3d molecular designs
Transforming Science Learning

3D Models for 3D Instruction: Using Models with Storylines

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Taught for 18 years at Cheyenne Central High School

And after 11 years of using 3D models and attending CBM summer courses, I am now working full-time for this amazing company.

Now, about you…

Workshop Learning Goals

You will be able to:

- Explore the connection between existing, and potential storylines, and 3D models.
- Explain how 3D models can support your students making sense of phenomena.

“The storylines approach includes design principles for engaging students with phenomena and problems to elicit their own questions that teachers, with support of curriculum materials, use to guide the trajectory of their sensemaking.”

“…storylines organize cycles of engaging with phenomena, questions, and sensemaking to incrementally build, test, and revise explanatory models...”

Brian J. Reiser
Northwestern University

coherence

Coherence from the student perspective

A Mouse That Howls

And it is a warrior!

Driving Question Board

Behavior/ecological relationships

Why would a mouse howl?

Does the howl really sound like a wolf howling?

Are these mice only carnivores?

How many scorpions do they eat?

Do scorpions eat the mouse if it dies or is it just protecting itself?

How come it doesn't die from the toxin from eating the scorpion?

Genetics/natural selection & evolution

Does the mouse pass its strength to its offspring?

Why only that species of mouse?

Could these mice breed with other non-immune mice to spread this ability.

Did the mouse become immune because of the scorpion or can the scorpion change its venom?

Toxins and function or nonfunction

How does toxin work?

Does the scorpion toxin kill other things?

Does it matter if they get stung many times like is it an amount dependent thing?

Does the toxin kill cells?

What exactly does the sting do to the mouse?

why doesn't the mouse die?

Does the mouses body have anitbodies or an immune system against the venom?

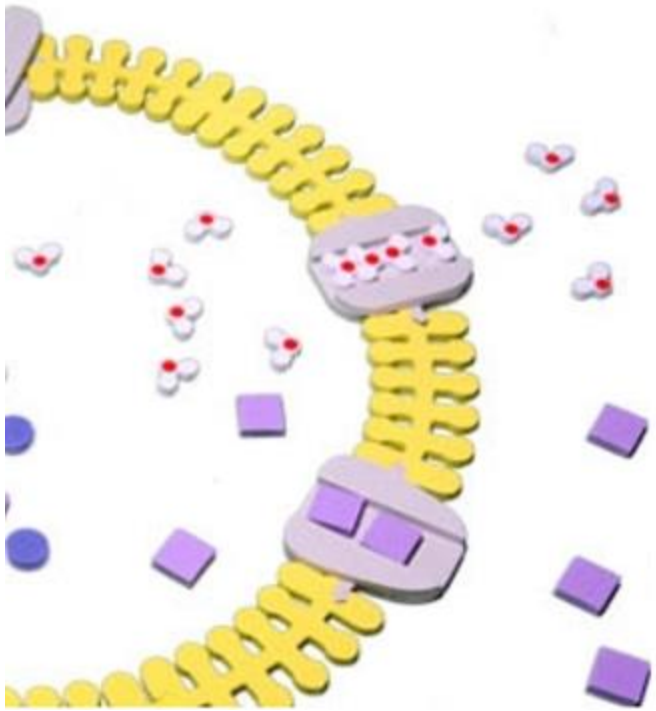
is the sting painful to the mouse?

Why doesn't the scorpion toxin affect the scorpion too?

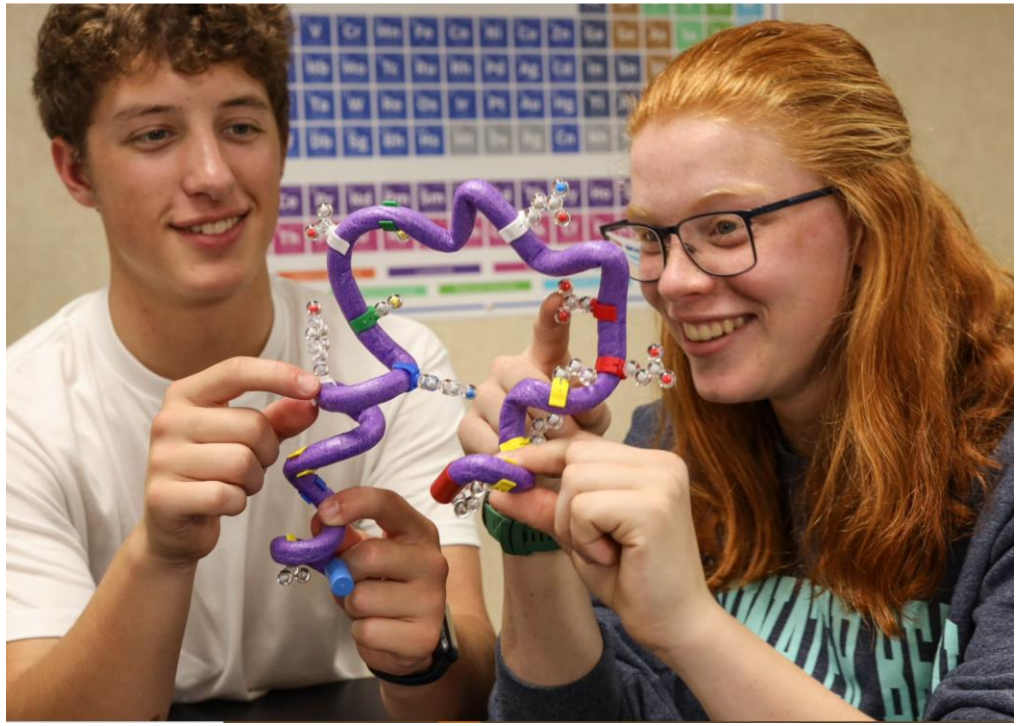
Is toxin the same thing as venom?

How can grasshopper mice take on scorpions, but other mice species can’t, and does it matter?
Why does the venom work on some species and not others?

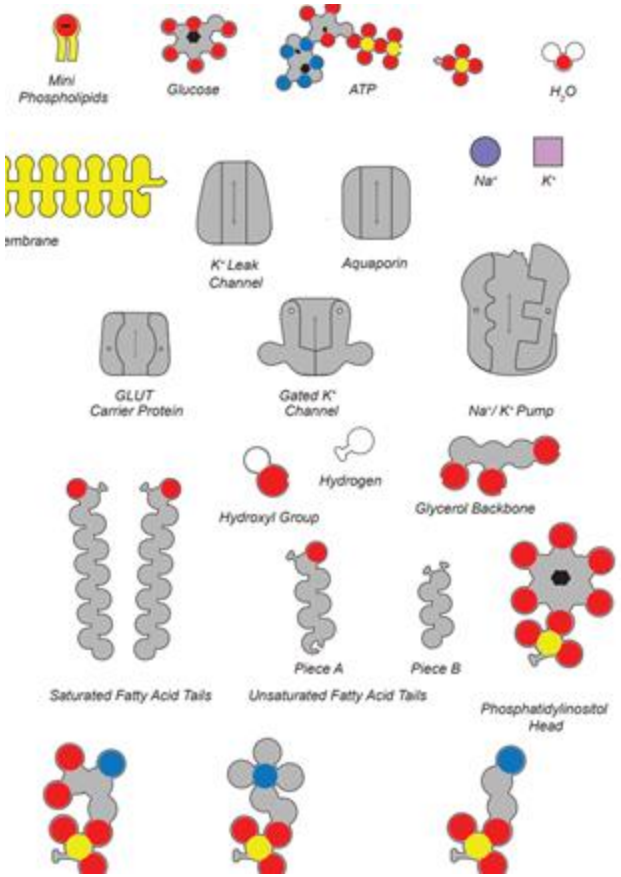
Phospholipid & Membrane Transport Kit

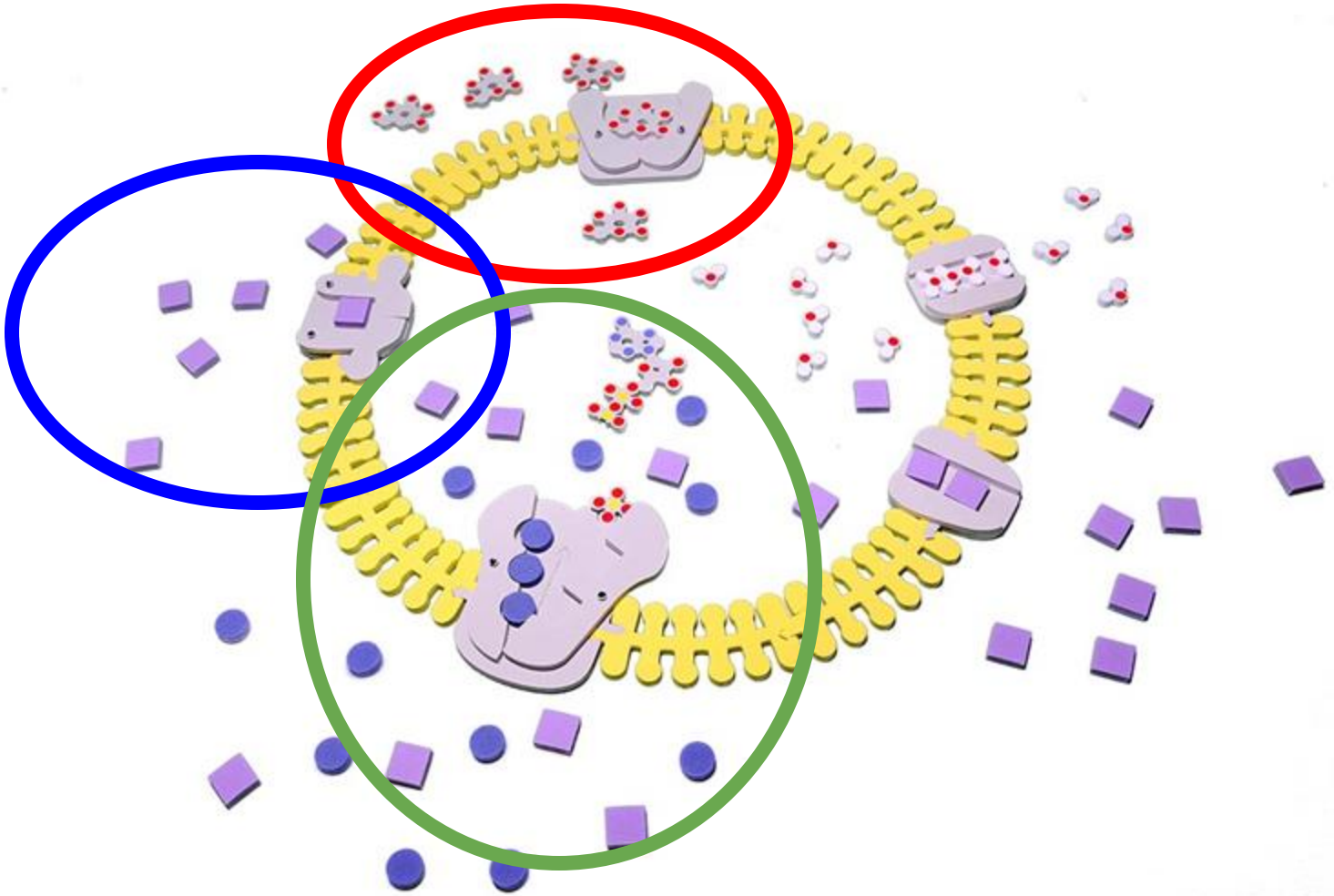


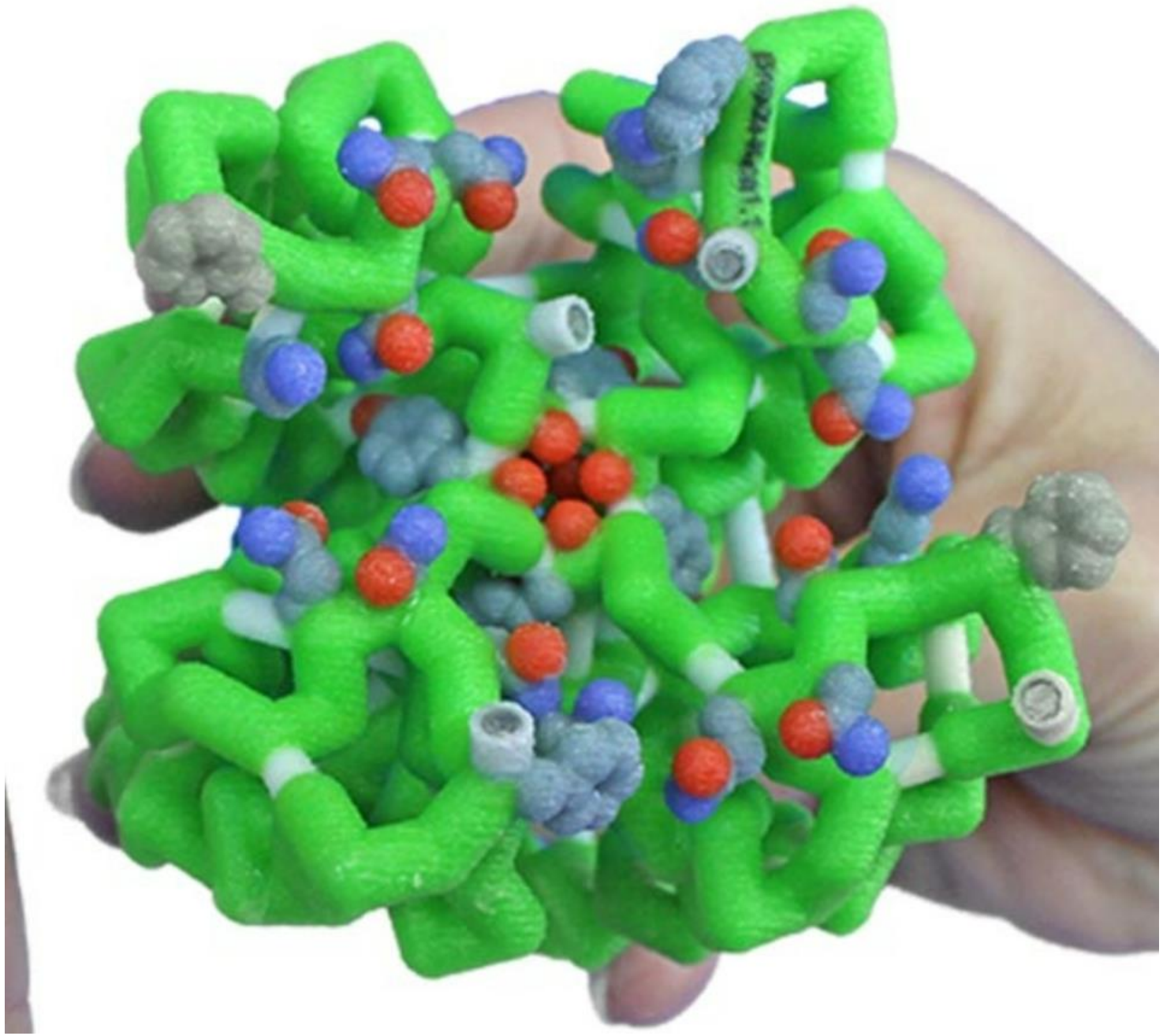
Amino Acid Starter Kit

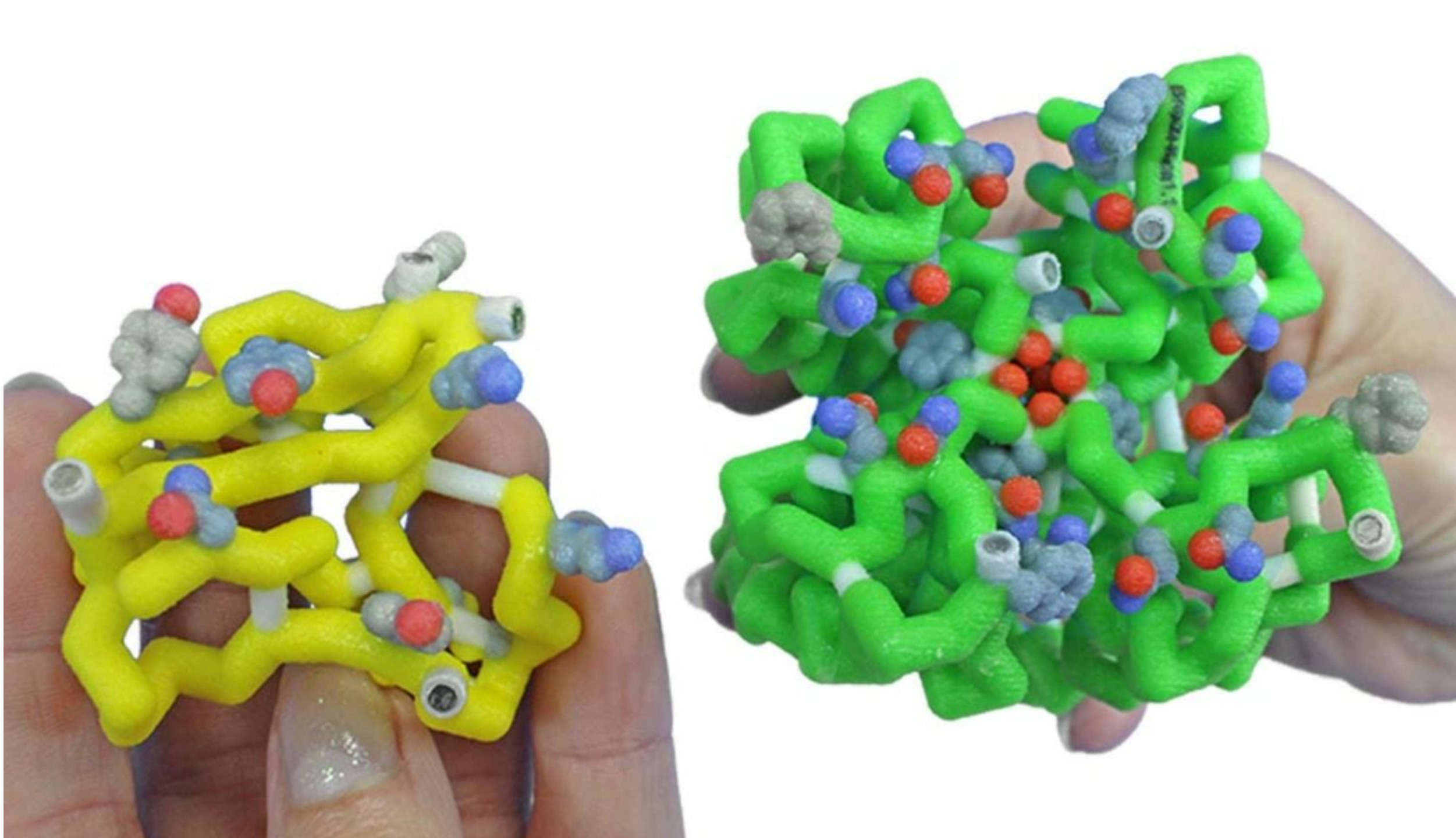


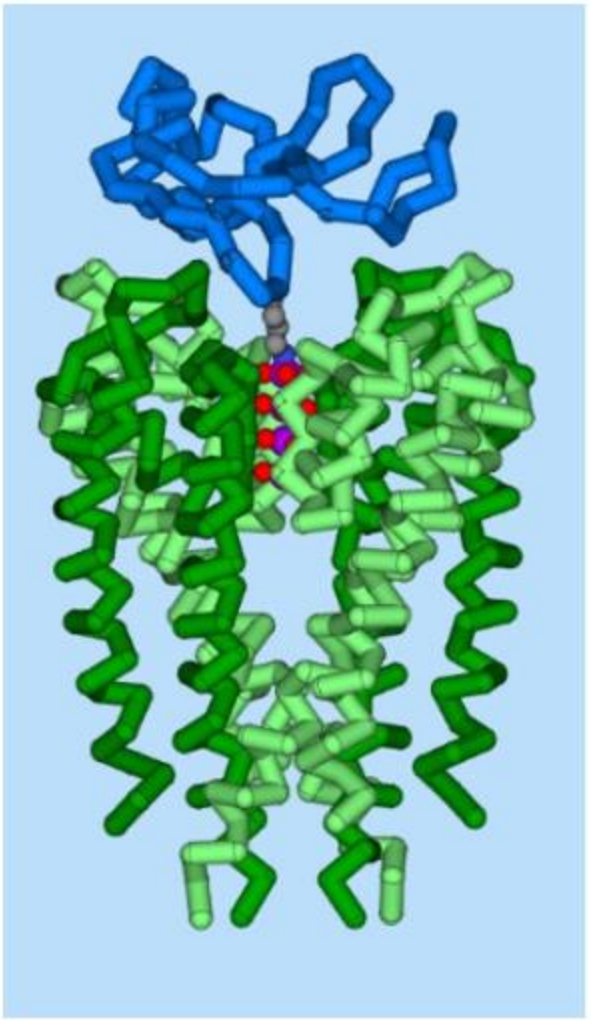
The aquaporin shows us passive transport but active transport can also be shown.

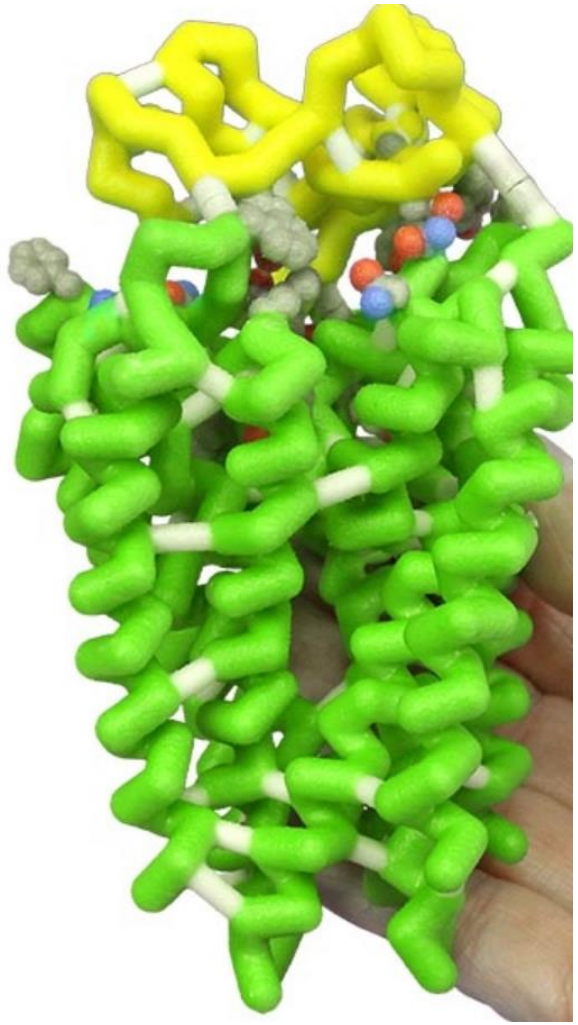


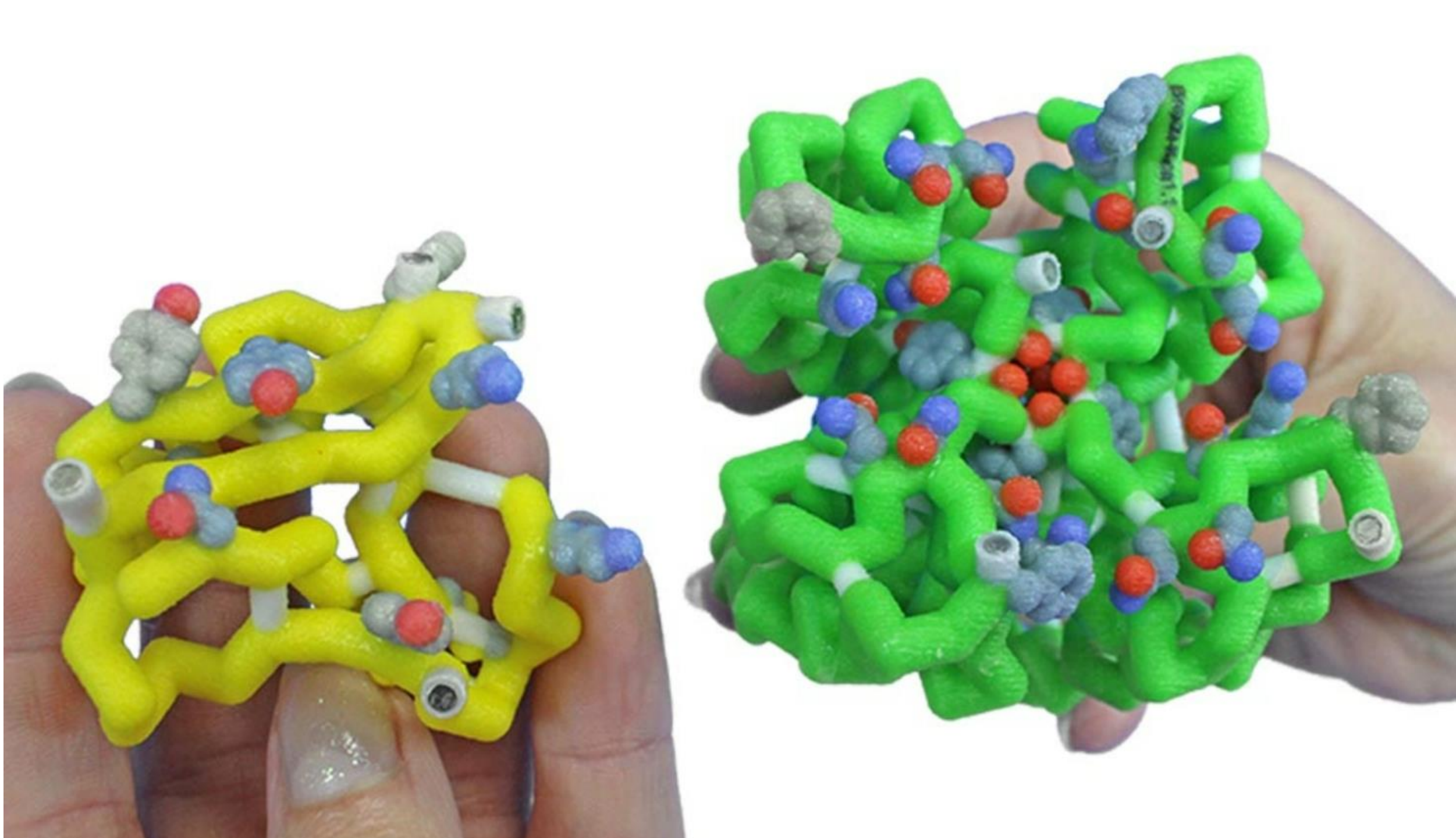


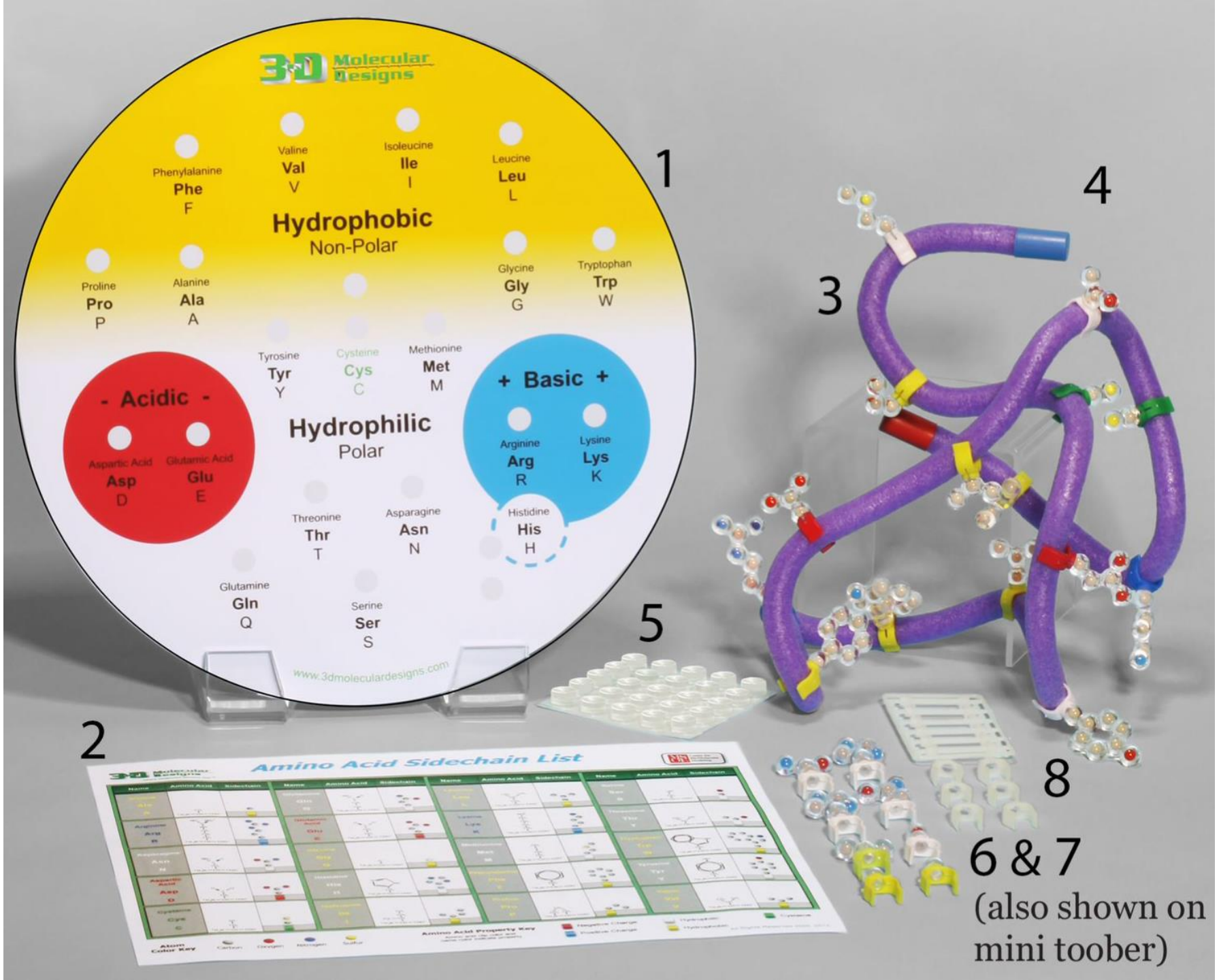










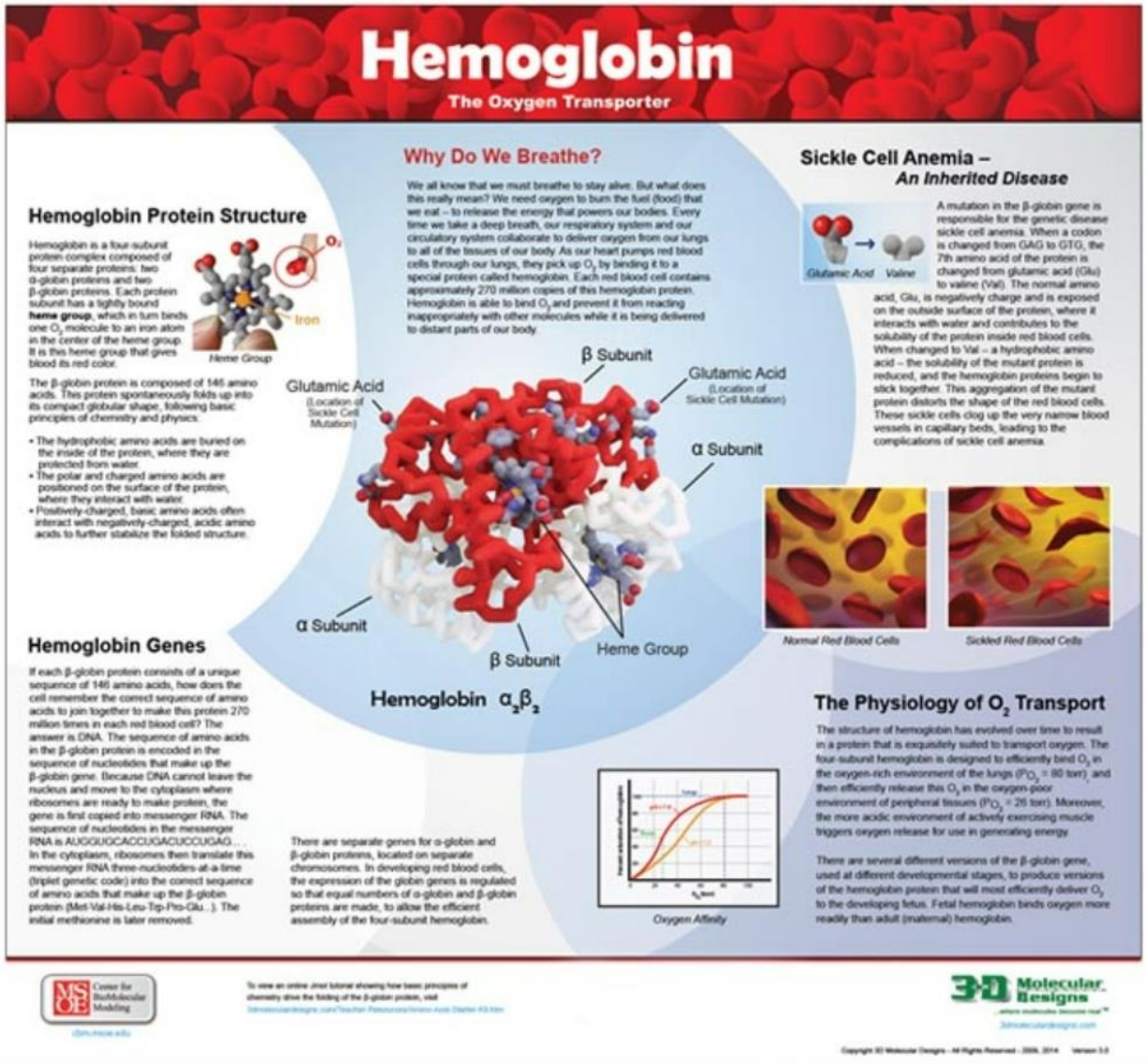

3D Molecular Designs
Hydrophobic
Non-Polar
Phenylalanine Phe F
Valine Val V
Isoleucine Ile I
Leucine Leu L
Proline Pro P
Alanine Ala A
Glycine Gly G
Tryptophan Trp W
Hydrophilic
Polar
Tyrosine Tyr Y
Cysteine Cys C
Methionine Met M
- Acidic -
Aspartic Acid Asp D
Glutamic Acid Glu E
+ Basic +
Arginine Arg R
Lysine Lys K
Histidine His H
Threonine Thr T
Asparagine Asn N
Glutamine Gln Q
Serine Ser S
www.3dmoleculardesigns.com
Amino Acid Sidechain List
1
2
3
4
5
8
6 & 7
(also shown on mini toober)

Voltage-Gated Sodium Channel in Grasshopper Mice Defends Against Bark Scorpion Toxin | Science

The scorpion toxin and the potassium channel - PMC (nih.gov)

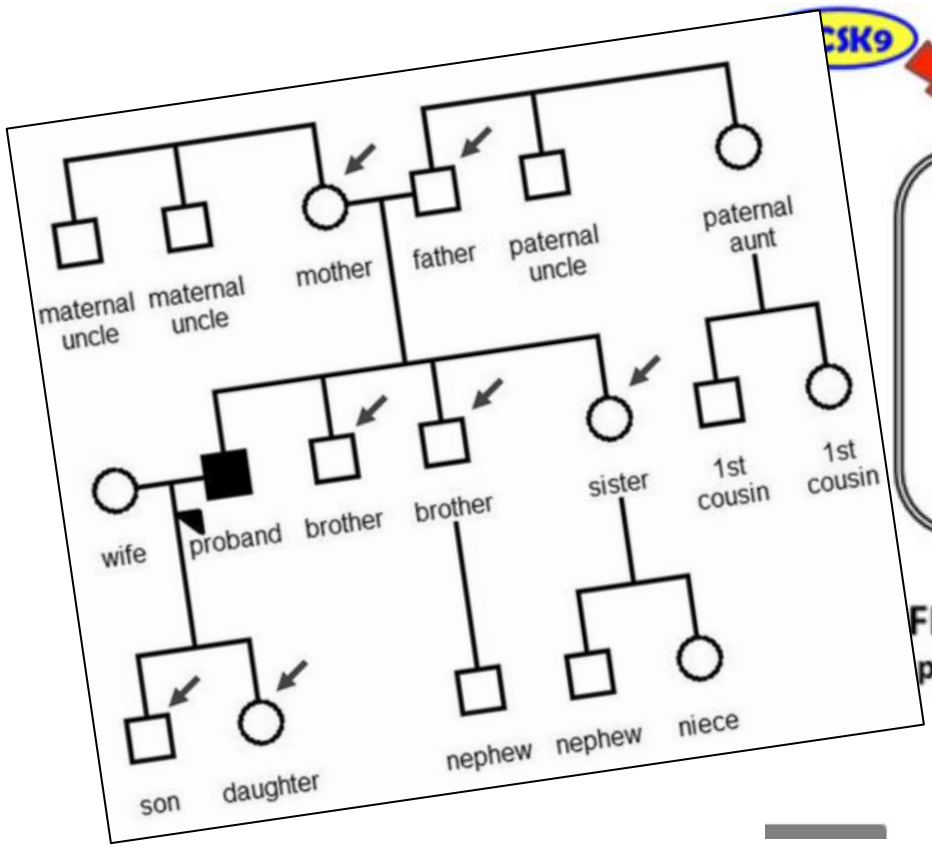
Toxins | Free Full-Text | Scorpion Toxins Specific for Potassium (K+) Channels: A Historical Overview of Peptide Bioengineering | HTML (mdpi.com)

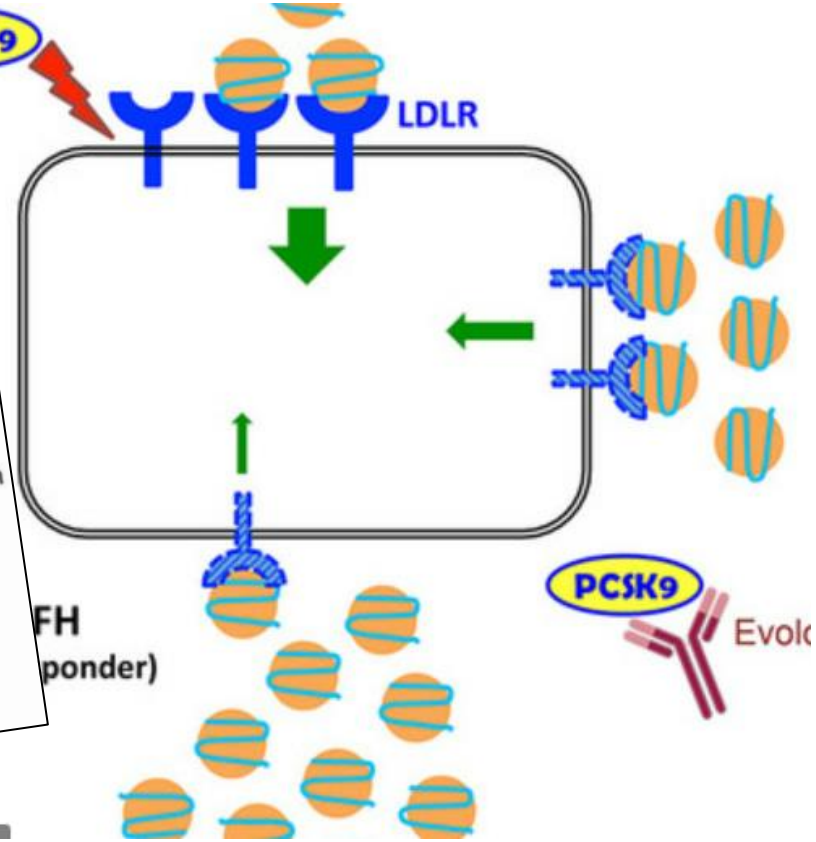
What stories could your students investigate with these models?



Sickle Cell Anemia

Heart Disease



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- Students make sense by investigating phenomena that reveals student understanding of all three dimensions of the NGSS.
- Students explicitly use the practices (SEPs) and cross cutting concepts (CCCs) to figure out the disciplinary core ideas (DCIs) to make their own sense of the phenomenon.
- Teachers use tasks that invite students to explain the phenomenon and reveal the students understanding or proficiency in all three dimensions.

(adapted from BSCS & NGSS Framework)