Teaching Third Graders About G-Protein Coupled Receptors (GPCR's)

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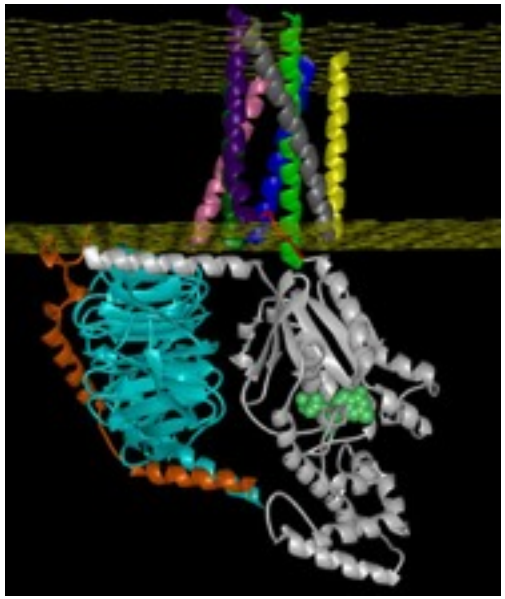
Expanding Minds through Art and Science…

Considering that the earlier students are introduced to a particular subject the more likely they will develop a greater knowledge and understanding of the subject, Elementary School Students represent a uniquely important underrepresented audience to which the physical sciences could be more effectively introduced. Molecules of Life (MoL) teams up college students from the Arts and Sciences to deliver an elementary school curriculum based around specific molecules of life with the intent of encouraging students to think and express their ideas by way of experiments and art projects. Introducing molecules in an enjoyable way, MoL strives to stimulate a basic interest and love of art and science that may be cultivated with age.

GPCR'S

- Membrane Proteins
- Serpentine Receptors
- Target of many medicines



GPCR structure

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Activity #1: what's this smell ?

1) Distribution of ten samples of boxes with hidden contents of various odorous foods and flavors, of which the students were asked to smell and thereby decide what was inside.

2) Comparing their lists with each other and with the revealed unknown food, the students recognized how similar and varied their sense of smells could be contingent on what odor they smelt.

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Activity #2: Interactive Poster

Using an interactive poster, the students did a trip into the nose. With magnified views, the students first recognized the nasal cavity and the tissues of the nasal membranes. They then then peered into the cells of the nasal tissues and arrived eventually at the G-protein coupled receptors (GPCRs) in the cellular membranes.

When the GPCRs come in contact with an odor molecule, it binds to the loops of these proteins at the outside of the cell. Then, the GPCR's seven helices inside the membrane begin to move (to "shake") in a way that releases, from a loop inside the cell, a G-protein, that sends a signal to tell the cell that an odor molecule has been recognized

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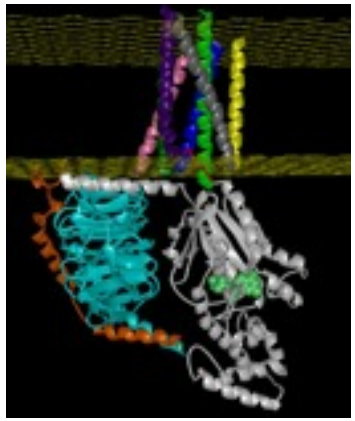
Activity #3: create your own GPCR's mobile

Showing pictures of mobiles designed by their originator Alexander Calder, the students were shown how to sculpt helices and loops from pipe-cleaners and thread them through two styrofoam trays that represent the inner and outer walls of the cell membrane. Exploring protein folding in this fun way, the students placed finally a paper circle, with "G" written on one side and the student's favorite odorous foods on the other side, onto the tail of their serpentine receptor models, to represent their associated G-protein.

Alexander Calder's Mobile



GPCR structure

GPCR'S

Activity #3: create your own GPCR's mobile

The students could build their own models of GPCRs, for hanging in the classroom as mobiles.

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Project Summary

In a 1 hour 15 minutes class, 3rd graders :

- Discovered how their sense of smells could be contingent on what odor they smelt
- Travelled into the nose using an interactive poster and arrived to the GPCRs
- Discussed the relation between the smells and the GPCRs
- Built their own GPCR mobile
- With their GPCR models in hand, they reviewed how molecules bind to the loops outside of the cell, how such binding causes the helices to move inside the membrane and how such movement causes release of the G-protein to send to the inside of the cell a message, that something smells good outside.

Thanks to Molecules of Life, 3rd graders have been introduced early to chemistry through art and scientific activities.

To **learn more** about

GPCR's

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.ca

Special Thanks

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- Volunteers and organizers of MLP events

- **Our sponsors**