house. From the manual you know which kind of bricks the house is made of and in which order then are laid. However, the eel genome we had available was not as complete as we needed it to be, like a manual with missing pages or with fading ink. Therefore, we assembled what is called a *de novo* transcriptome, which is a list of all genes, without information of the order of the genes. In house terms, this is like a list of all types of bricks used in the house.



Simpleshow video - https://vimeo.com/271433708

During my Masters, I studied five eel genes, which involved finding the sequence of the genes in the eel genome. To my surprise, three of the five genes appeared twice although they have been only documented once in other fish. In the literature, many other authors have described similar discoveries. Therefore, we decided to analyze the occurrence of duplicated genes in our *de novo* transcriptome. To follow the analogy, we looked at how many time the same brick appeared twice in our list.

In the literature, the most common conclusions upon finding duplicated genes were that eels have conserved more genes from an ancient event, when all genes were duplicated in an common ancestor to all bony fishes, than other fishes. Therefore, we expected to find a high number of genes duplicated in eel, and we expected these genes to have been duplicated at the time of this ancient event. As expected, we found many duplicated genes, but the timing of these duplications did not seem to fit. Most of the duplications were much younger and only found in eel, which points to them originating from an event that happened much later and specifically for the eel ancestry. A such event has never been proposed before.

Following my supervisor's advice, and taking one step at the time, my other experiments have produced good results and have broadened our understanding of eel reproduction. However, the accidental discovery of an eel specific gene duplication event is by far the most important result of my PhD.