

2022

## Fin-tastic Fish Science

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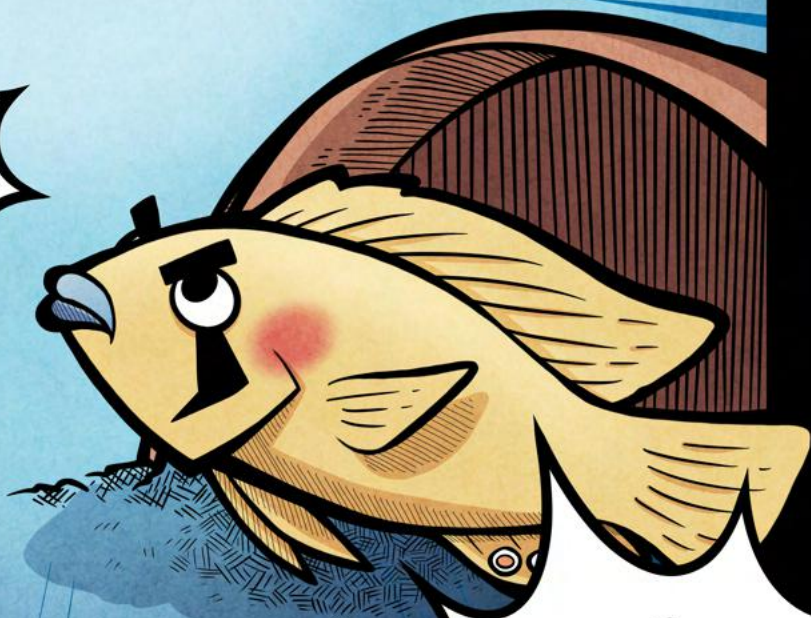
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# FIN-TASTIC FISH SCIENCE

PRESENTED BY  
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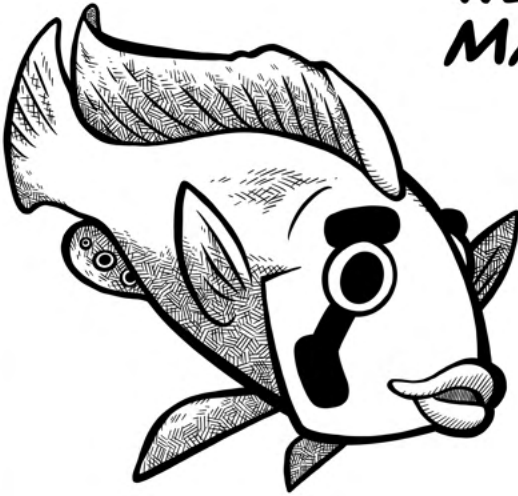
FEATURING  
TYRONE  
THE BRAVE ...



... AND  
BURT  
THE BULLY!



# WELCOME TO THE MARUSKA LAB!



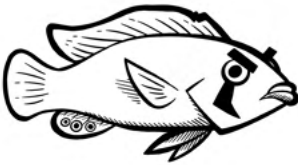
WHERE NEW AND EXCITING  
SCIENCE IS ALWAYS  
TAKING PLACE.

SCIENCE IS A FUN WAY  
TO UNDERSTAND THE  
NATURAL WORLD BASED ON  
FACTS LEARNED THROUGH  
OBSERVATION AND  
EXPERIMENTATION!

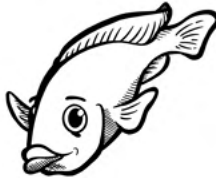
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THE LAB USES AN AFRICAN CICHLID (PRONOUNCED SICK-LID) FISH  
CALLED **ASTATOTILAPIA BURTONI** TO UNDERSTAND HOW  
THE BRAIN WORKS, HOW IT CONTROLS BEHAVIORS LIKE  
MATING AND FIGHTING, AND HOW IT PERCEIVES  
INFORMATION FROM THE ENVIRONMENT.

SOME OF THESE FISH, LIKE **BURT**, **TYRONE**, AND **TONI** WORK WITH  
THE SCIENTISTS TO EXPLORE THESE SCIENTIFIC QUESTIONS AND  
THEY LOVE TO SHARE STORIES ABOUT THEIR ADVENTURES.



**BURT**



**TYRONE**



**TONI**

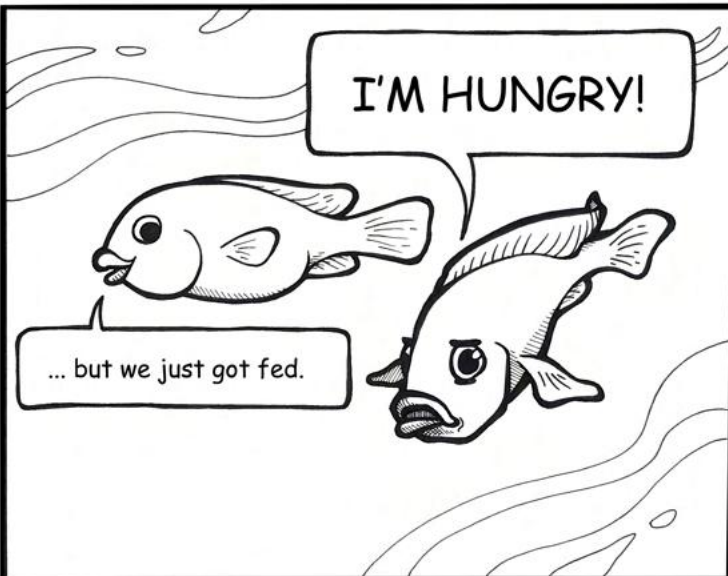
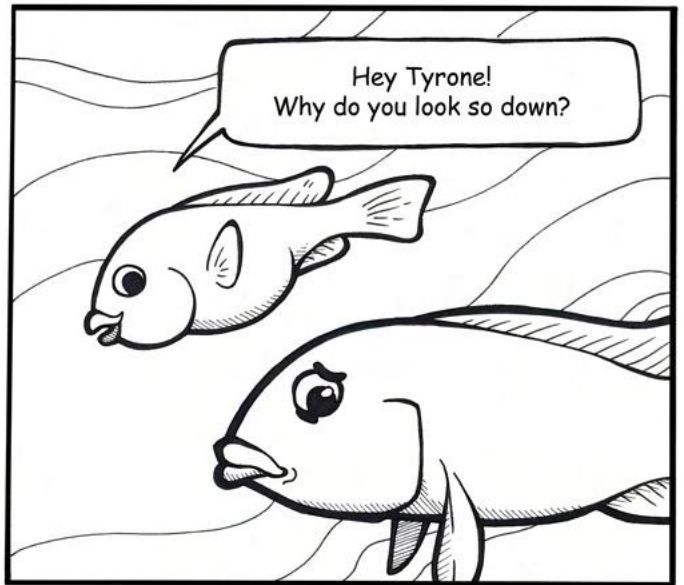
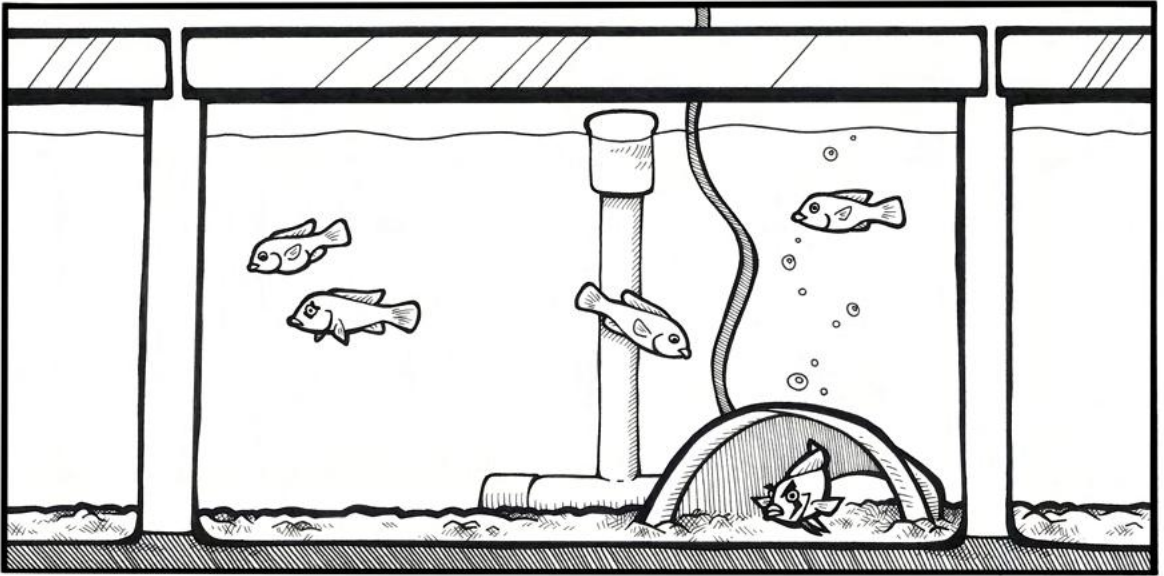
BURT IS A COLORFUL MACHO MALE WITH A TERRITORY,  
WHO NEVER PASSES UP AN OPPORTUNITY TO BULLY THE LESS  
COLORFUL AND TIMID TYRONE. FORTUNATELY, TYRONE'S BEST FRIEND  
TONI IS ALWAYS THERE TO ENCOURAGE AND SUPPORT HIM EVEN  
THOUGH HE DOESN'T HAVE A TERRITORY OF HIS OWN YET. HE WILL  
NEED A LOT OF CONFIDENCE IF HE IS TO EVER DEFEAT  
BURT THE BULLY AND REALIZE HIS FULL POTENTIAL.

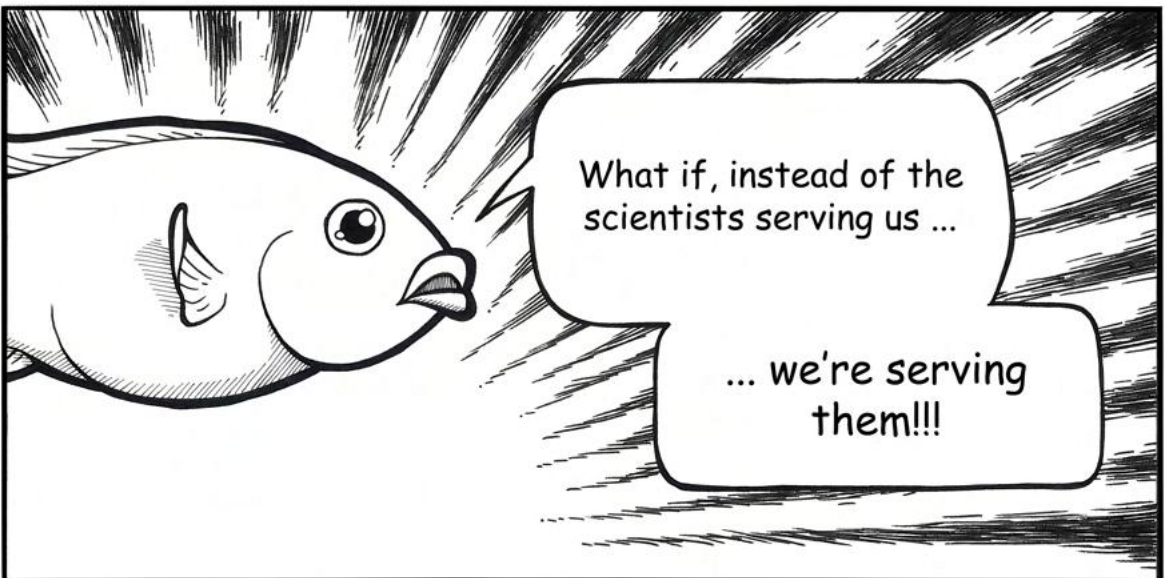
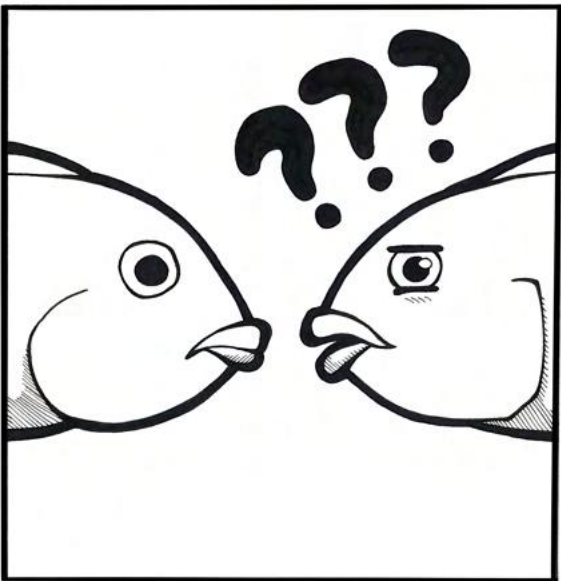
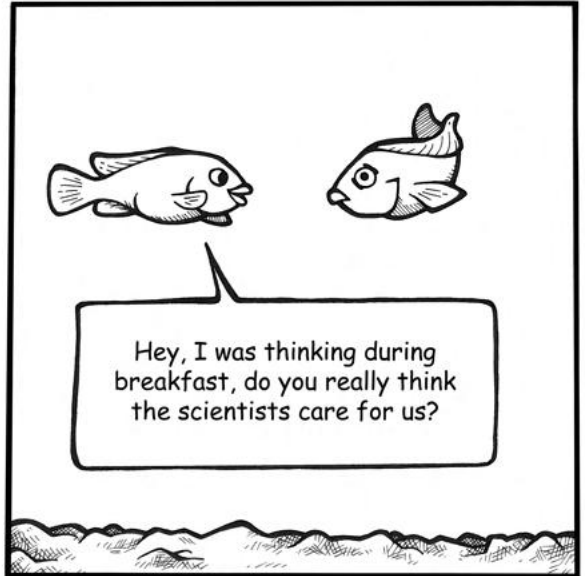
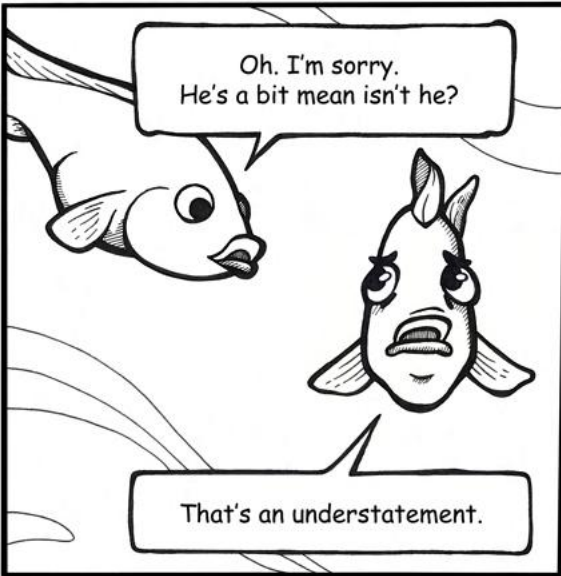
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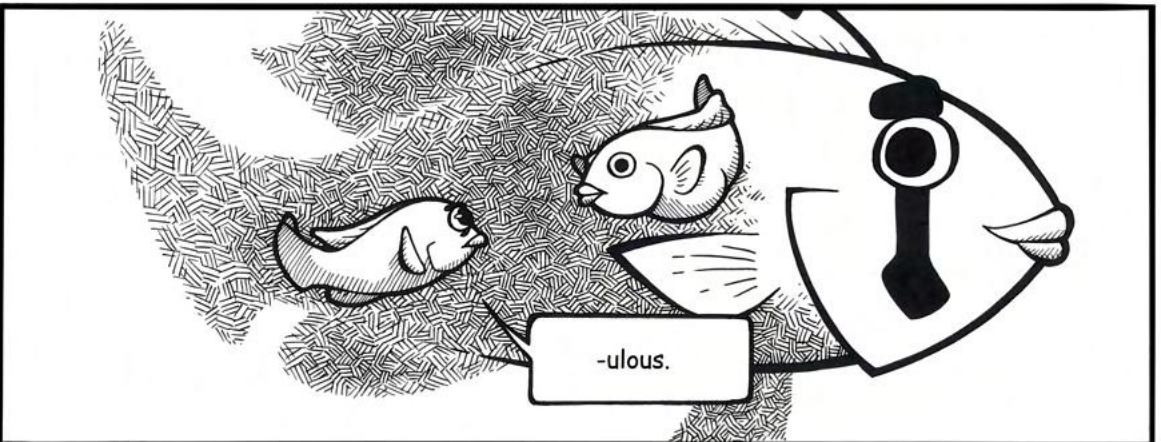
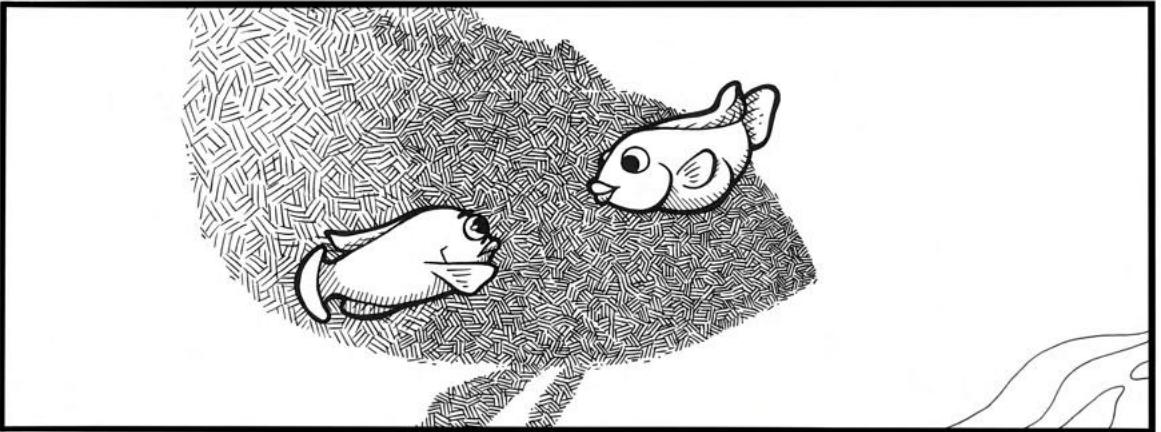
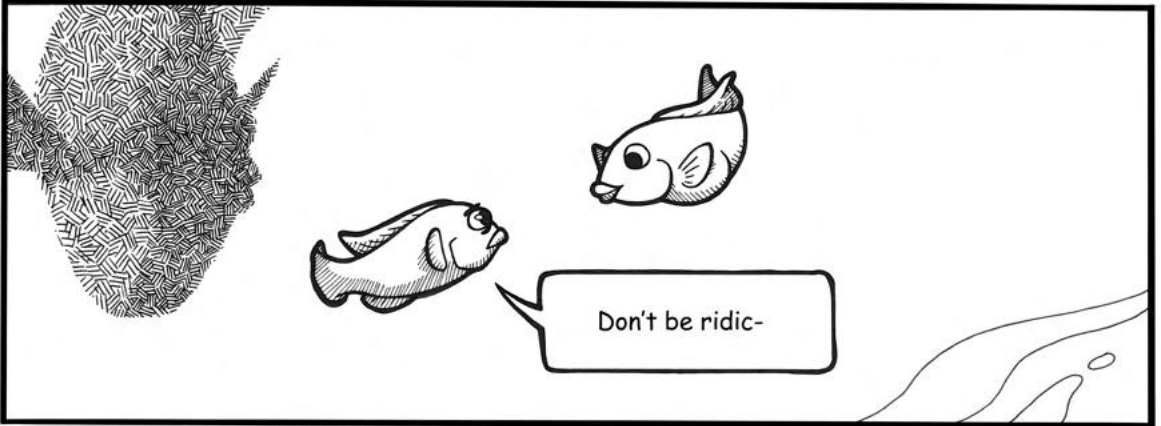
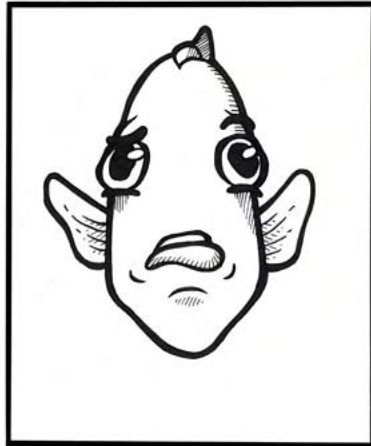
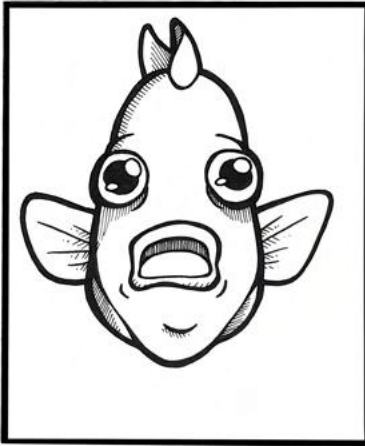
WHAT DOES TYRONE'S PERSONAL STRUGGLE HAVE  
TO DO WITH SCIENCE YOU ASK? WELL, LET US ENTER  
THEIR UNDERWATER WORLD AND FIND OUT!

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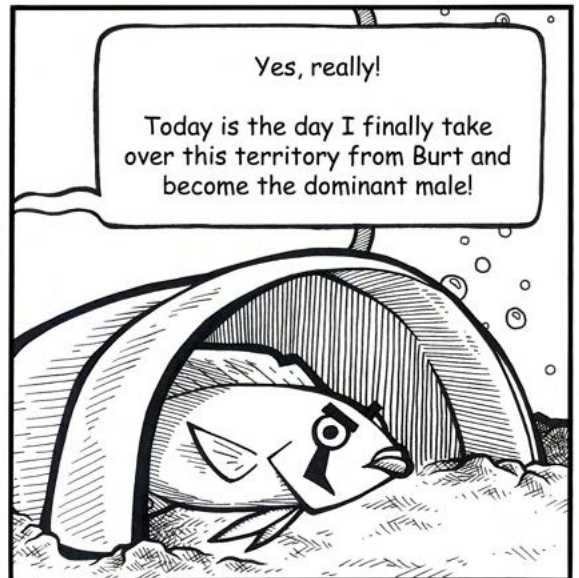
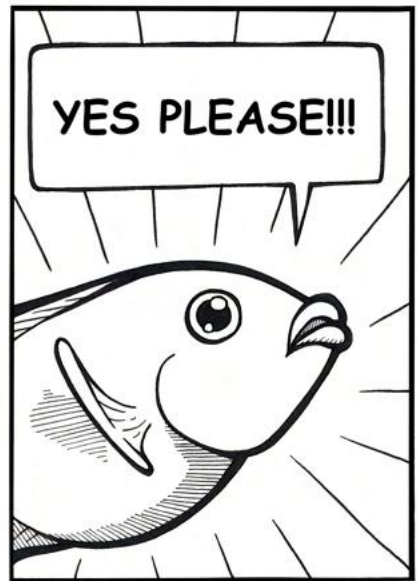
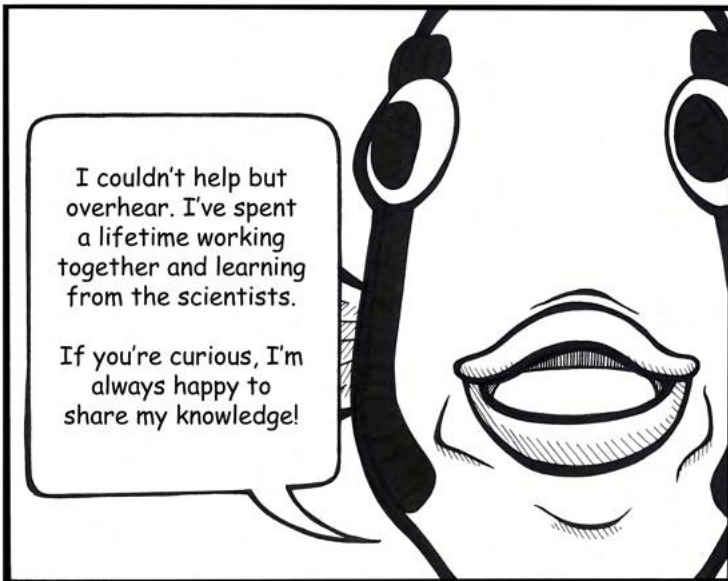
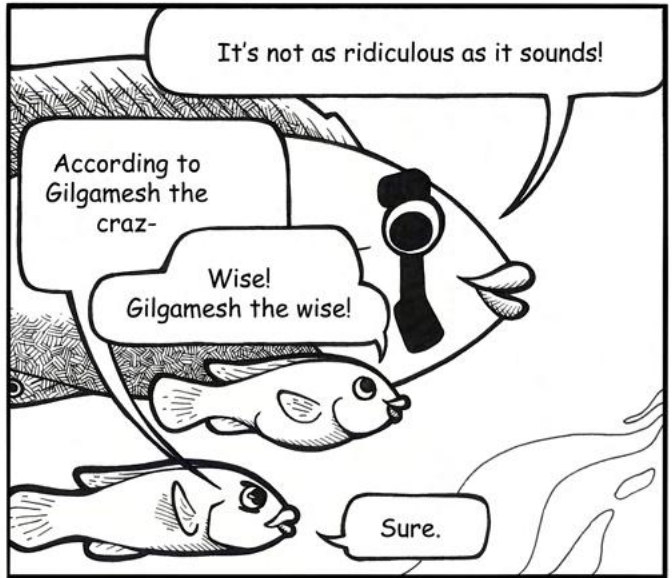
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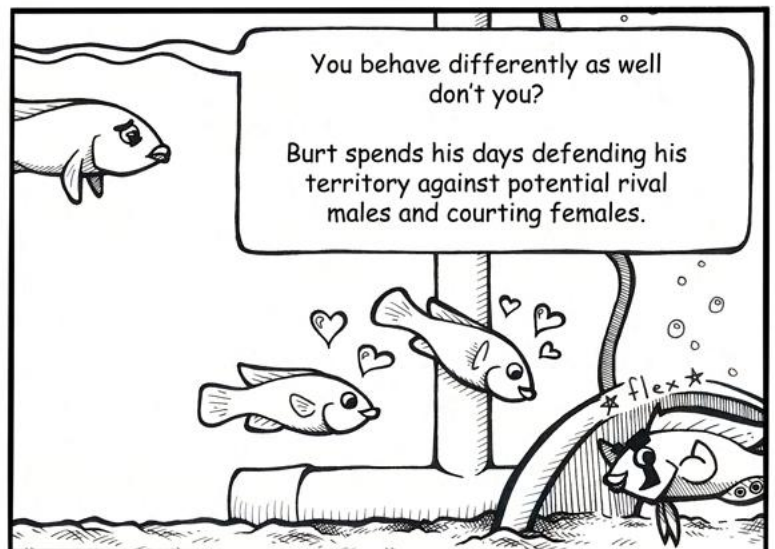
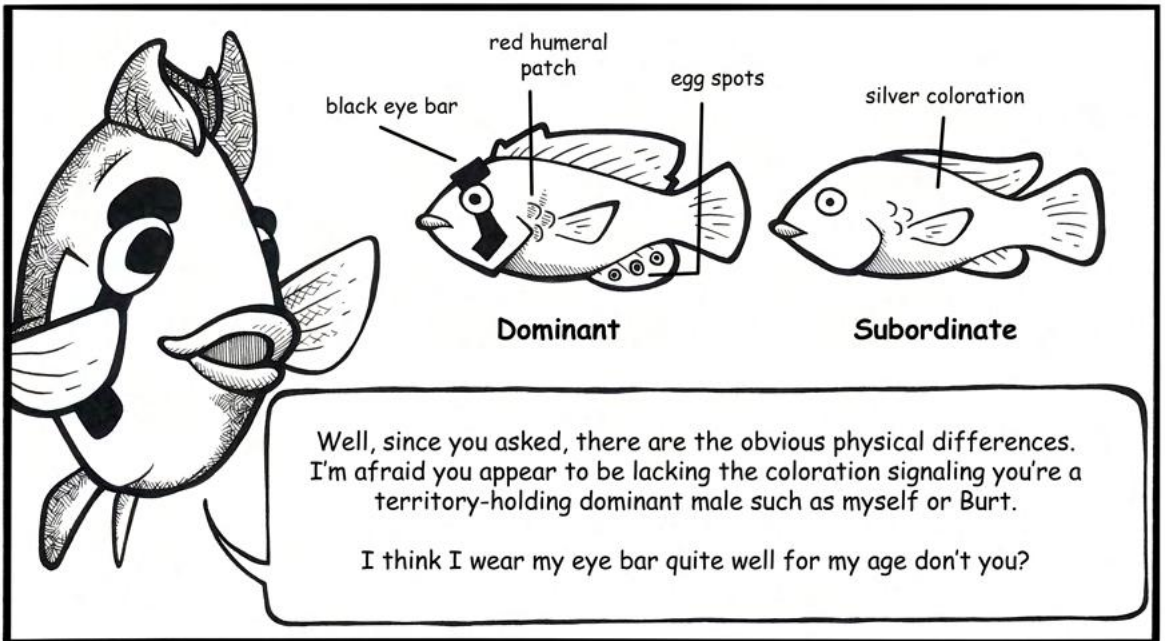
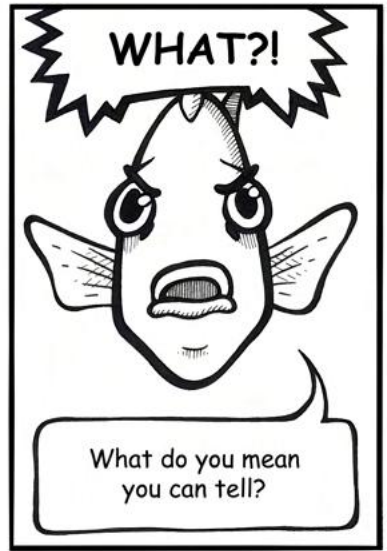
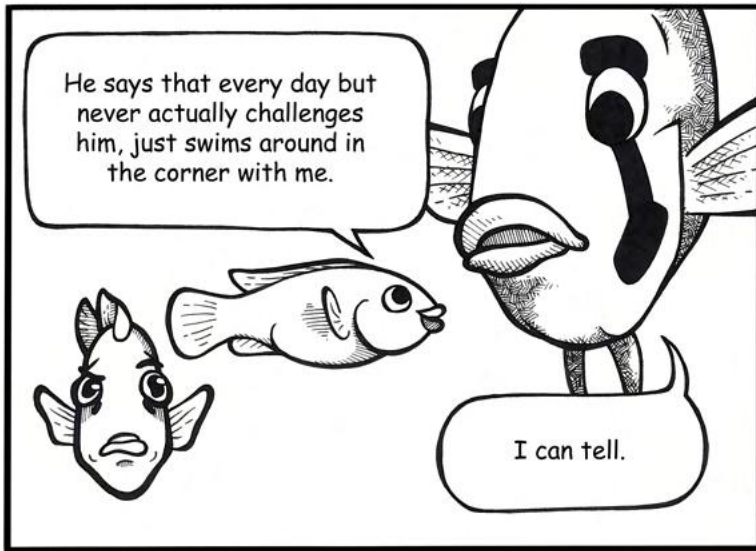


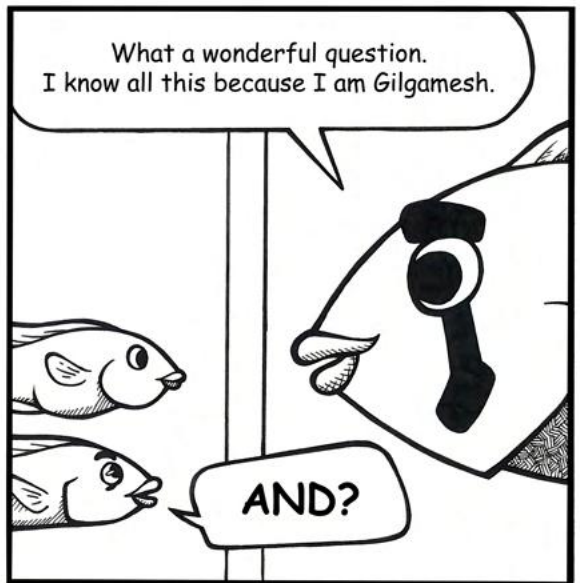
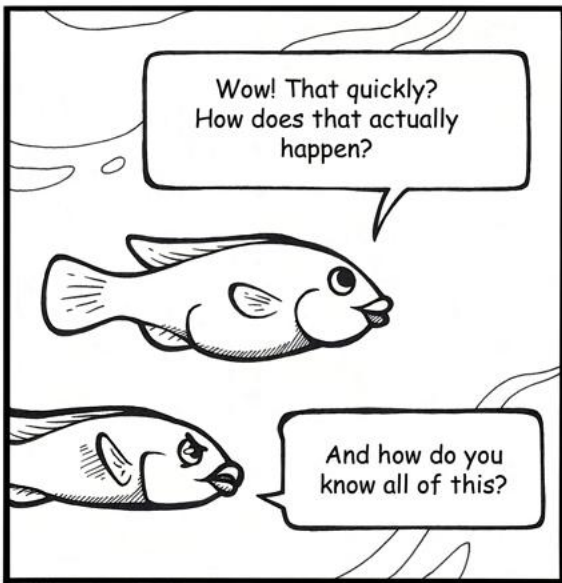
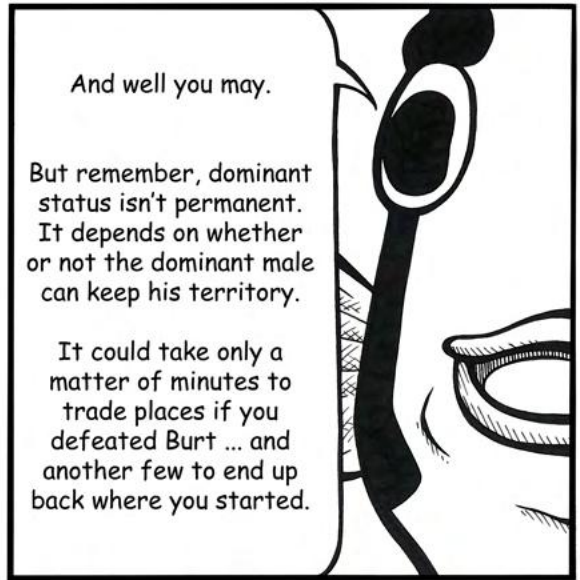
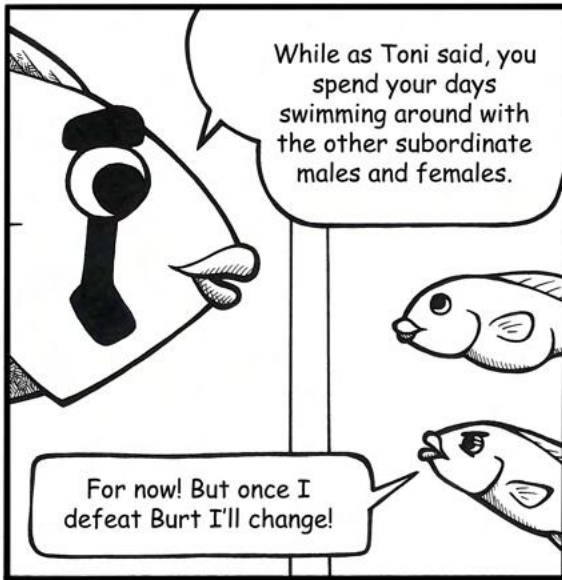


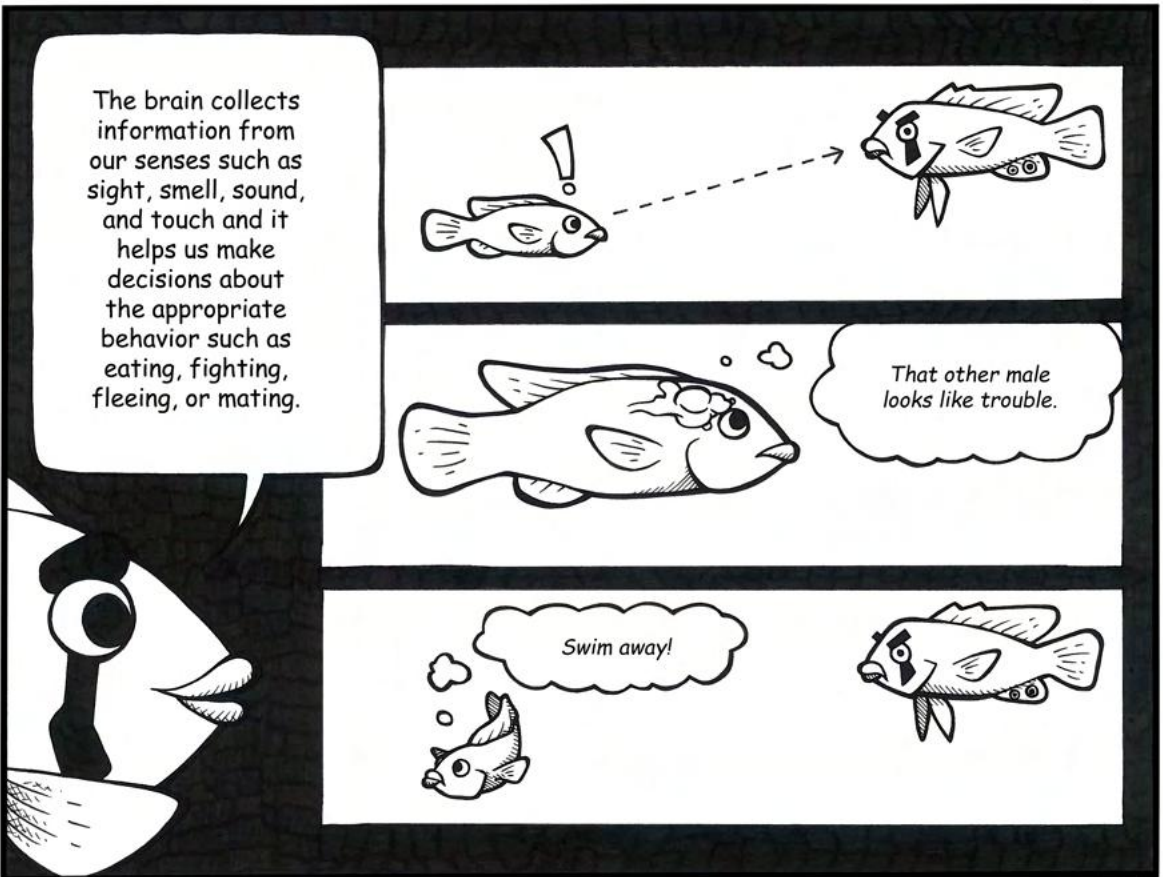
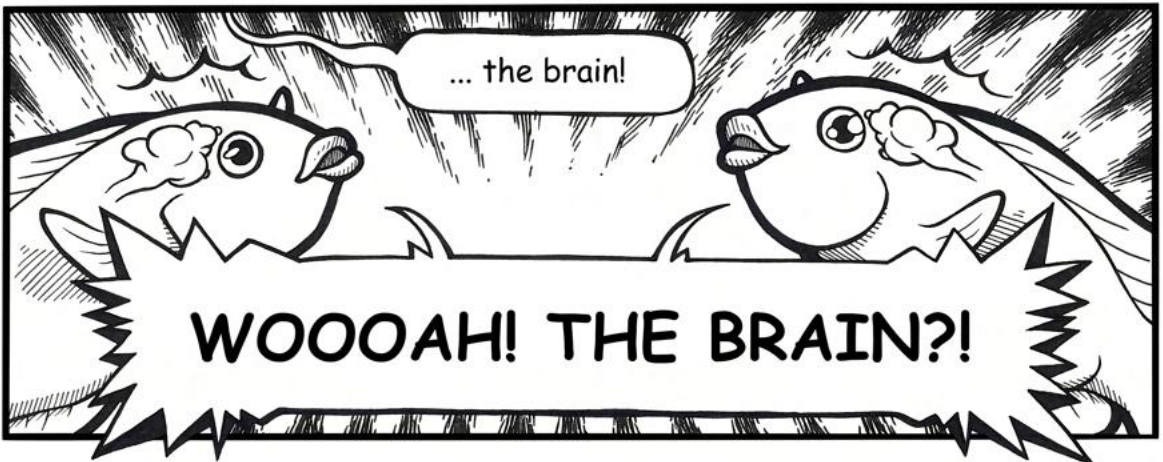
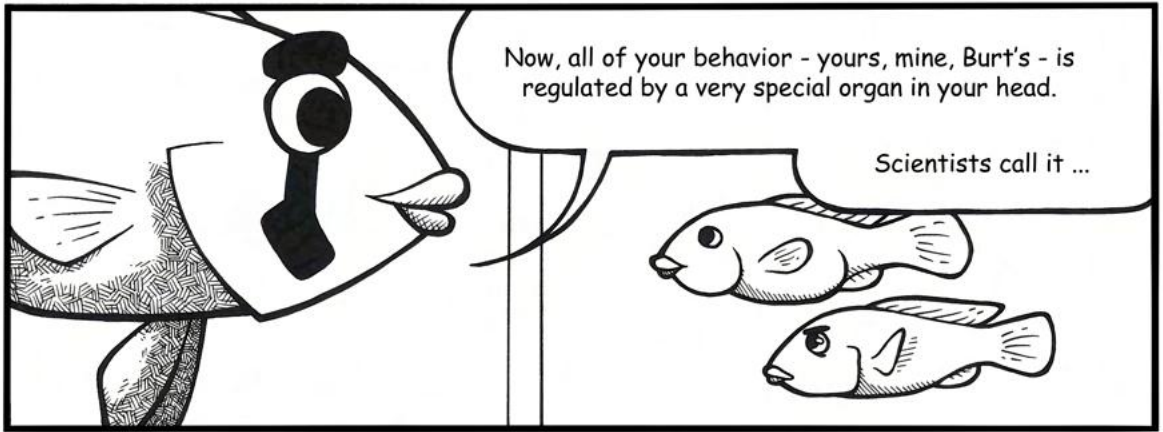


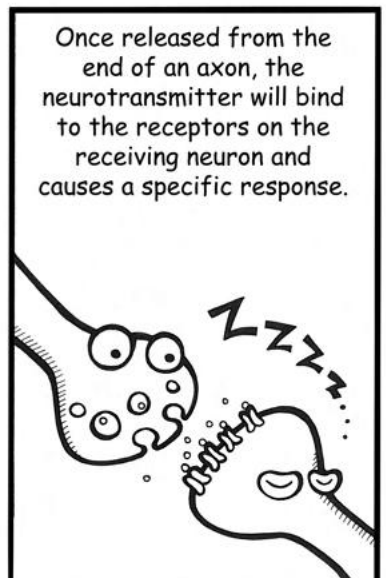
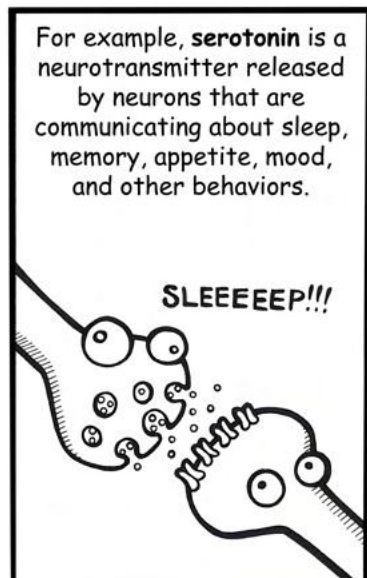
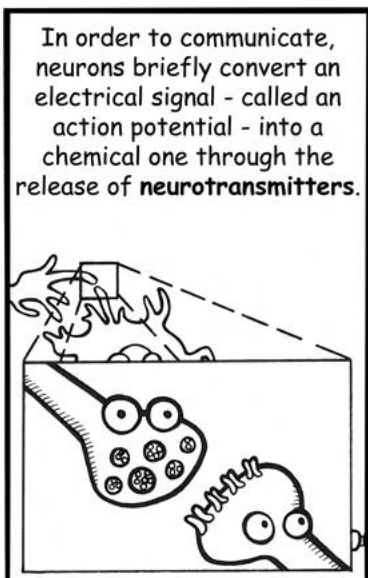
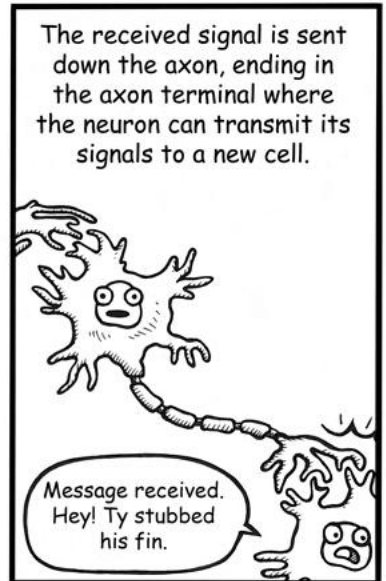
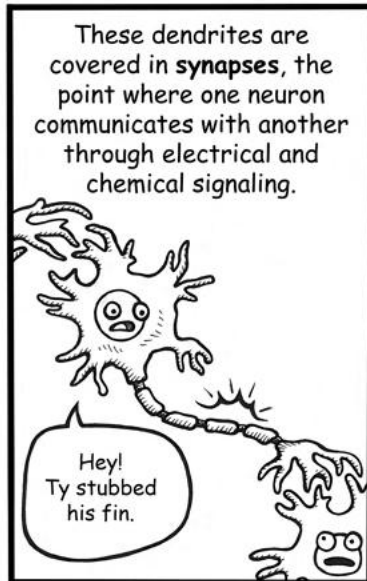
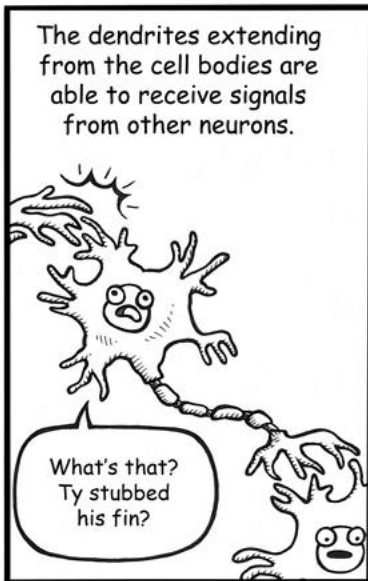
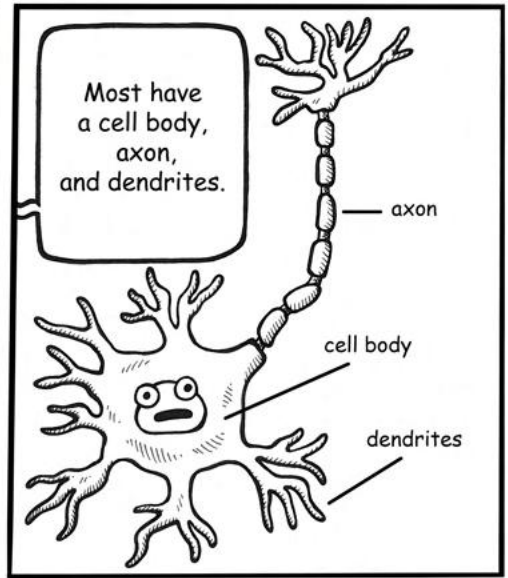
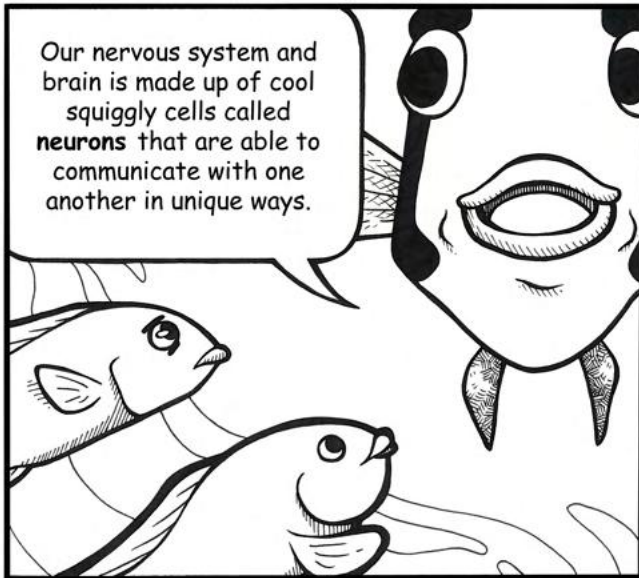


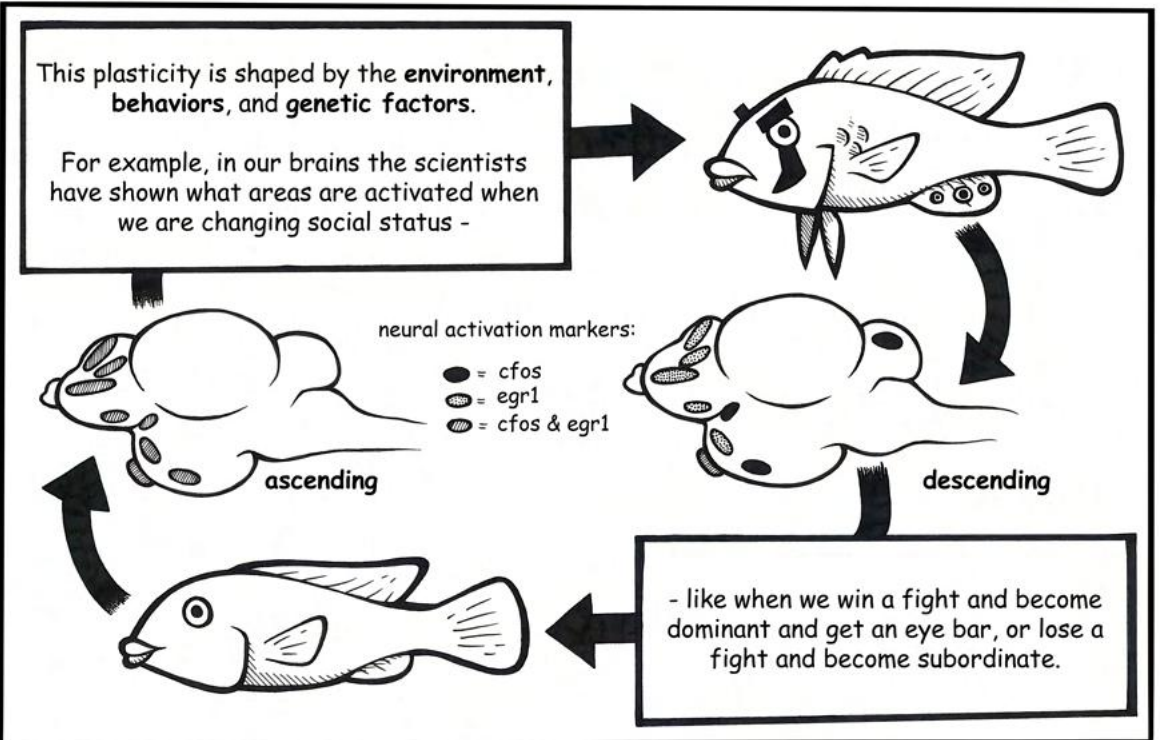
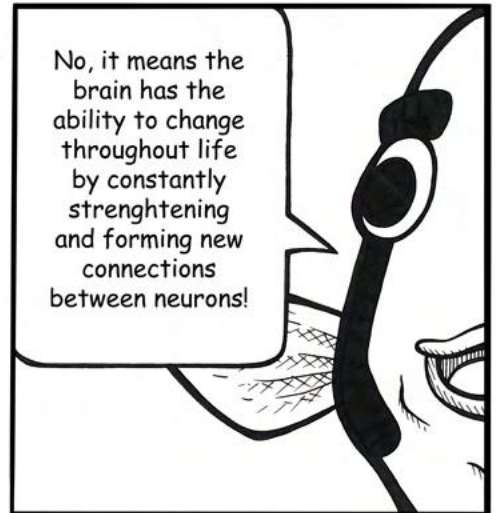
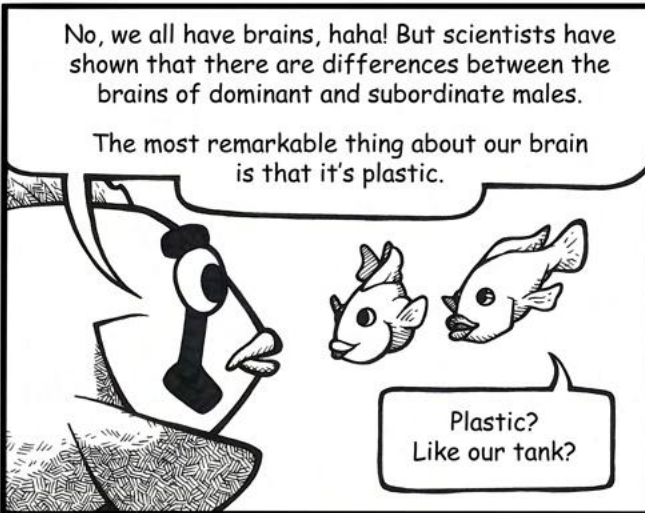
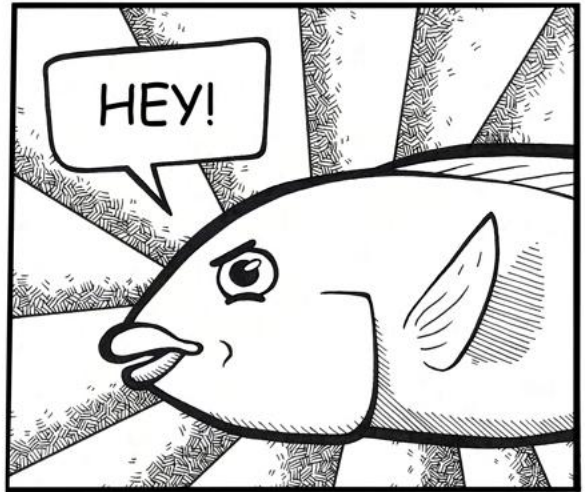
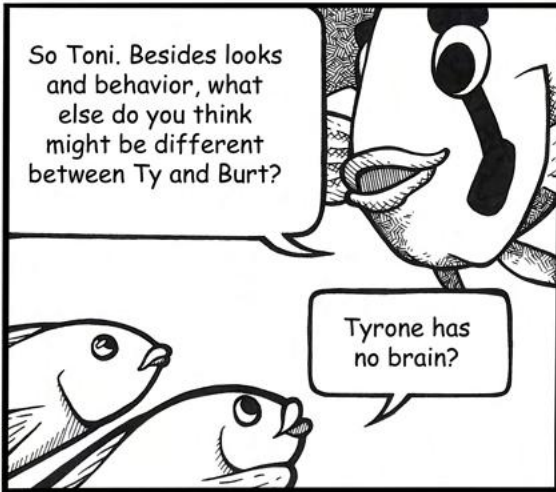


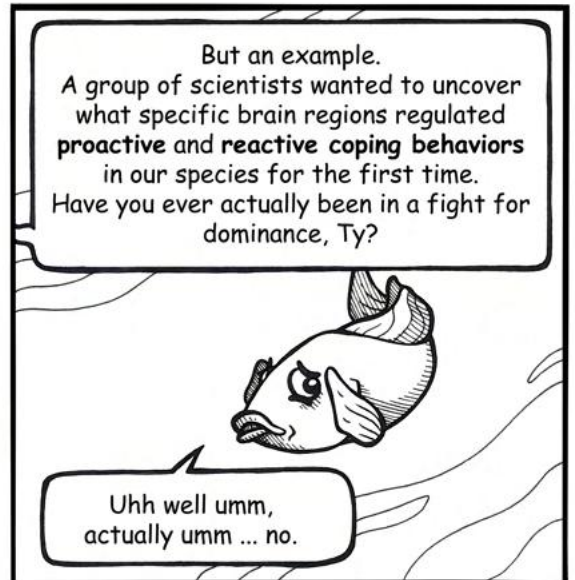
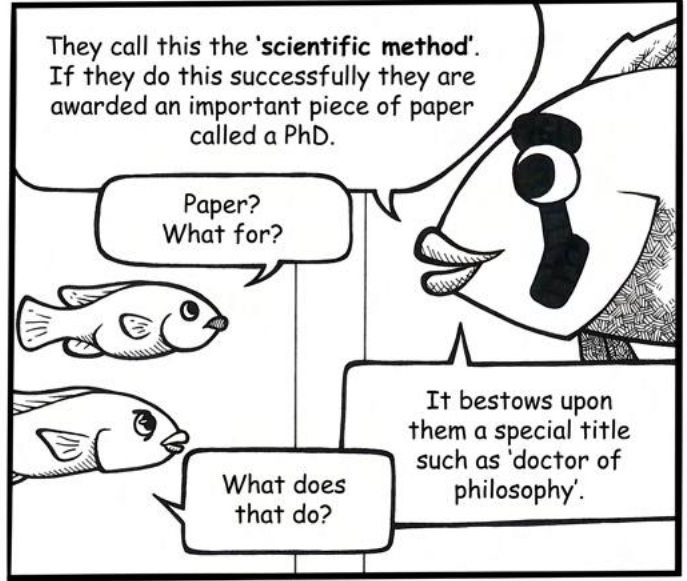
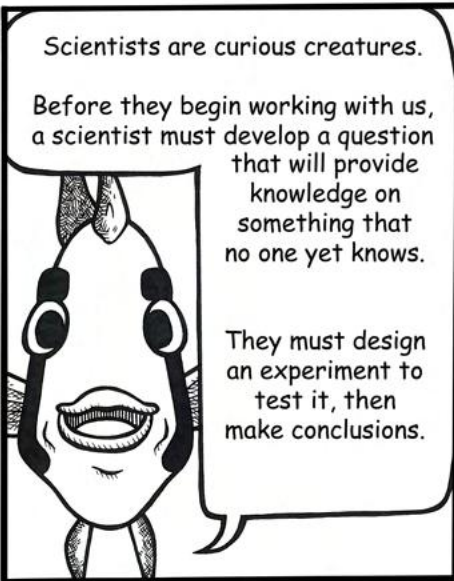
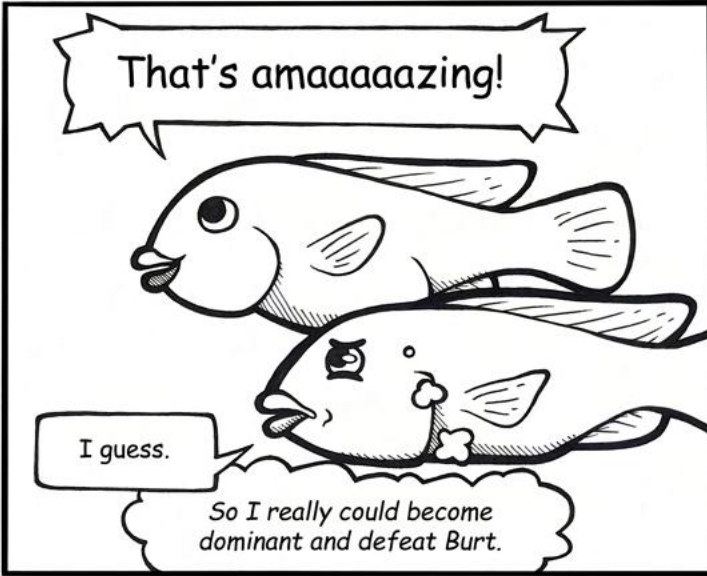









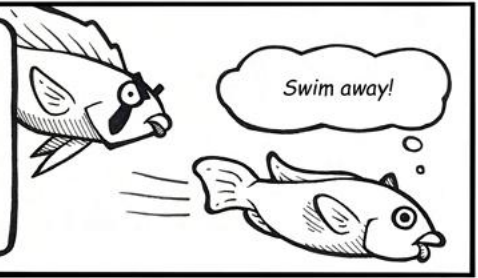




Well, when a male loses a fight he either displays what the scientists classified as **proactive** or **reactive** behaviors.



Proactive behaviors are responses of aggression or attempts to escape the stressor.



Swim away!

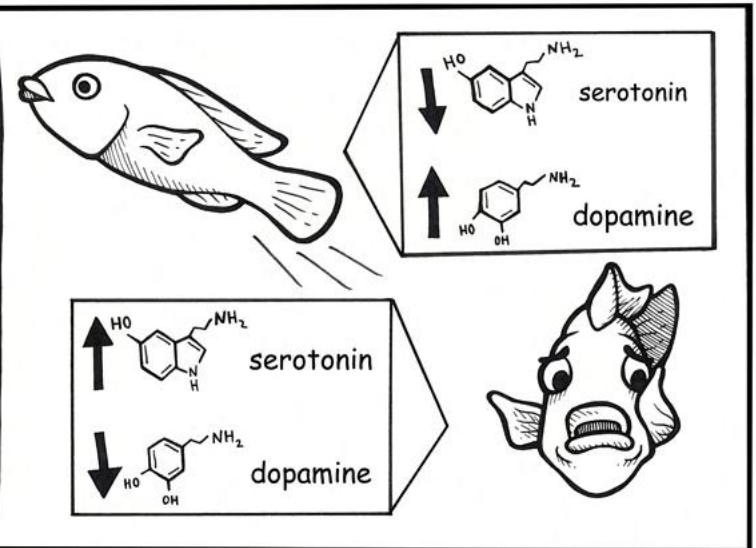
Reactive animals are more 'shy' and do not attempt to escape.



Maybe if I freeze he'll go away.

Depending on which coping strategy a fish uses, the levels of neurotransmitters in the brain differ.

Proactive animals have high levels of dopamine and low levels of serotonin, while reactive animals have high levels of serotonin and low levels of dopamine.



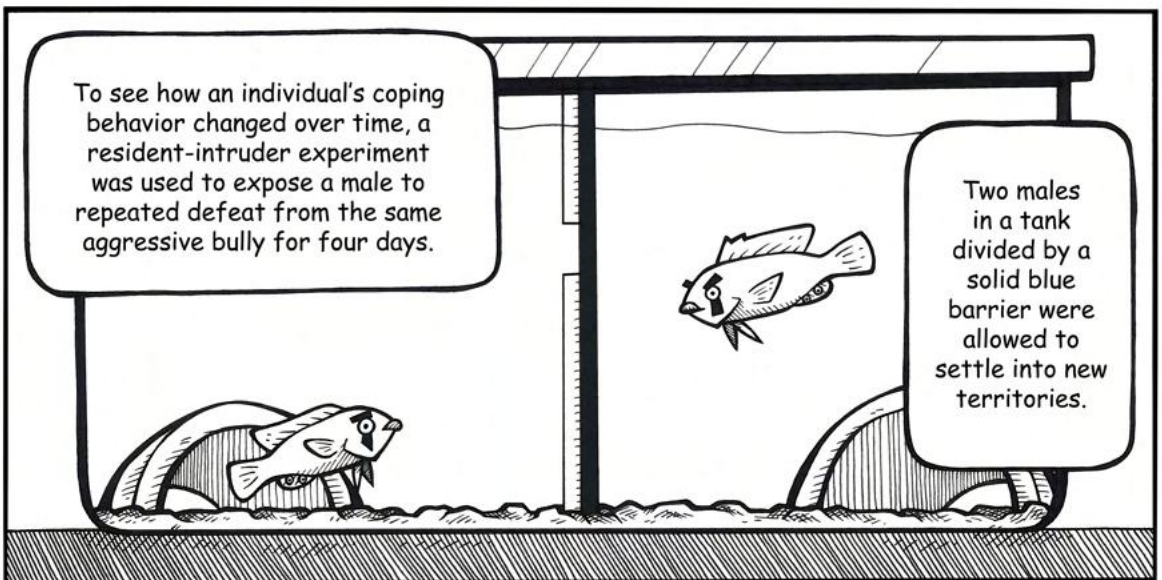
serotonin

dopamine

serotonin

dopamine

To see how an individual's coping behavior changed over time, a resident-intruder experiment was used to expose a male to repeated defeat from the same aggressive bully for four days.

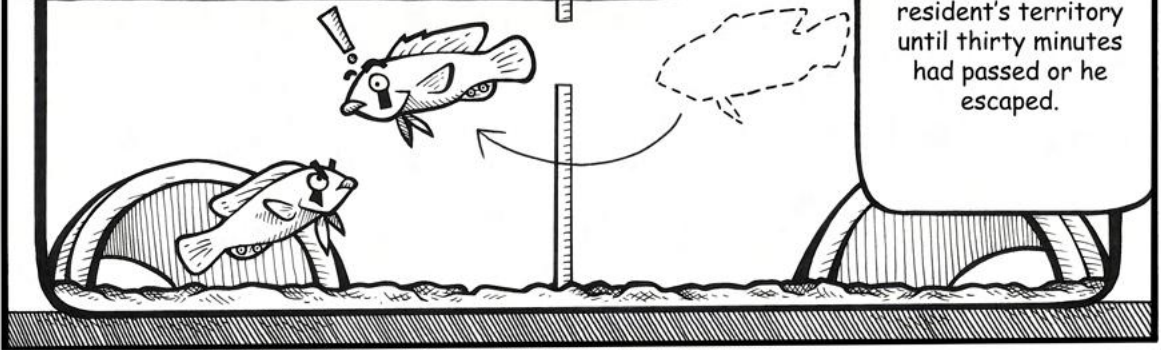


Two males in a tank divided by a solid blue barrier were allowed to settle into new territories.

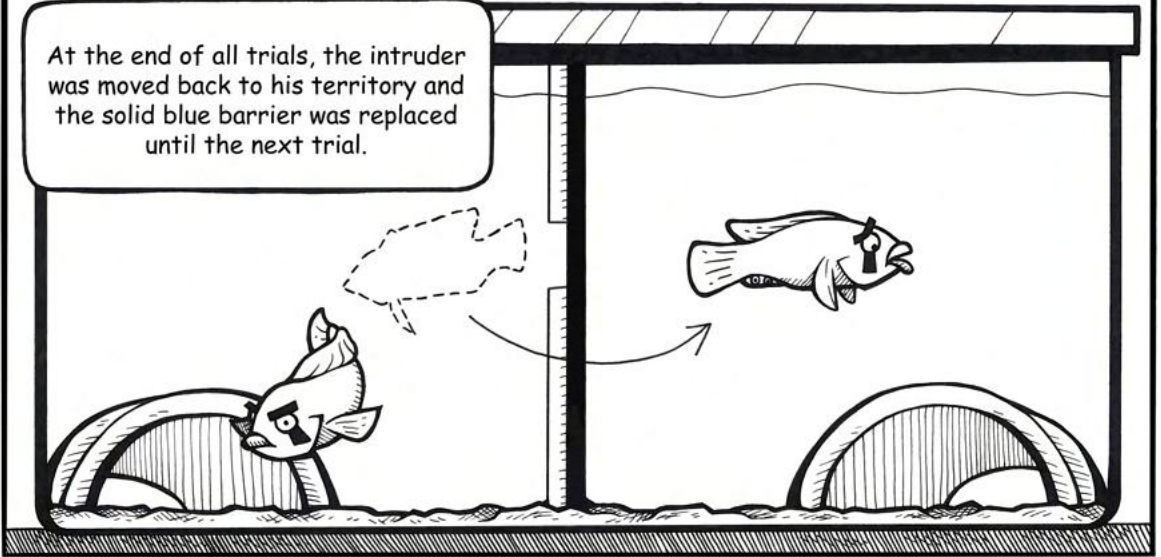


On the first day, the blue barrier was removed and the intruder was moved from his territory and into the very handsome resident's territory, until an hour had passed or he escaped through a small hole.

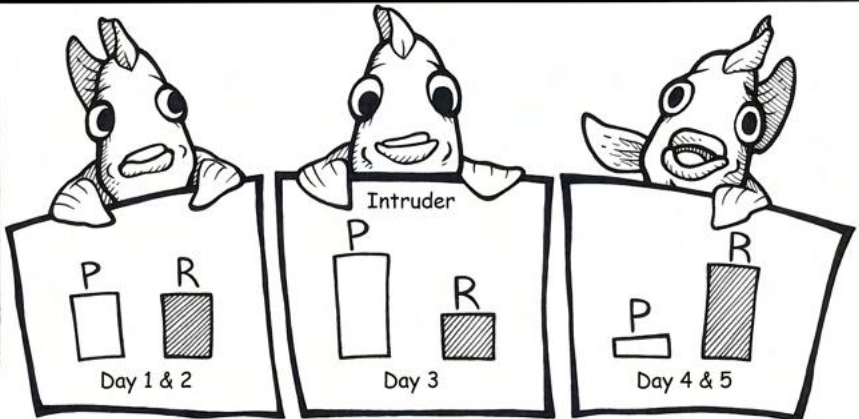
On the remaining days he was moved again into the, again very handsome, resident's territory until thirty minutes had passed or he escaped.



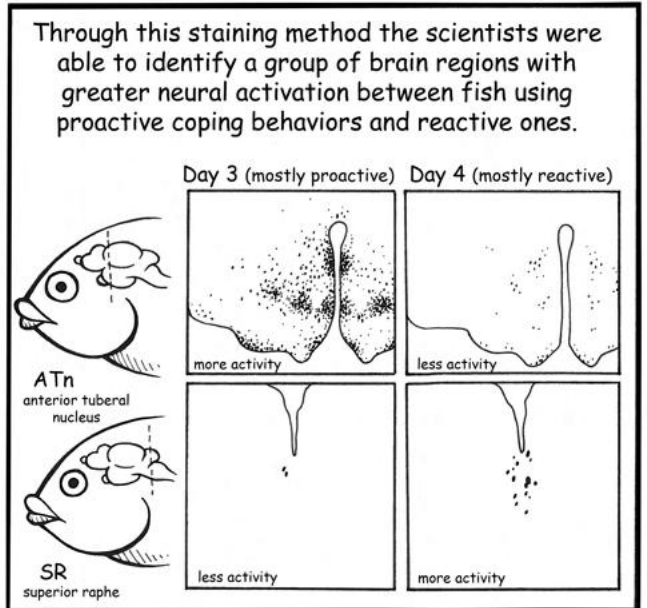
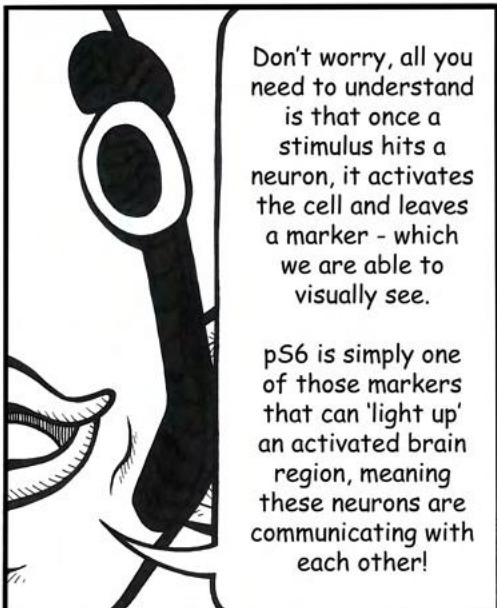
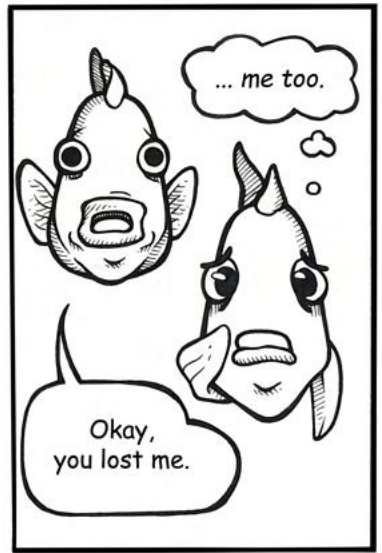
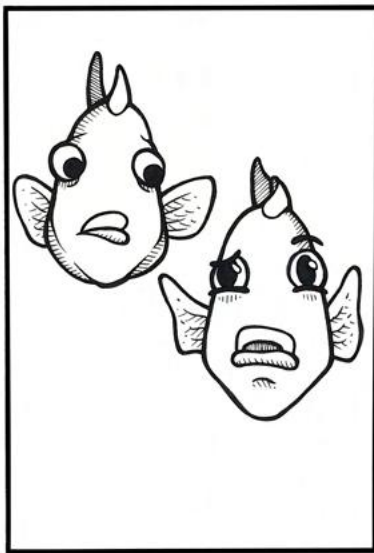
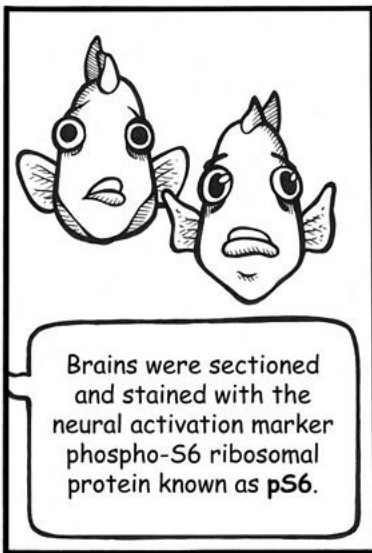
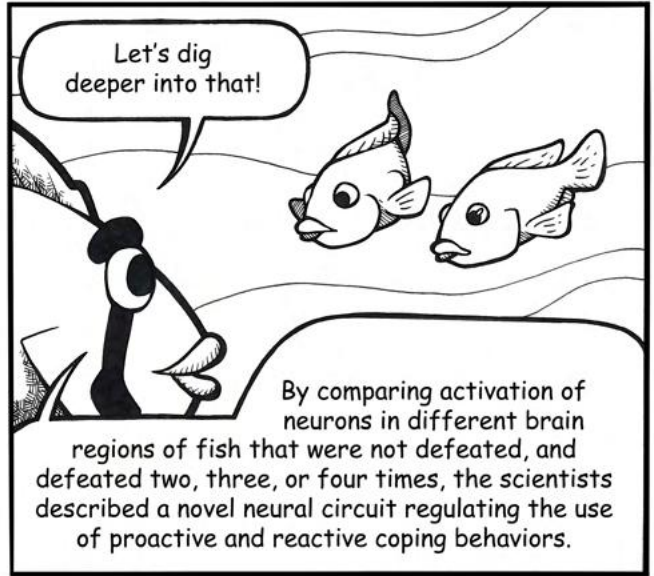
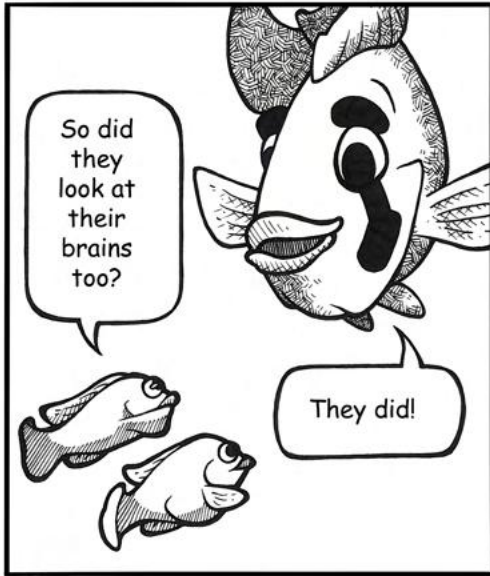
At the end of all trials, the intruder was moved back to his territory and the solid blue barrier was replaced until the next trial.

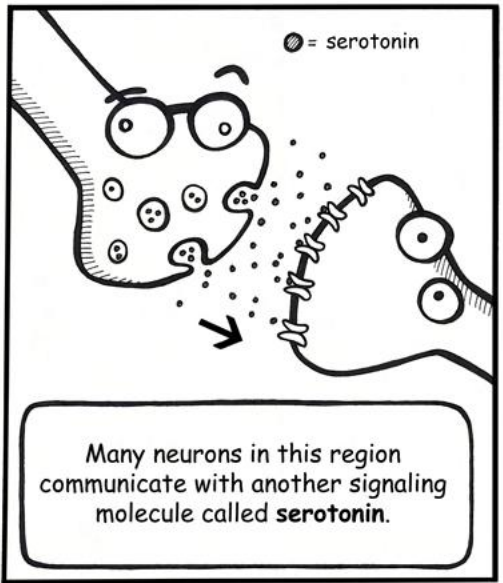
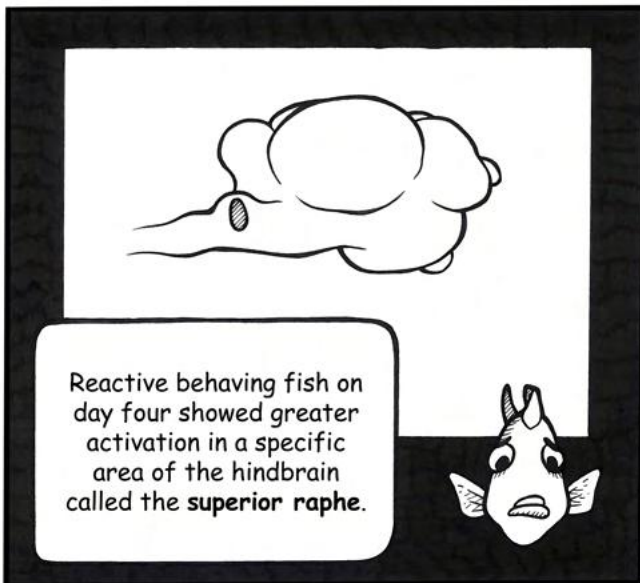
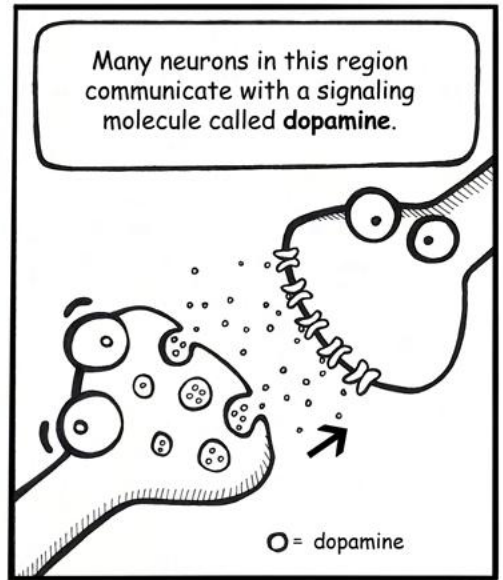


During the first two days, individual fish used both proactive and reactive behaviors while decreasing the use of reactive behaviors during later trials.

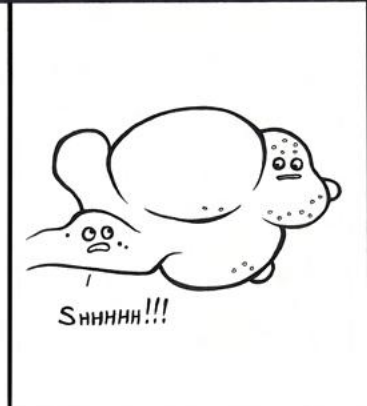


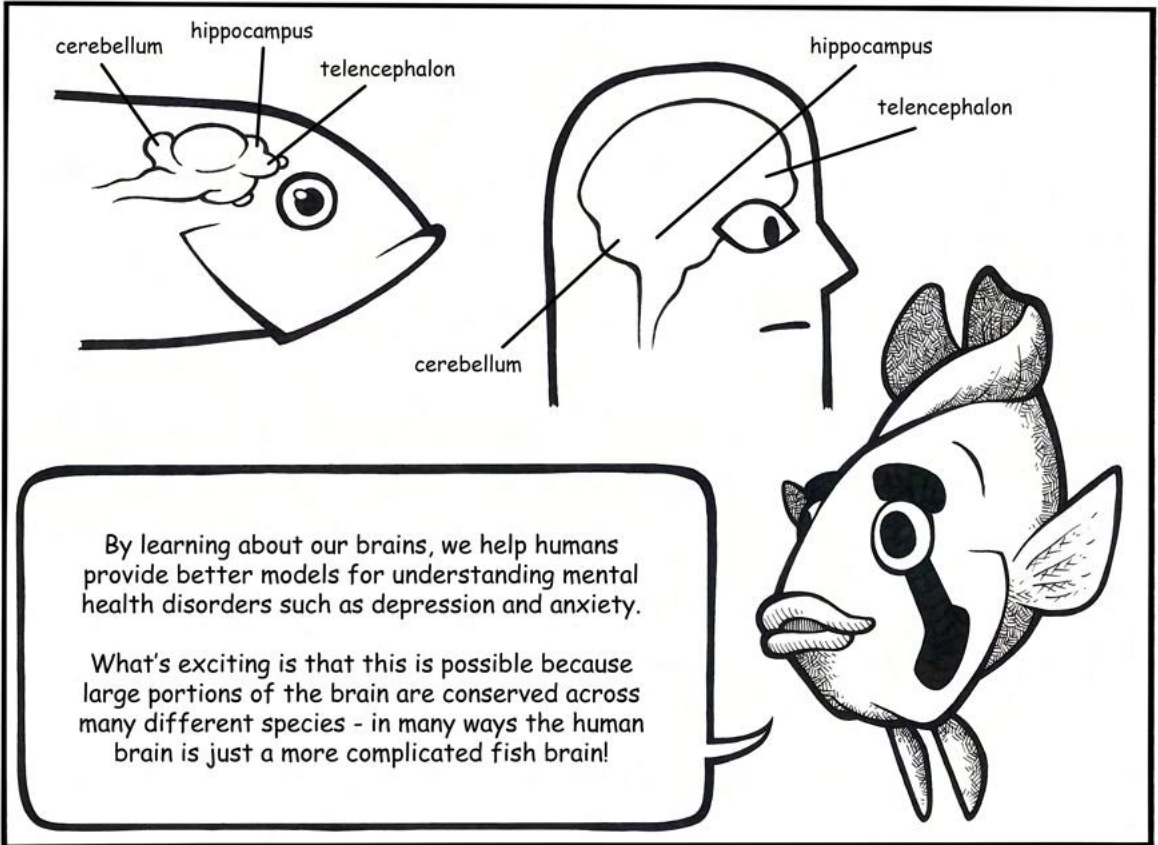
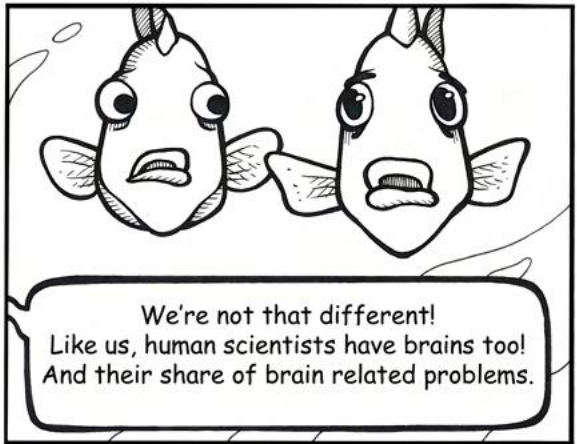
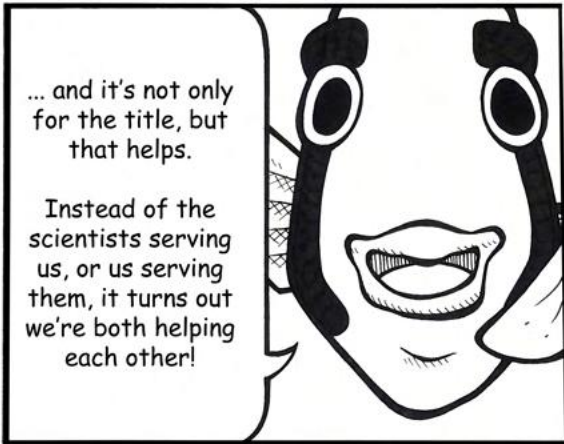
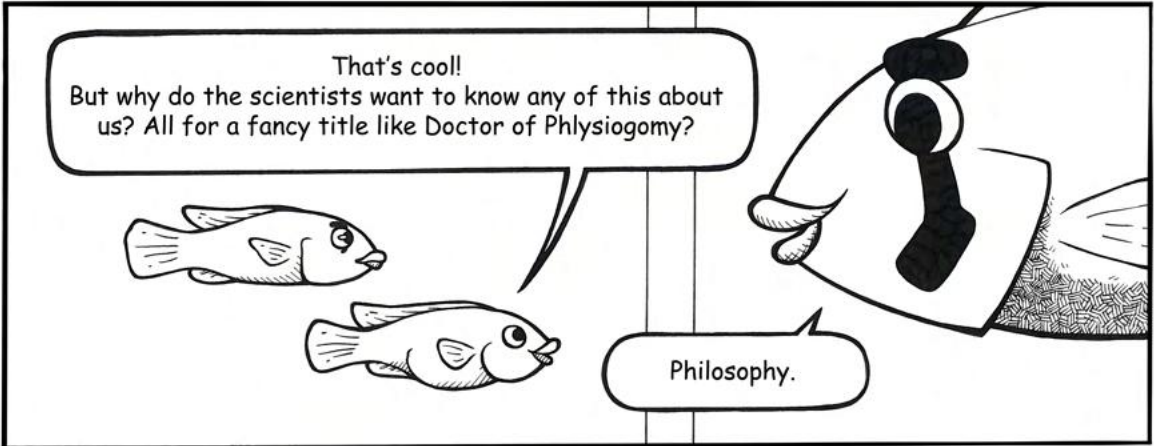
Many fish reached a threshold, most commonly on the third interaction, where their proactive coping behaviors peaked. The subsequent day had a drastic reduction in proactive but increase in reactive behaviors.

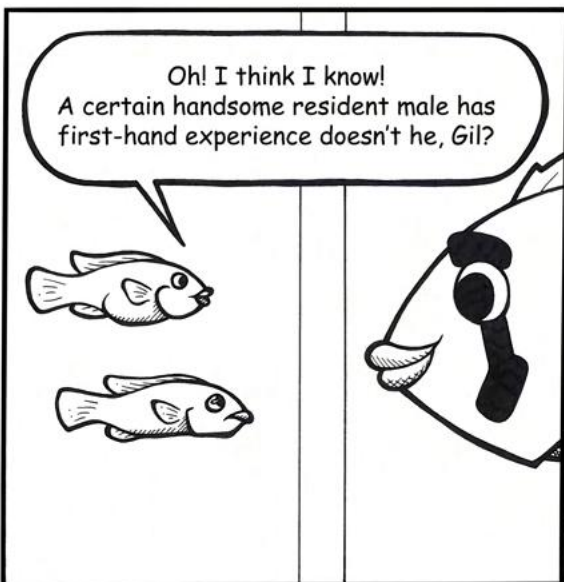
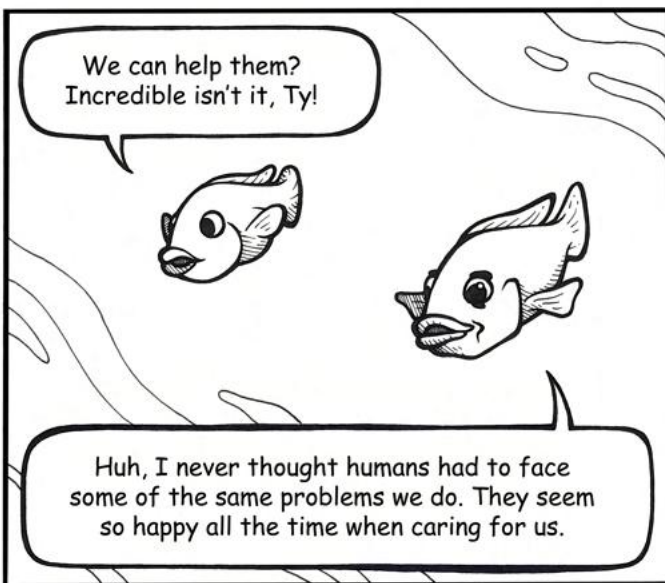
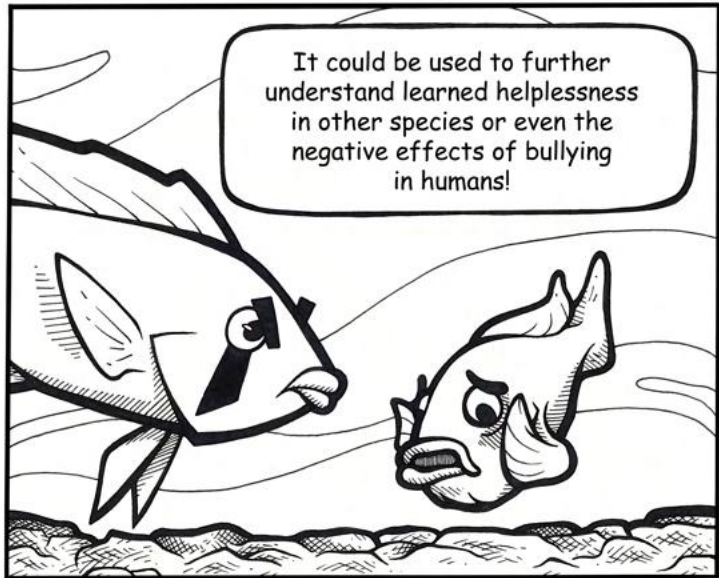
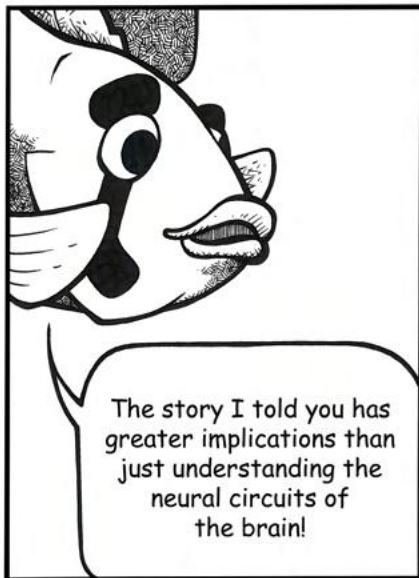


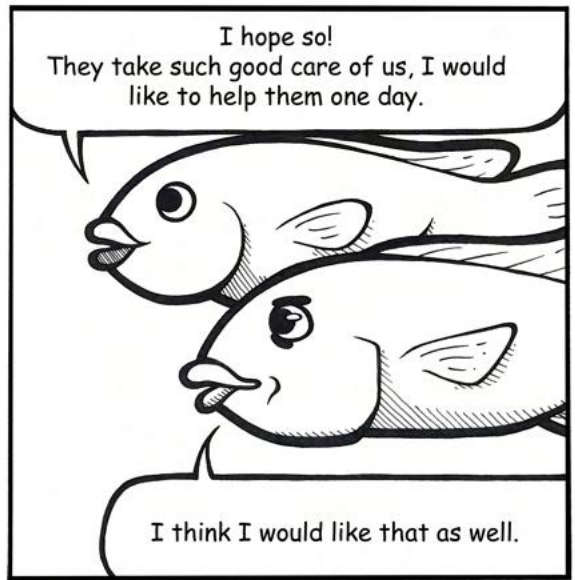
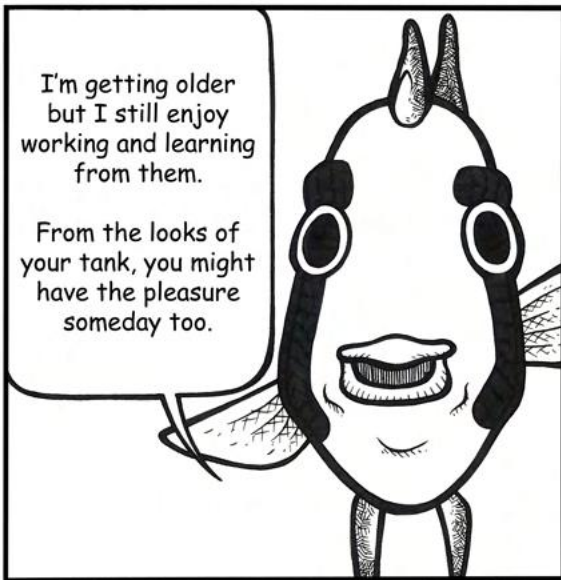


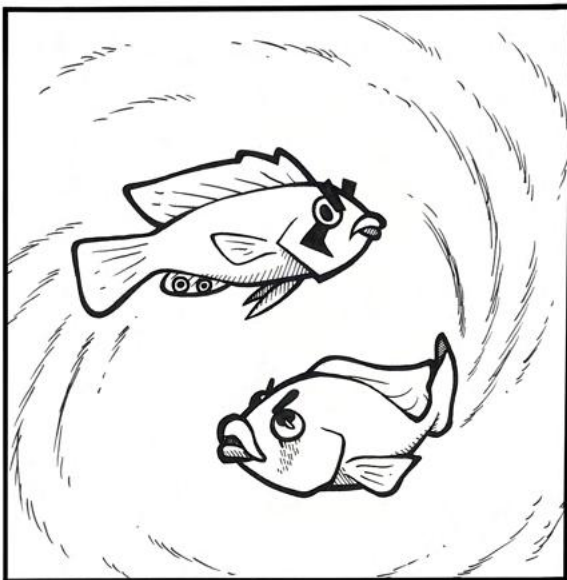
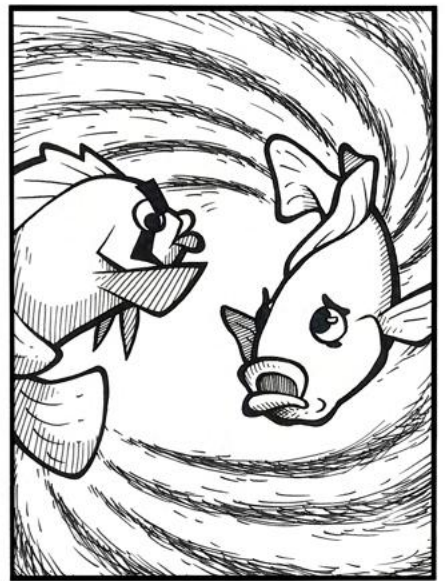
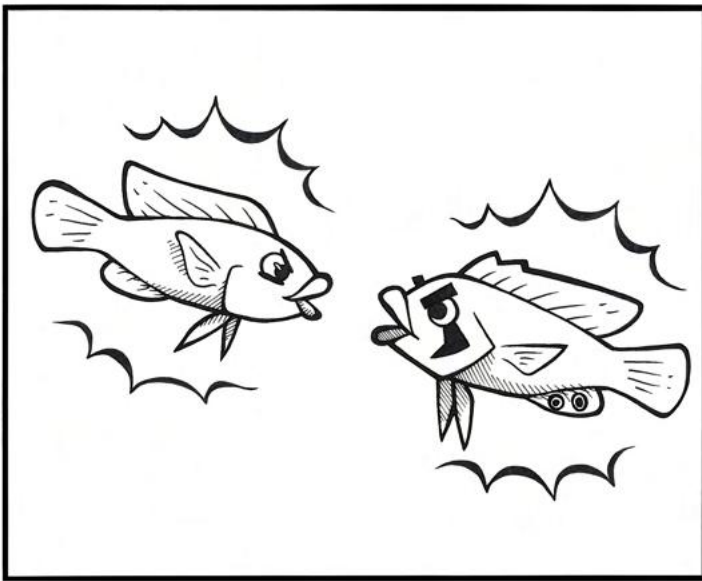
The scientists propose that activation of this superior raphe region of the hindbrain is one of the key mediators regulating proactive vs. reactive coping as an increase in serotonin output may be inhibiting the 'proactive' network of the forebrain.

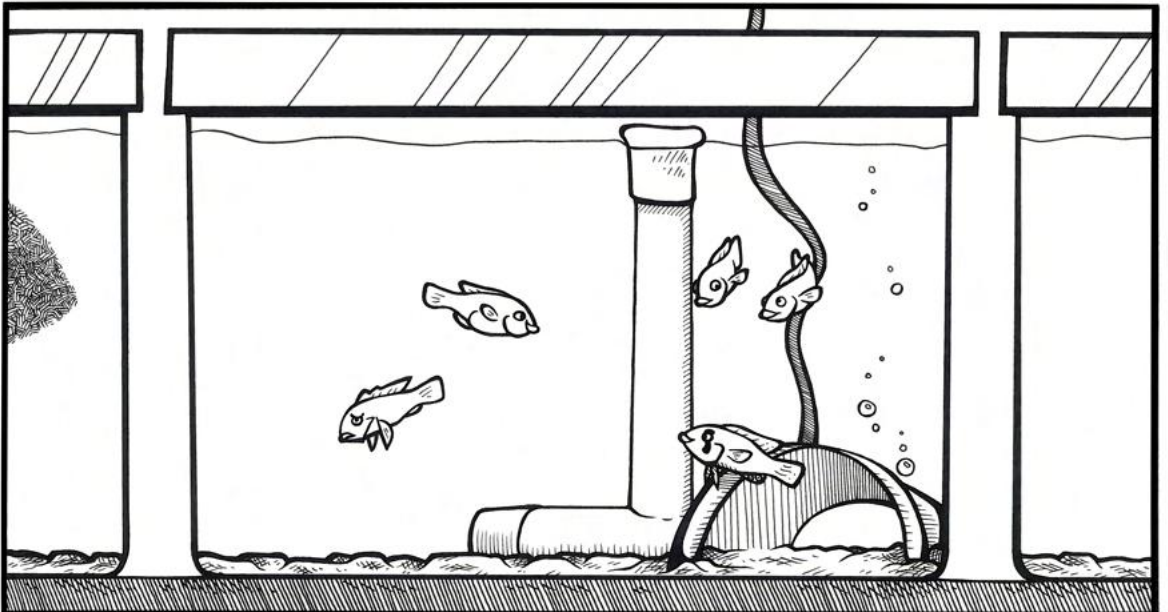
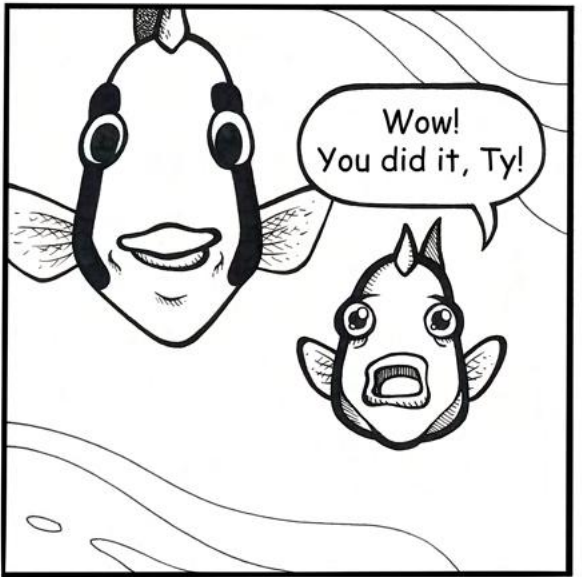
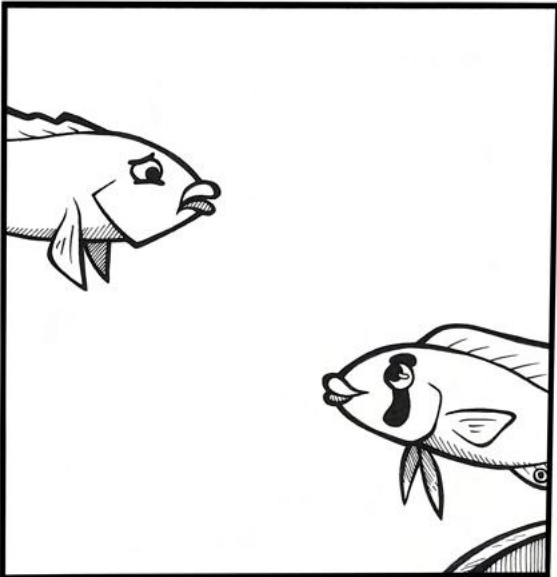
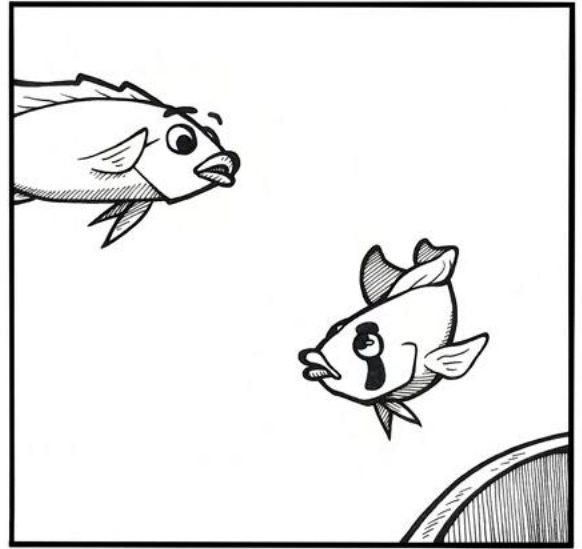
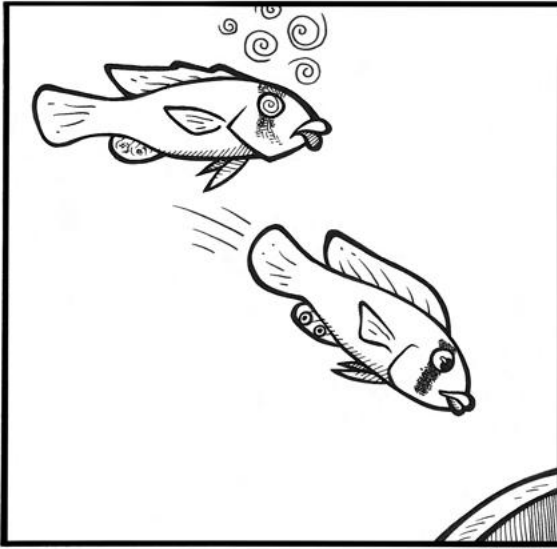




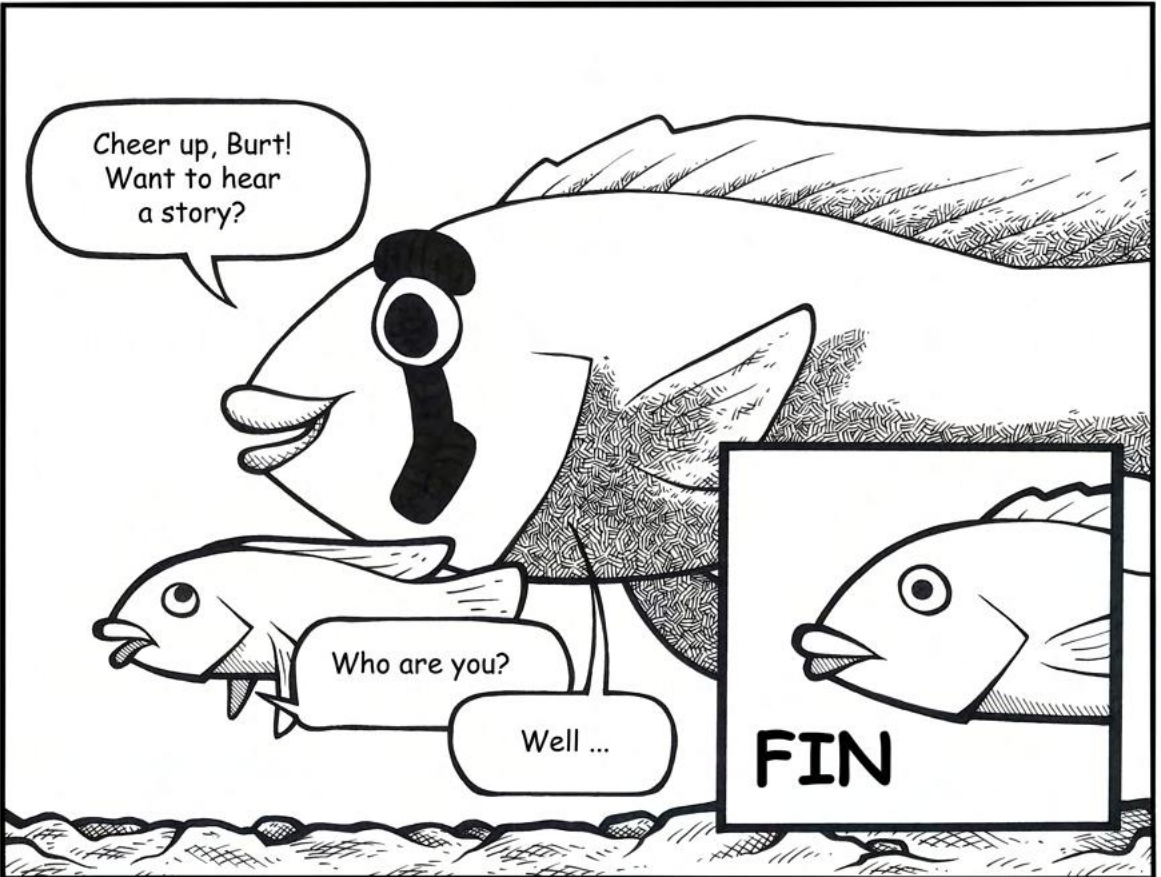
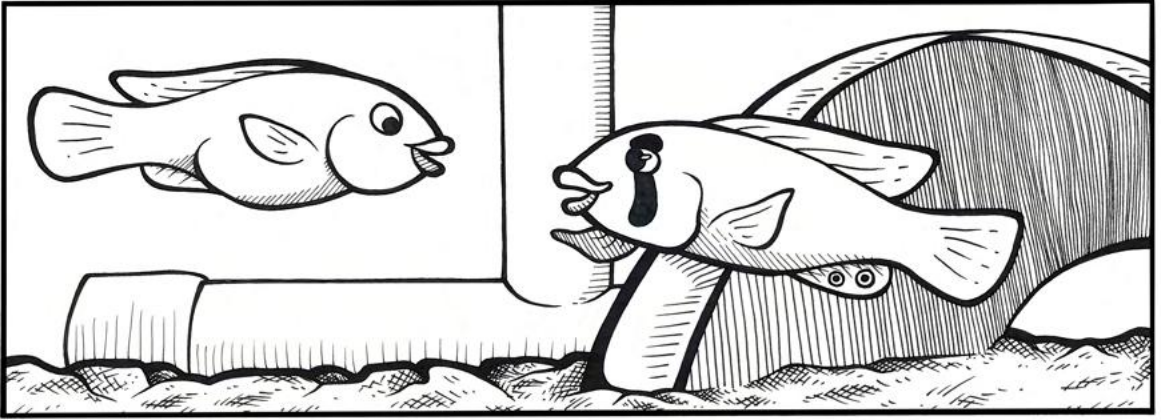




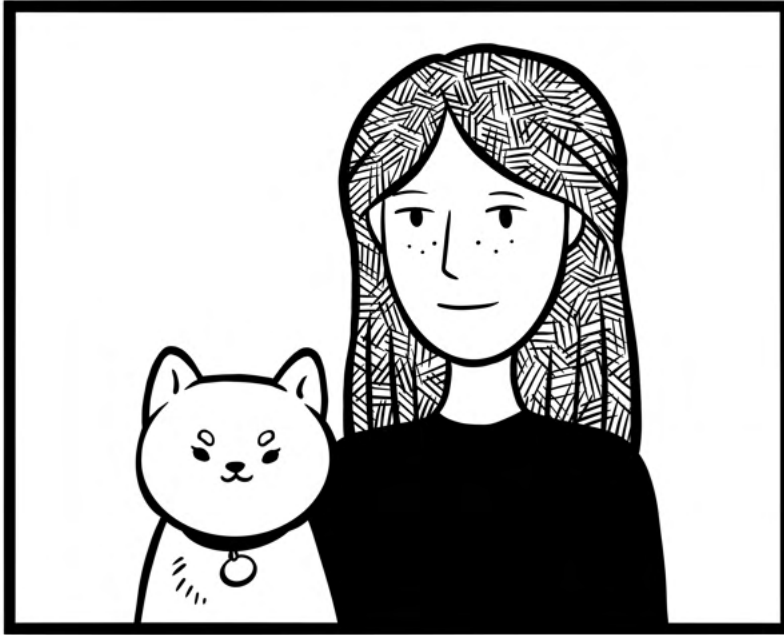








# ABOUT THE AUTHOR



ROSE WAYNE IS A PHD STUDENT IN THE MARUSKA LAB STUDYING THE IMPACTS OF REPEATED SOCIAL DEFEAT STRESS ON THE BRAIN.

DRAWING COMICS BEGAN AS A FORM OF NOTE TAKING AND A TOOL TO BETTER UNDERSTAND THE SCIENCE SHE WAS INTERESTED IN.

THIS COMIC WAS CREATED AS A FUN WAY TO SHARE HER WORK AND THE WORK IN THE MARUSKA LAB TO A WIDE AUDIENCE.

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THANK YOU FOR READING!