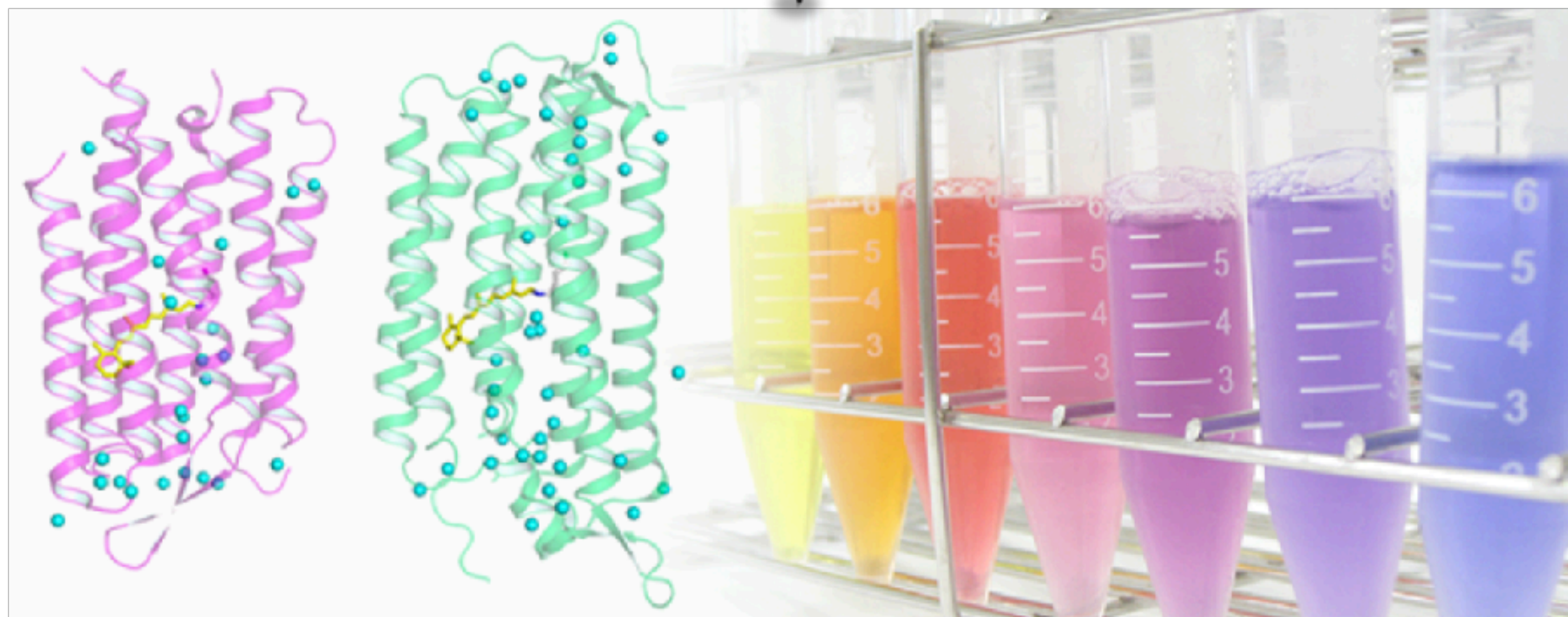


Theoretical and Experimental Modeling of Light-responsive Proteins in the Era of Optogenetics

Dr. María del Carmen Marín Pérez
JSPS Postdoctoral Fellow

The Institute for Solid State Physics
The University of Tokyo
Japan



@LabInoue (INOUE Ia. (ISSP, The Univ. Tokyo))

Presentation Roadmap (プレゼンテーションロードマップ)

**Who am I?
(私は誰?)**

Personally

Professionally

**Where do I come from?
(どこから来たの?)**

**Why did I become a scientist?
(なぜ私は科学者になったのですか?)**

Motivations

Why Science and not other discipline?

**Let's talk about Science!
(科学について話しましょう!)**

Self Introduction (自己紹介)

Who am I? (私は誰?)

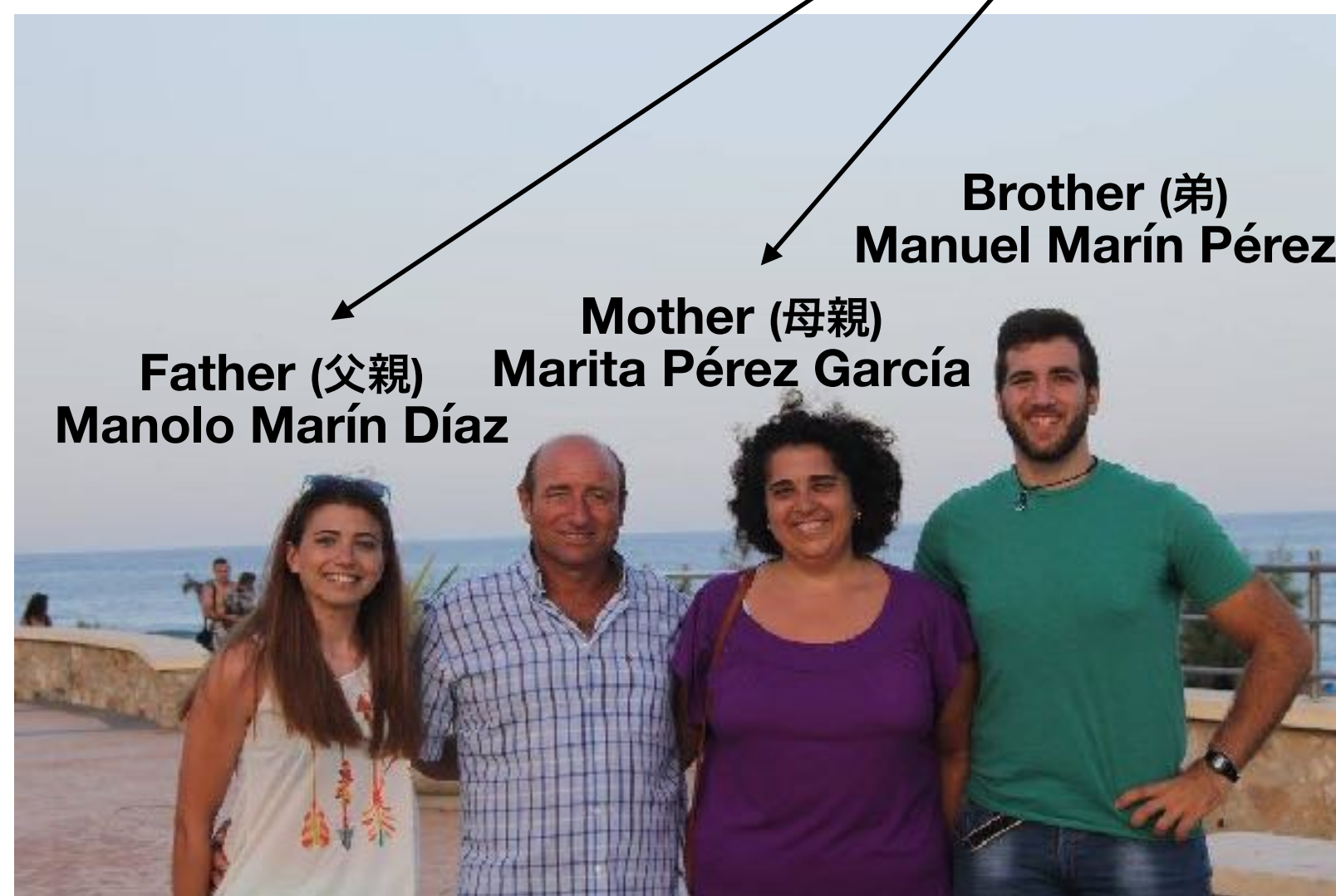


Hola!

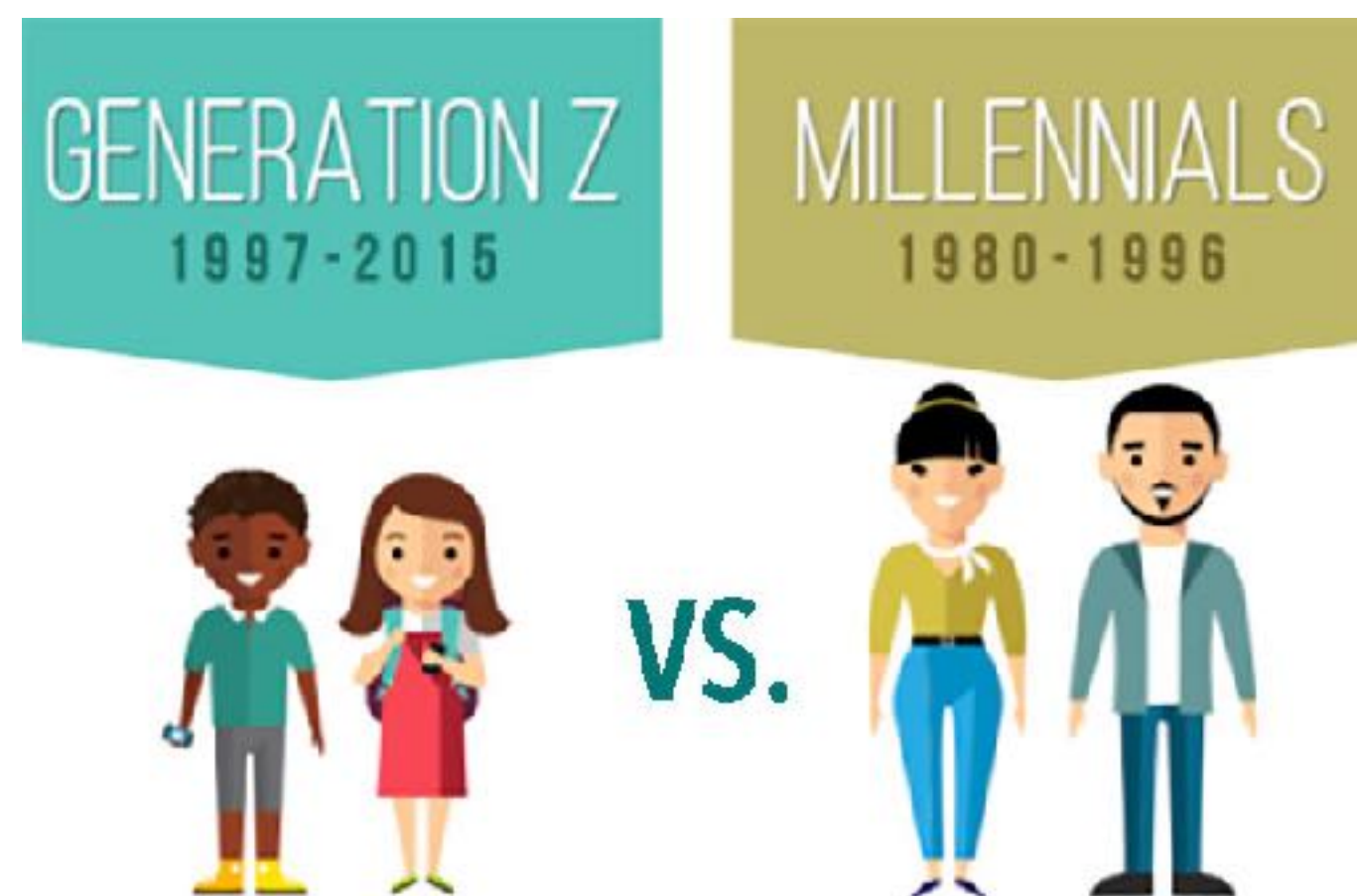
I was born in Quesada (Spain) on the November 9th, 1992 (29 years ago)



Dr. María del Carmen Marín Pérez



Marín Pérez Family



- @MaicaMarinPerez
- maricarmen.marin
- Maica Marín

Self Introduction (自己紹介)

Who am I? (私は誰?)

- In my village Quesada, we have a lot of tourist attractions:



Source of the Guadalquivir river



Watchtower of Infante Don Enrique



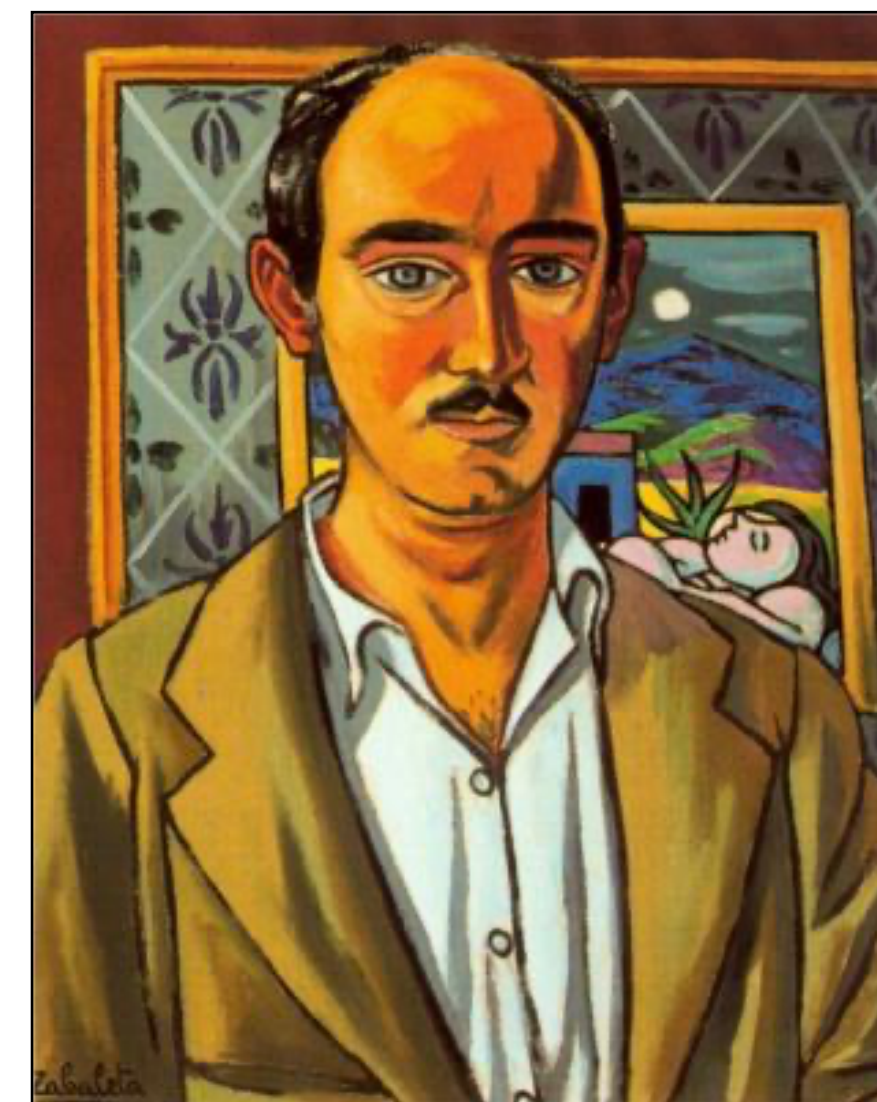
Museum of contemporary painting
Rafael Zabaleta



Water cave (Tíscar)



Quesada street



Rafael Zabaleta (painter)



Self Introduction (自己紹介)

Who am I? (私は誰?)

- But the most important attraction is: **THE OLIVE OIL**



Self Introduction (自己紹介)

Who am I? (私は誰?) Personally...

I am a professional Rugby player



Husband (夫)
Nésar Viera Martínez



Brother (弟)
Manuel Marín Pérez

I love Photography & Friends



I love Travel



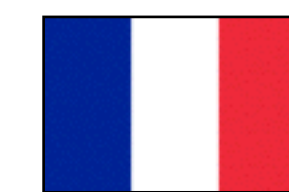
Meet new people and learn new languages!



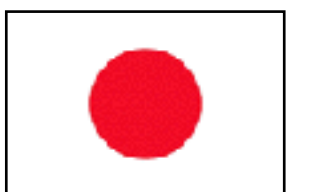
English



Italian



French



Japanese

Self Introduction (自己紹介)

Who am I? (私は誰?) Professionally...

I studied CHEMISTRY at the University of Jaén (Spain) (2010-2014)



I performed my Ph.D. course (Doctor of Pharmacy and Chemical Sciences) at the University of Siena (Italy) (2015-2019, Prof. Olivucci's research group)



Then, I did a MASTER course at the University of Alcalá (Spain) (2014-2015)

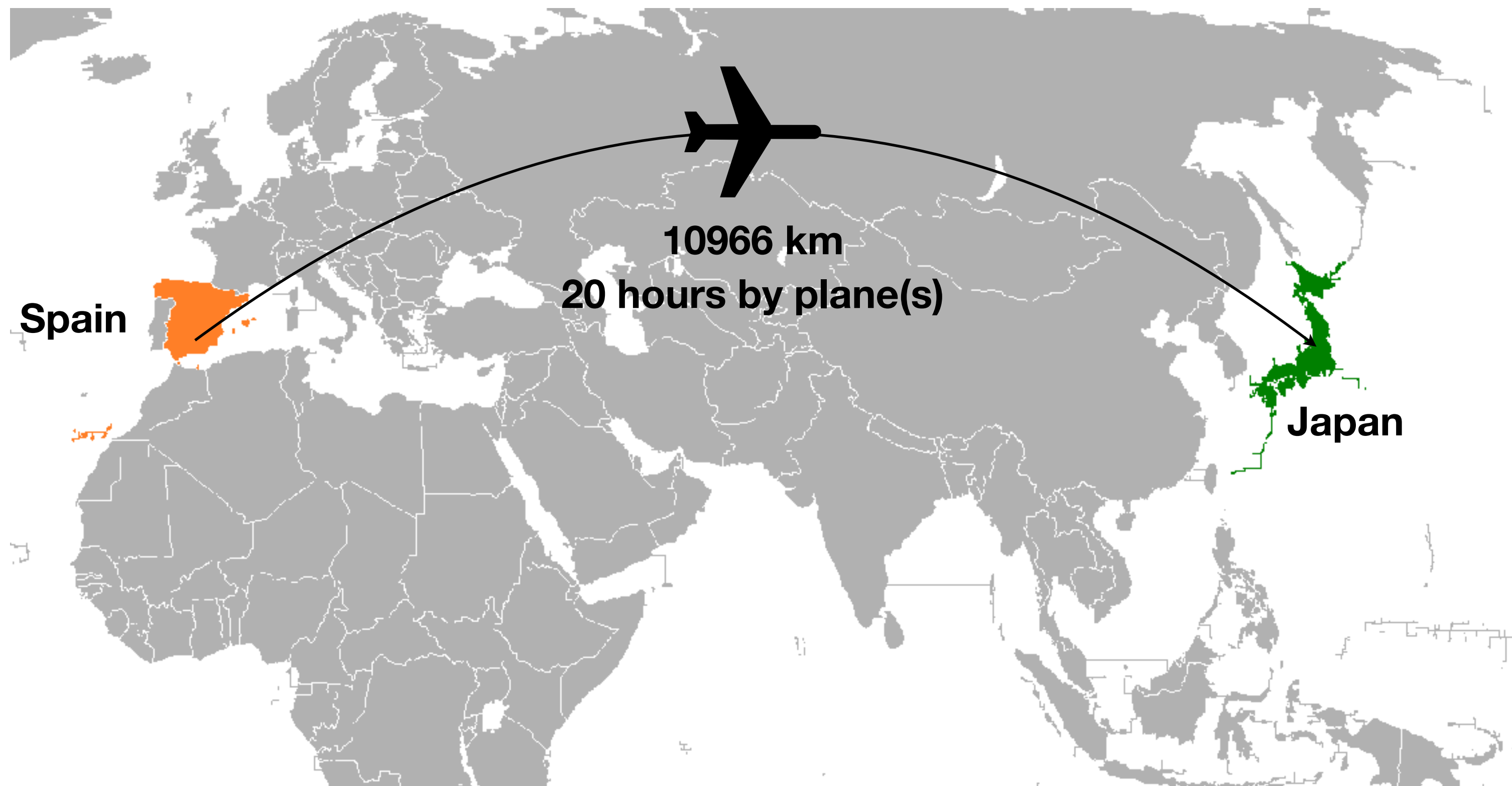


Since last November 2020, I am doing a postdoctoral state at the ISSP at the University of Tokyo thanks to the JSPS Fellowship program (2020-2022, Prof. Inoue's research group)



What do you know about Spain? (スペインについて何を知っていますか?)

Where do I come from? (どこから来たの?)



Jaén is one of the province of Andalusia region

What do you know about Spain? (スペインについて何を知っていますか?)

Where do I come from? (どこから来たの?)



-VS-



Biggest Area? (最大のエリア?)

Spain (505 990 km²) Japan (377 972 km²)

Population (人口)

Spain (126 919 659 people) Japan (46 423 064 people)

Density (人口密度)

Spain (92 per km²) Japan (336 per km²)

Language (言語)

Spain (Spanish) Japan (Japanese)

Life Expectancy (平均寿命)

Spain (82.3, 9th overall rank) Japan (83.7, 1st overall rank)

Biggest City? (最大の都市?)

Spain (Madrid, 3 165 235 people) Japan (Tokyo, 8 949 447 people)

Highest Mountain (一番高い山?)

Spain (Teide, 3718 m) Japan (Fuji-san, 3 775 m)

Drives on the... (車は...)

Spain (Right) Japan (Left)

What do you know about Spain? (スペインについて何を知っていますか?)

Where do I come from? (どこから来たの?)

Emblematic Cities



Alhambra (Granada)



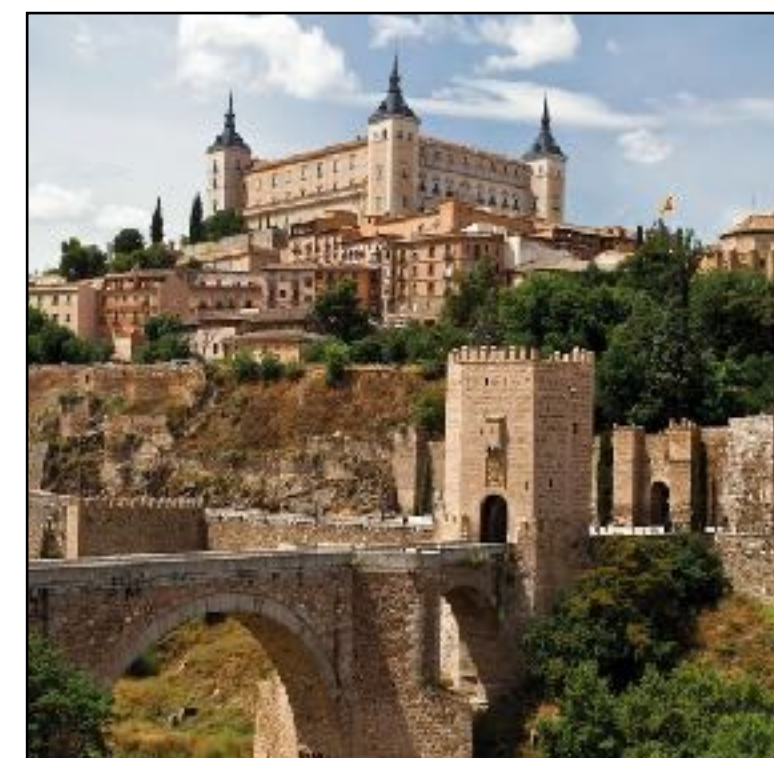
Sagrada Familia (Barcelona)



Salamanca City (Salamanca)



Imperial Palace (Madrid)



Toledo City (Toledo)



Food
We are famous for the Mediterranean diet

Culture



When I grow up, I want to be... (大きくなったらなりたい...)

Why did I become a scientist?
(なぜ私は科学者になったのですか?)



When I was 3 years old

Vet
(獣医)



When I was 8 years old

Singer
(歌手)



When I was 14 years old

Archaeologist
(考古学者)



When I was 17 years old

Chemical Engineer
(化学技術者)



Present

Chemist
(化学者)



Who inspires me? (誰が私にインスピレーションを与えますか?)

Why did I become a scientist?
(なぜ私は科学者になったのですか?)

During my first year at High School, I met...



Santiago Ramón y Cajal

Spanish neuroscientist, pathologist, and histologist specializing in neuroanatomy and the central nervous system.

**NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE
IN 1906**

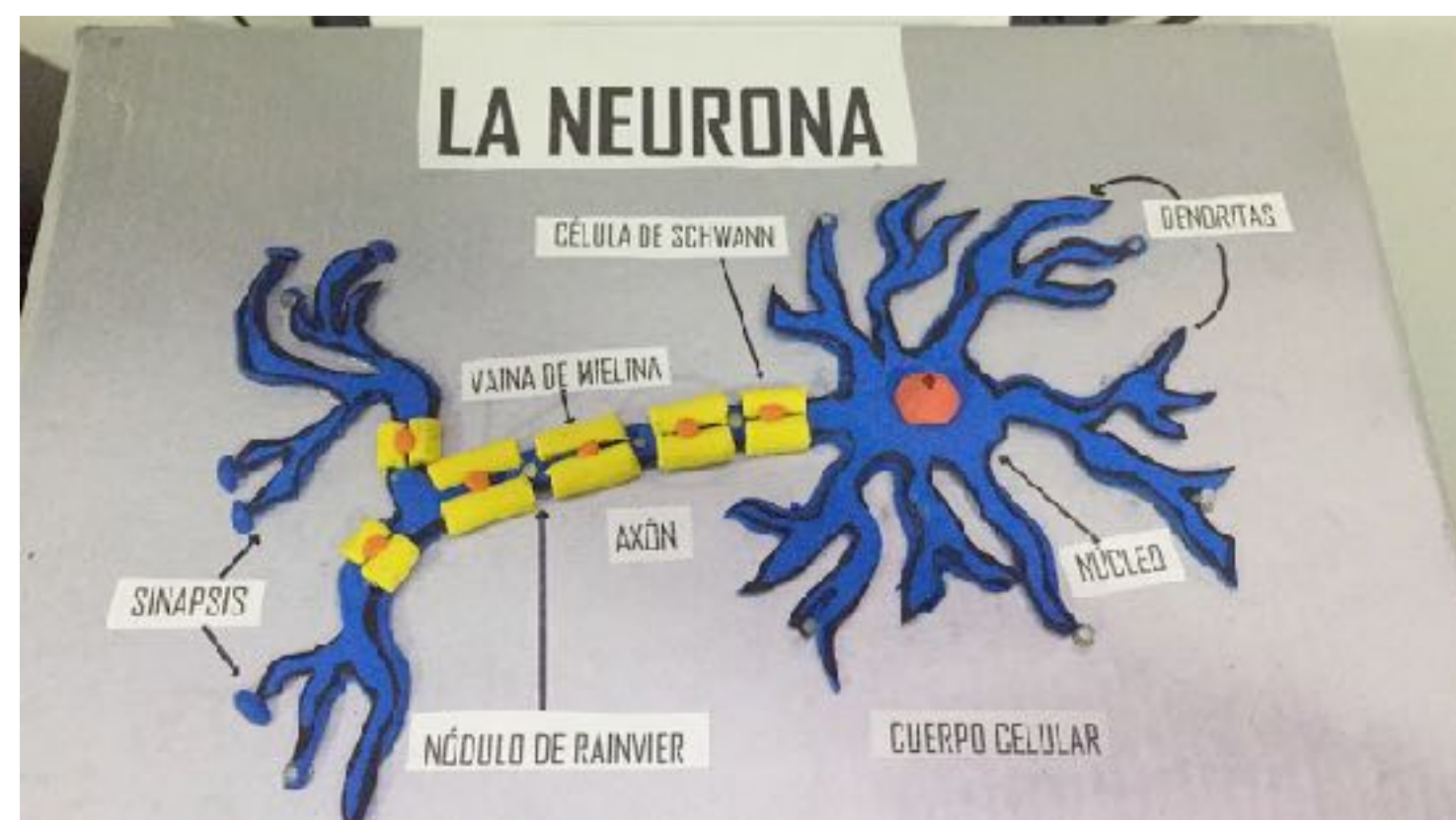


Ramón y Cajal was the first person of Spanish origin to win a scientific Nobel Prize

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Model of a neuron in plasticine

Spanish neuroscientist, pathologist, and histologist specializing in neuroanatomy and the central nervous system.

**NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE
IN 1906**



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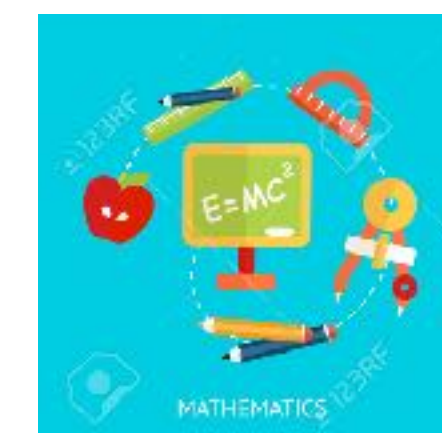
Ramón y Cajal was the first person of Spanish origin to win a scientific Nobel Prize

Professor Influence Senior High School

Isabel-sensei (Chemistry Professor)



Mari Angeles-sensei (Maths Professor)



Anabel-sensei (Physics Professor)



Maths, Chemistry and Physics Olympic Games



Ranking

- **3rd Position Chemistry**
(160 participants)
- **5th Position Maths**
(80 participants)
- **7th Position Physics**
(75 participants)

Who inspires me? (誰が私にインスピレーションを与えますか?)

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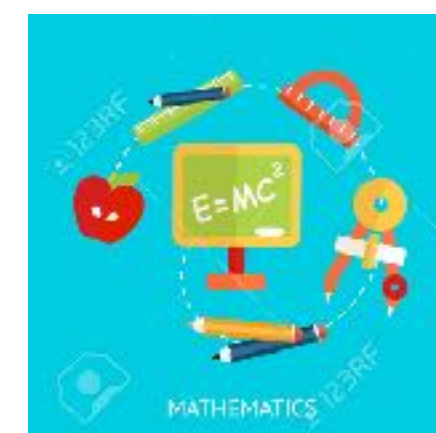
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Professor Influence Senior High School

Isabel-sensei (Chemistry Professor)



Mari Angeles-sensei (Maths Professor)



Anabel-sensei (Physics Professor)



Curiosity

Science satisfies curiosity

Science helps you to develop:

Creativity (創造性),
Imagination (想像力), and
New skills (新しい技術)

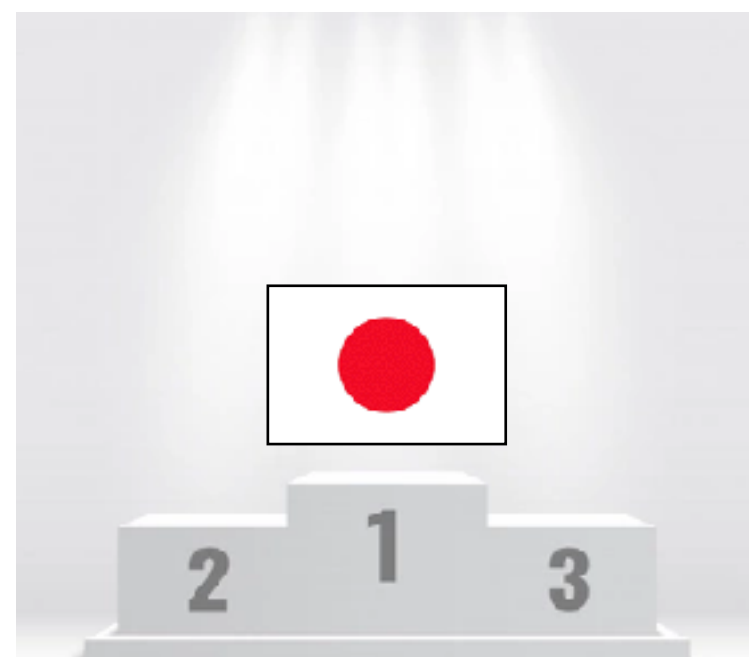
Science can be really fun!

Why did I come to Japan? (なぜ日本に来たのですか?)

Why did I become a scientist?
(なぜ私は科学者になったのですか?)

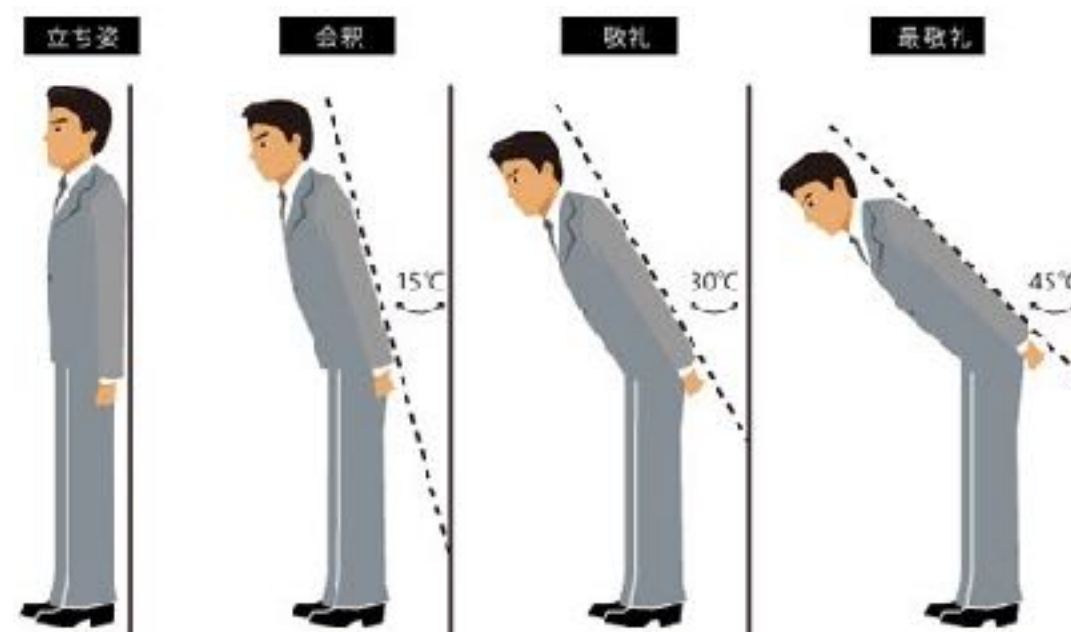
1 RESEARCH (リサーチ)

Japan es on of the best ranked countries for conducting research in the word



2 PEOPLE & CULTURE (人と文化)

Japanese people is very friendly and helpful. Also, Japan is the safest country in the hole world!



3 NATURE (自然)

Japan possesses and incredible landscape with many different Nature



4 FOOD (食物)

I love Japanese food in all its kinds!

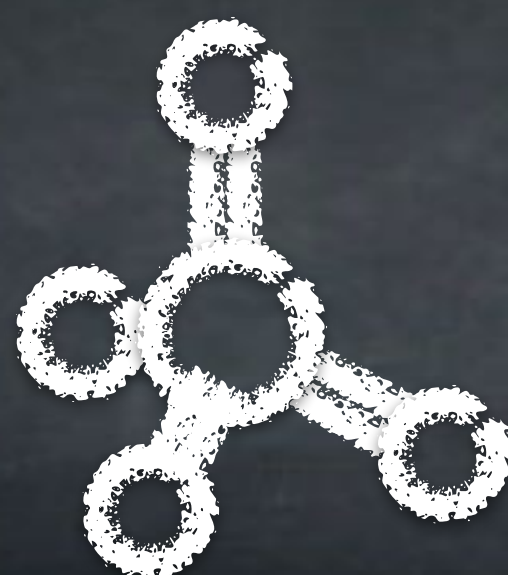
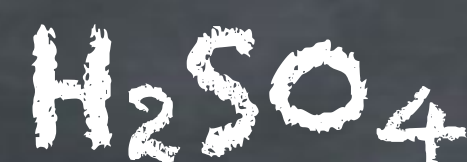


What is Chemistry? (化学とは何ですか?)

Let's talk about Science! (科学について話しましょう!)

Chemistry

● Science that studies the composition of materia

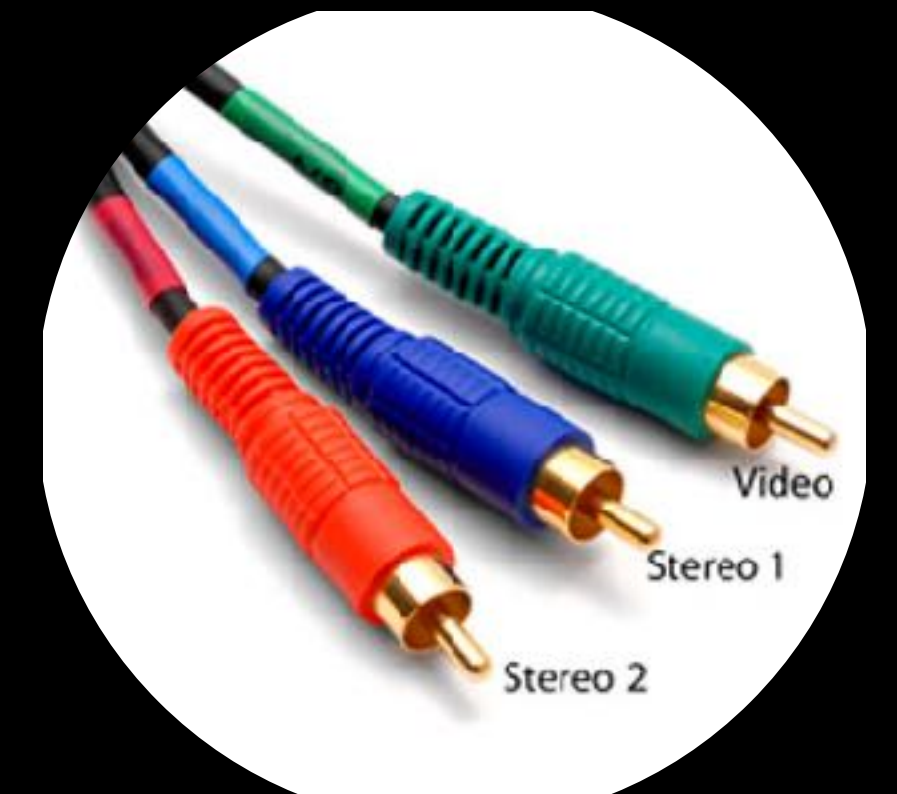
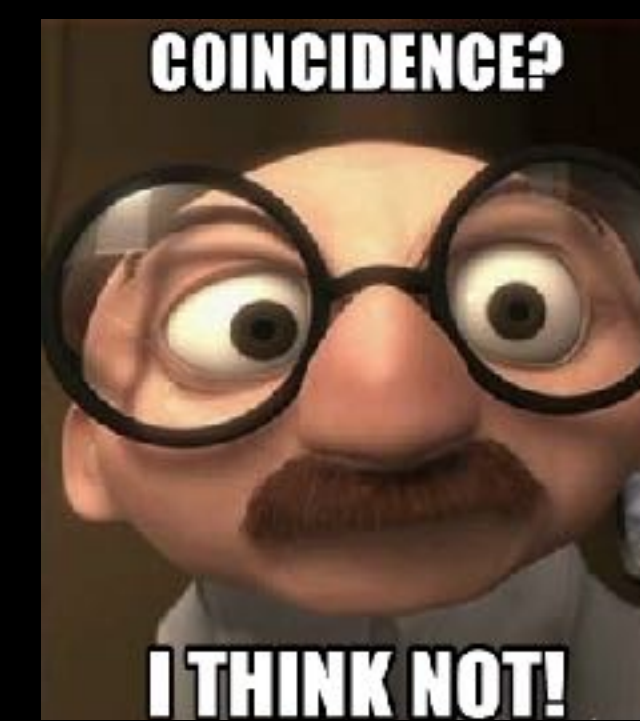
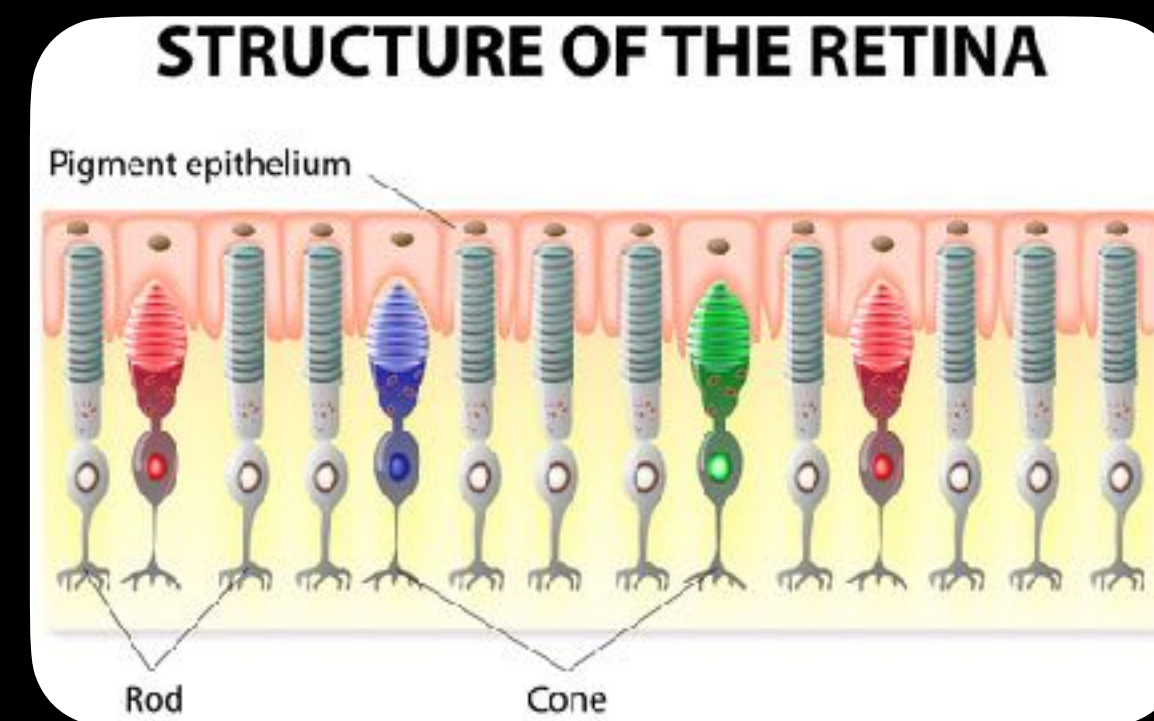
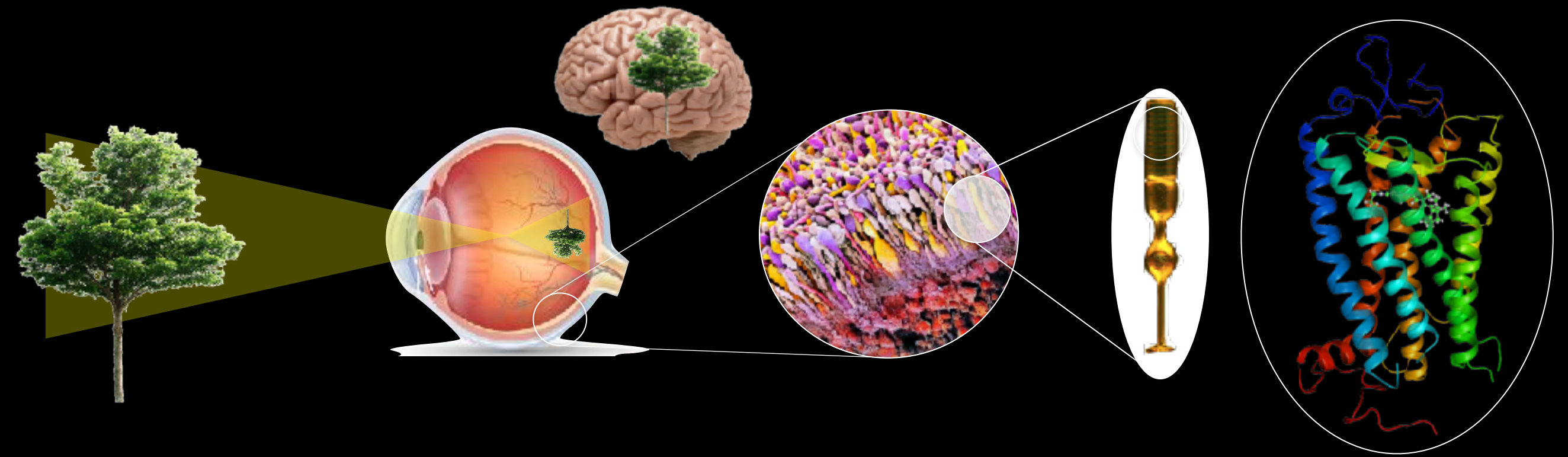


Special molecules: Rhodopsin proteins (特別な分子：ロドプシンタンパク質)

Let's talk about Science! (科学について話しましょう!)



Photochemical Reactions

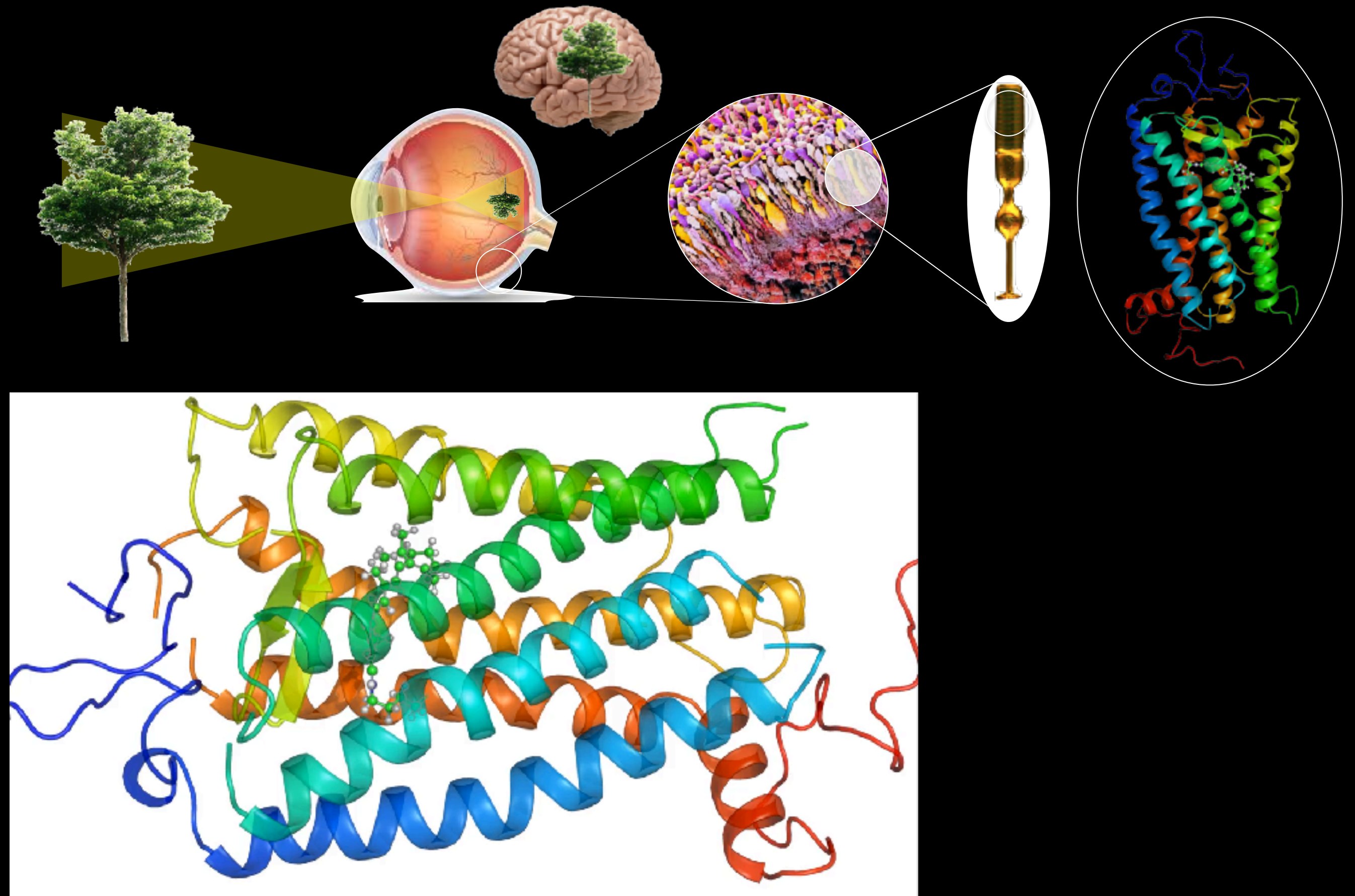


Special molecules: Rhodopsin proteins (特別な分子：ロドプシンタンパク質)

Let's talk about Science! (科学について話しましょう!)



Photochemical Reactions

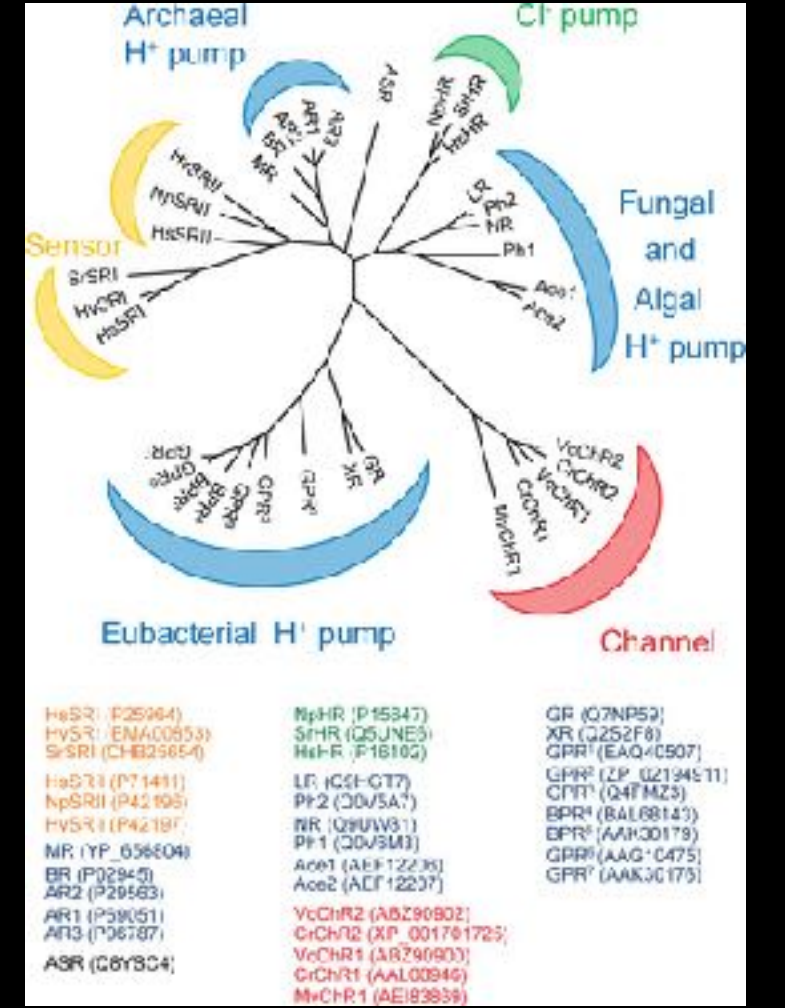
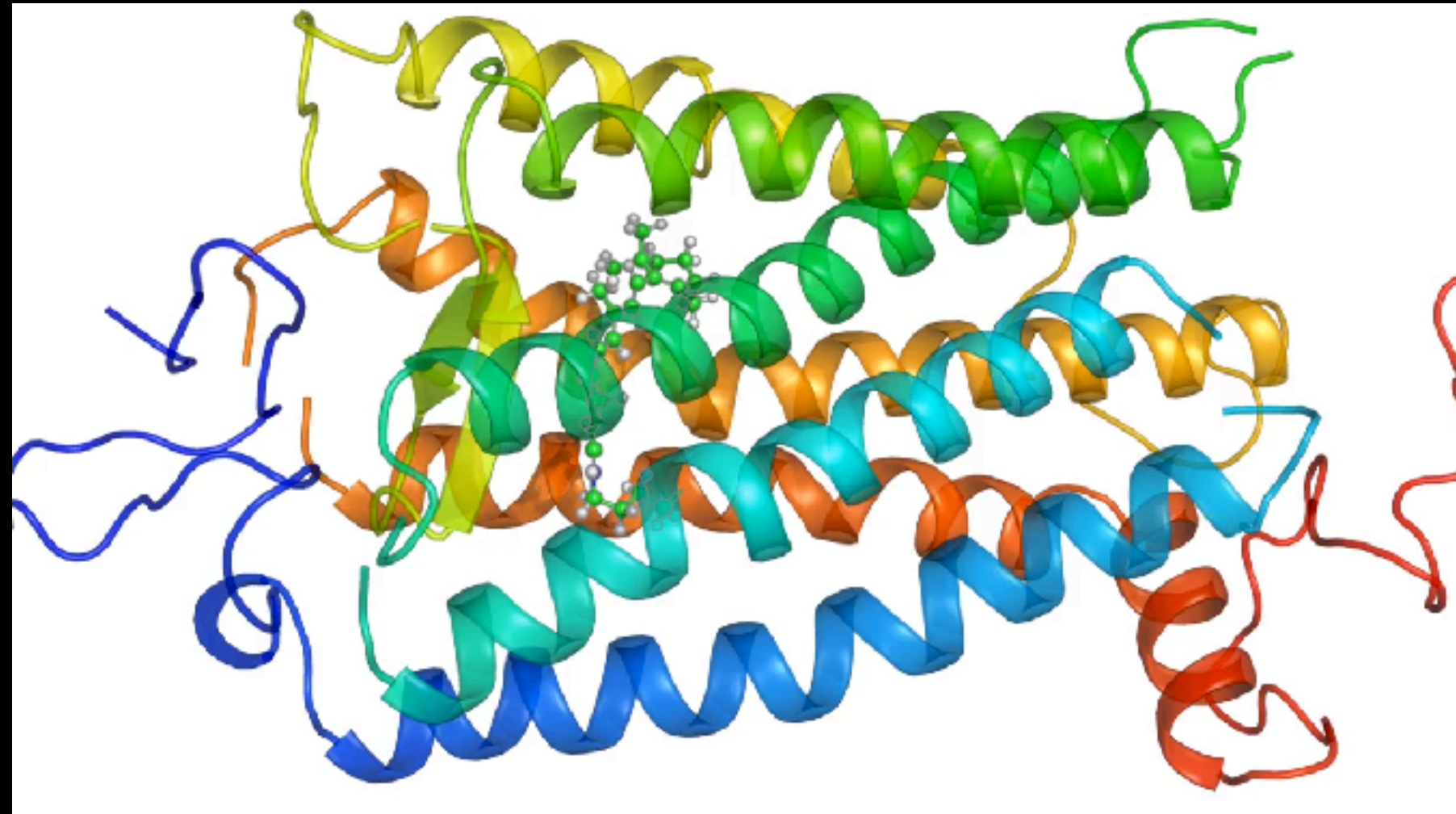
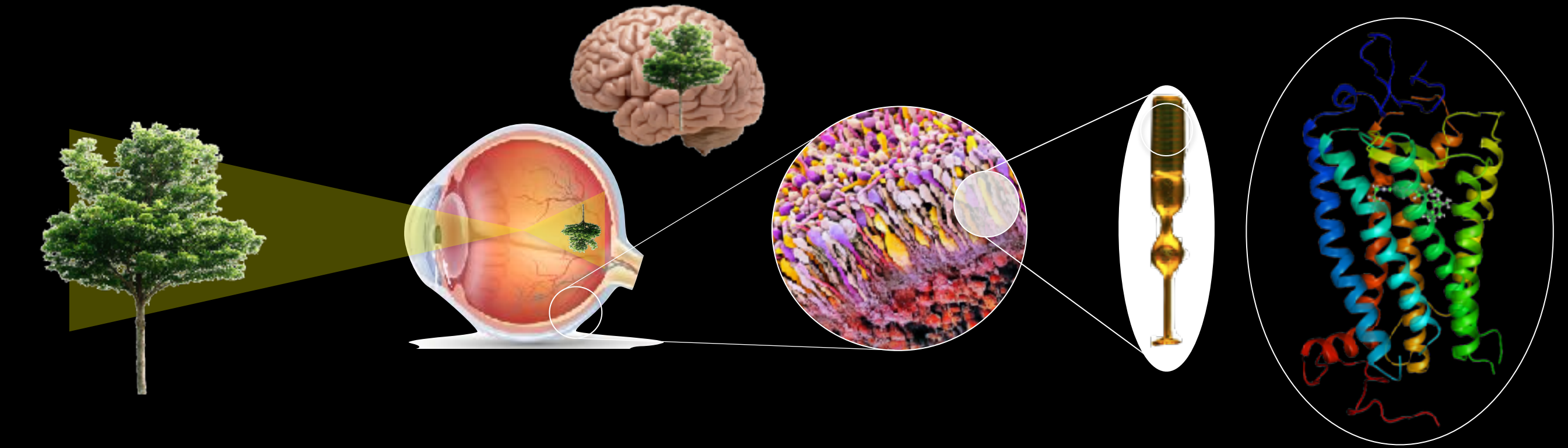


Special molecules: Rhodopsin proteins (特別な分子：ロドプシンタンパク質)

Let's talk about Science! (科学について話しましょう!)

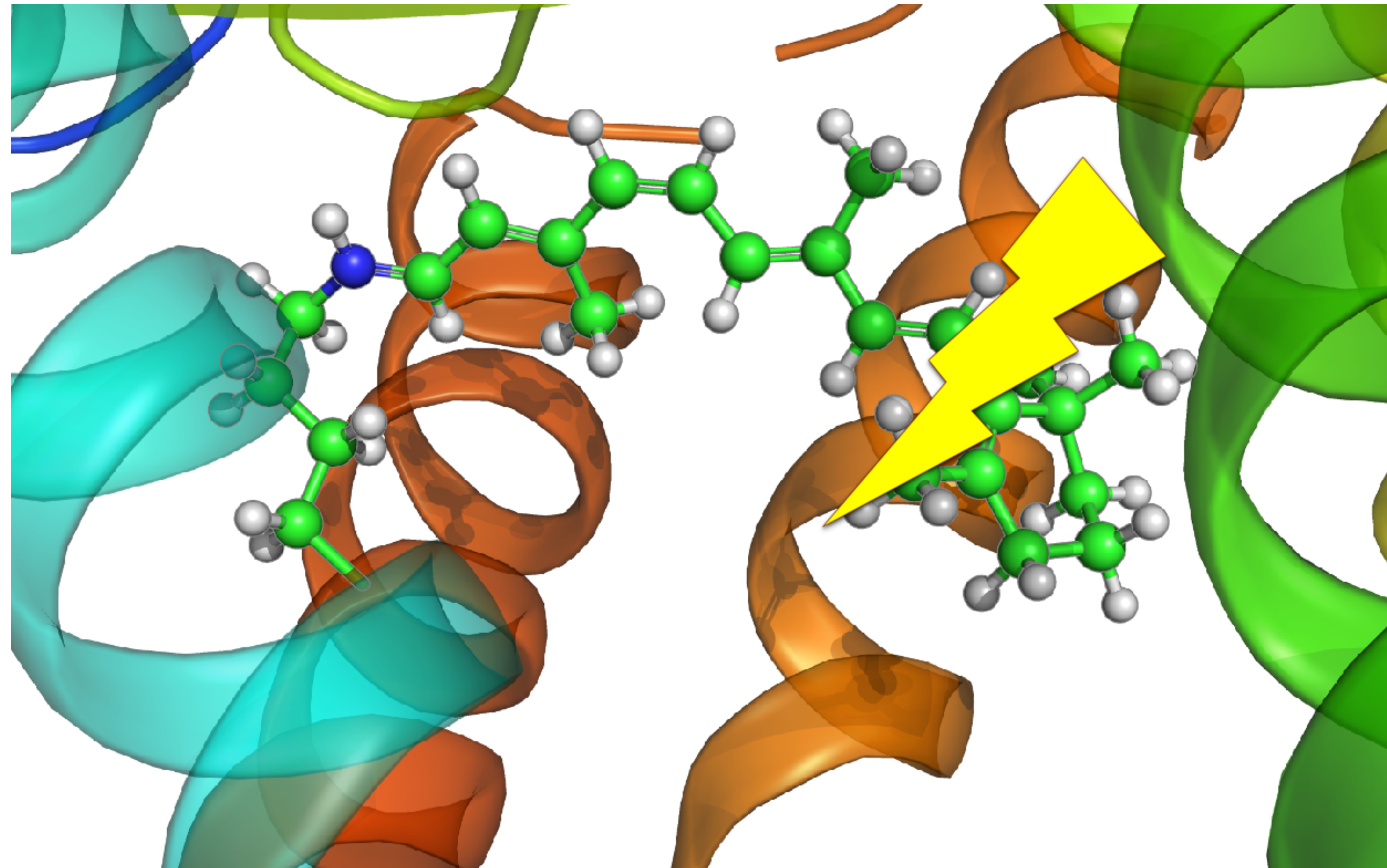


Photochemical Reactions



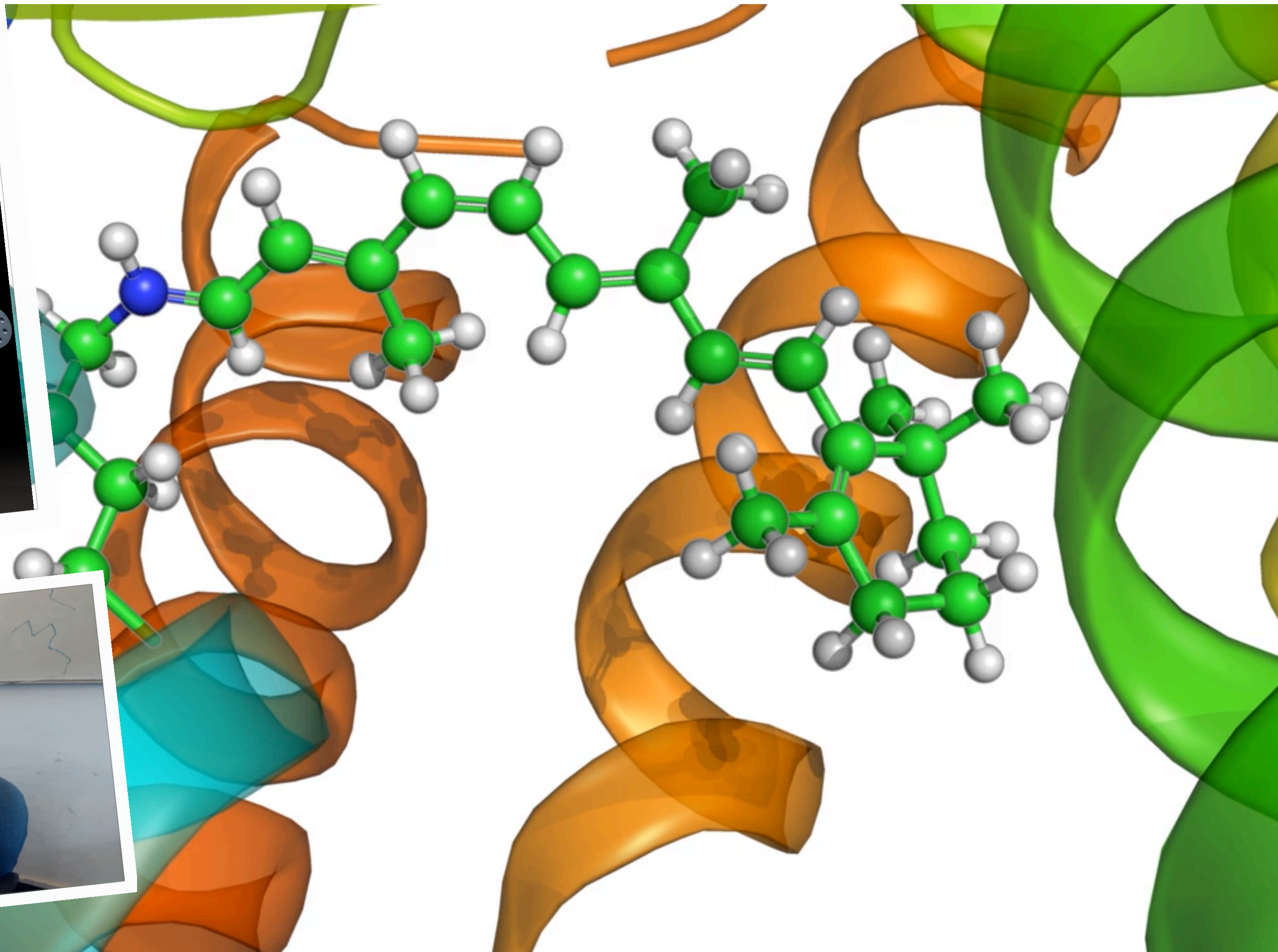
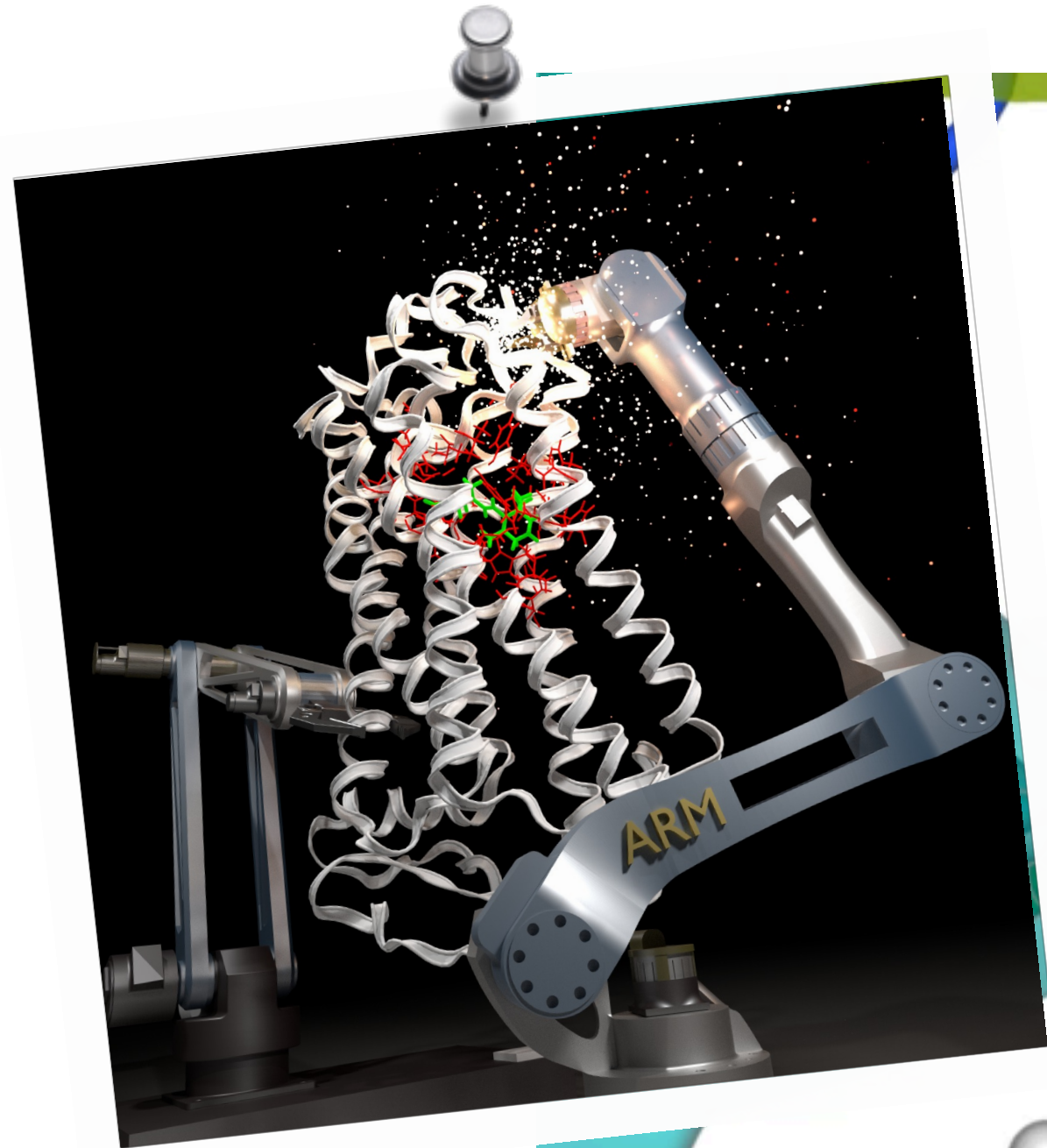
Special molecules: Rhodopsin proteins (特別な分子：ロドプシンタンパク質)

Let's talk about Science! (科学について話しましょう!)



Special molecules: Rhodopsin proteins (特別な分子：ロドプシンタンパク質)

Let's talk about Science! (科学について話しましょう!)



Let's talk about Science! (科学について話しましょう!)

Who loves sushi?

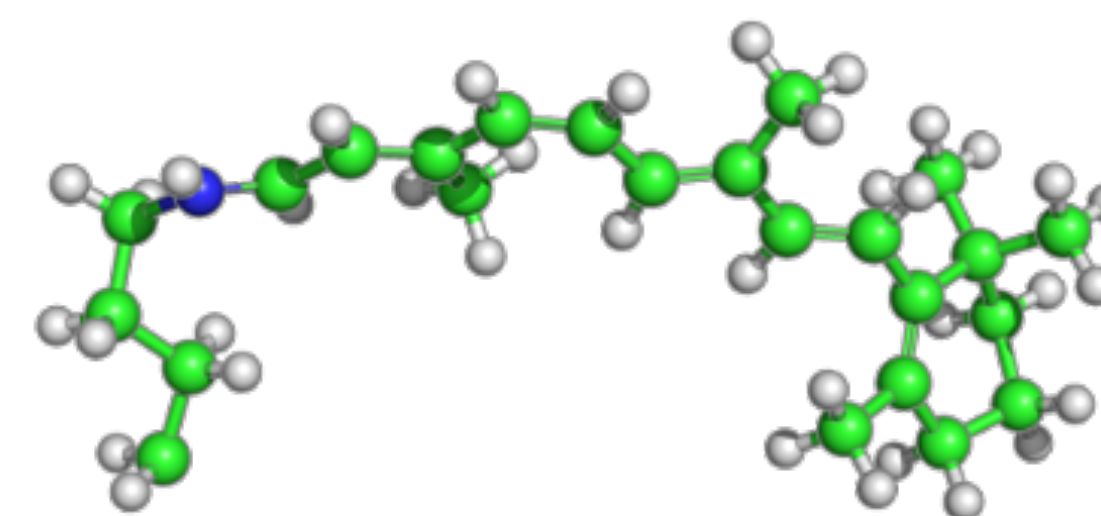


How do computational models work? (計算モデルはどのように機能しますか?)

Let's talk about Science! (科学について話しましょう!)



Salmon



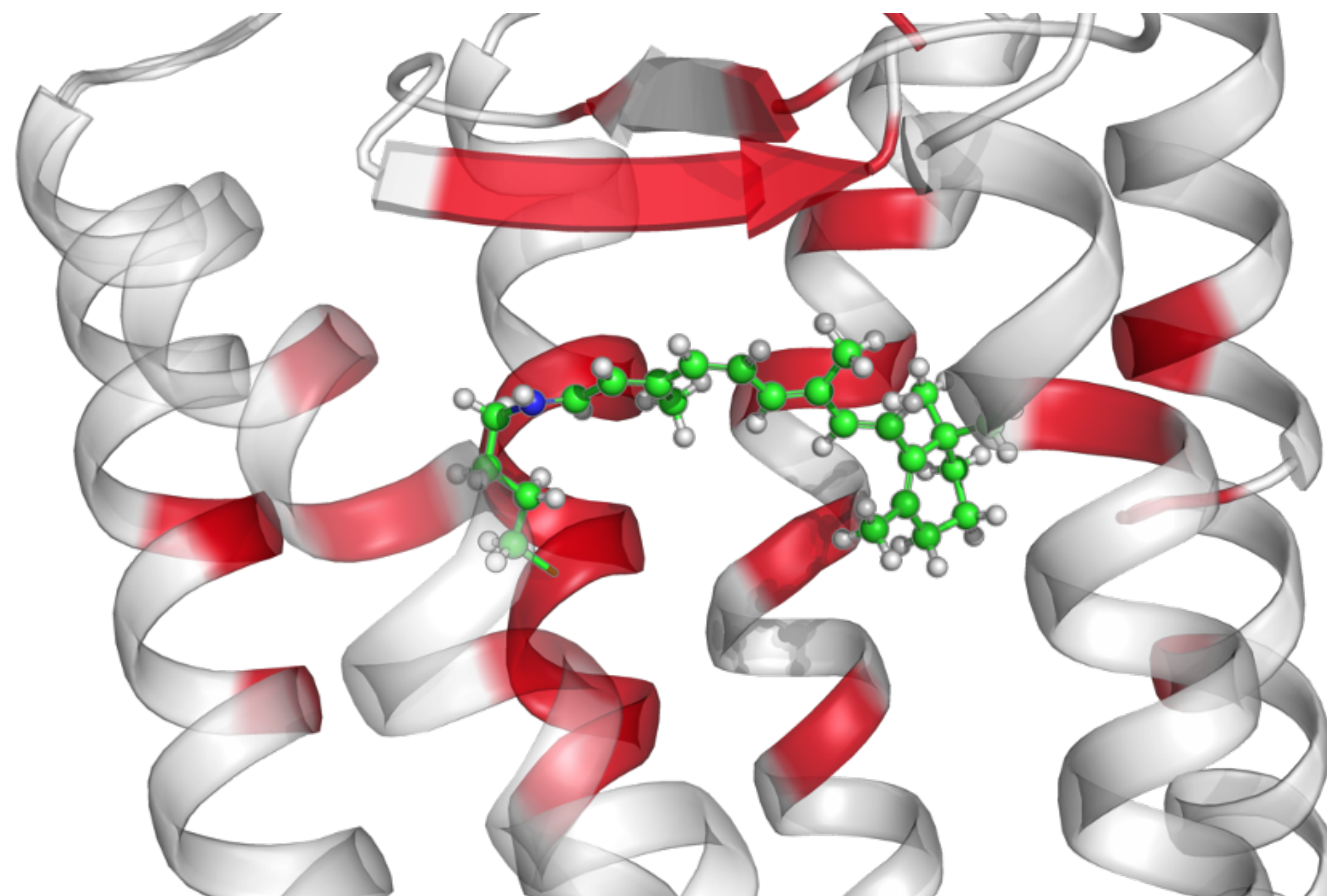
Retinal

How do computational models work? (計算モデルはどのように機能しますか?)

Let's talk about Science! (科学について話しましょう!)



Salmon + Rice



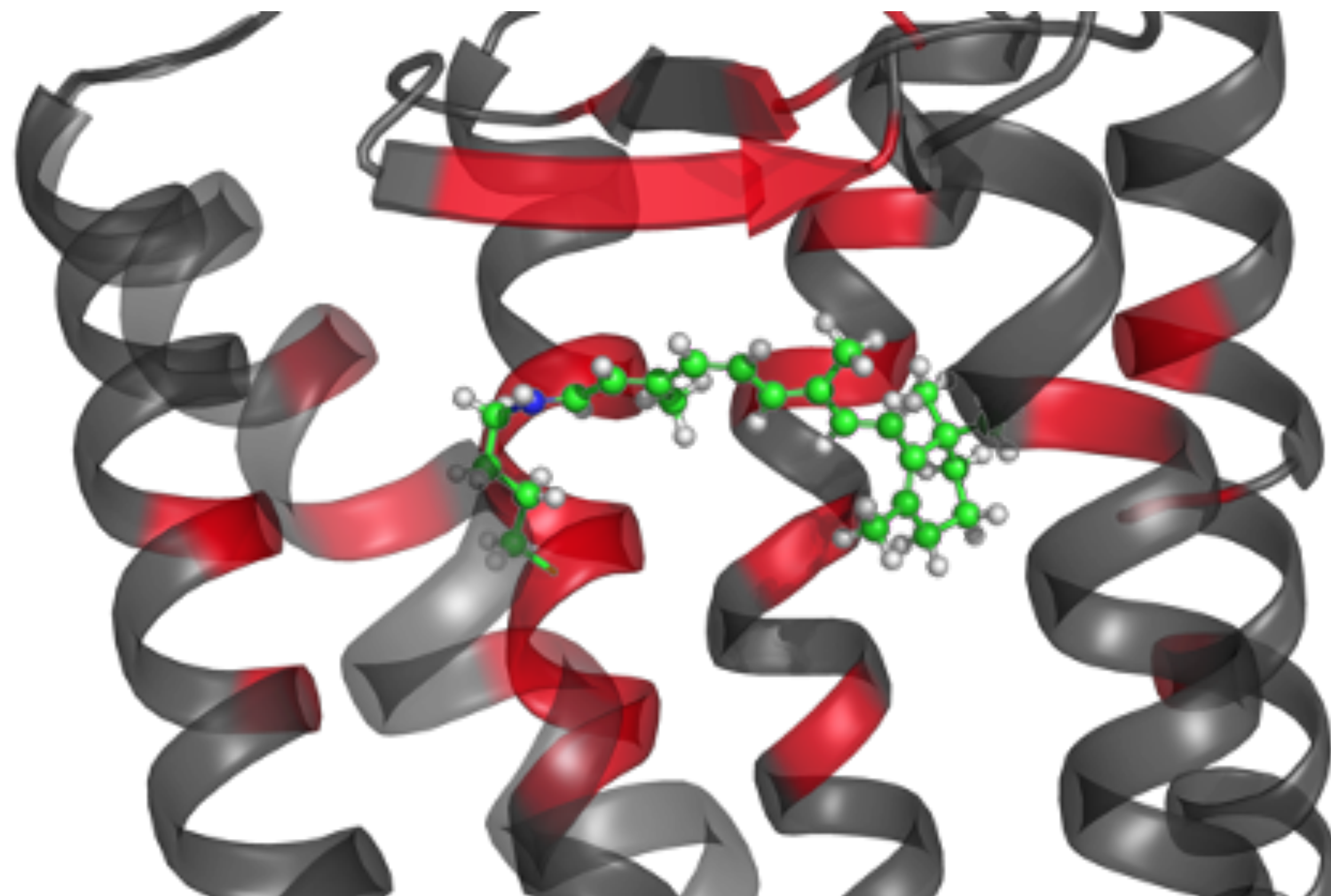
Retinal

How do computational models work? (計算モデルはどのように機能しますか?)

Let's talk about Science! (科学について話しましょう!)



Salmon + Rice + Nori seaweed

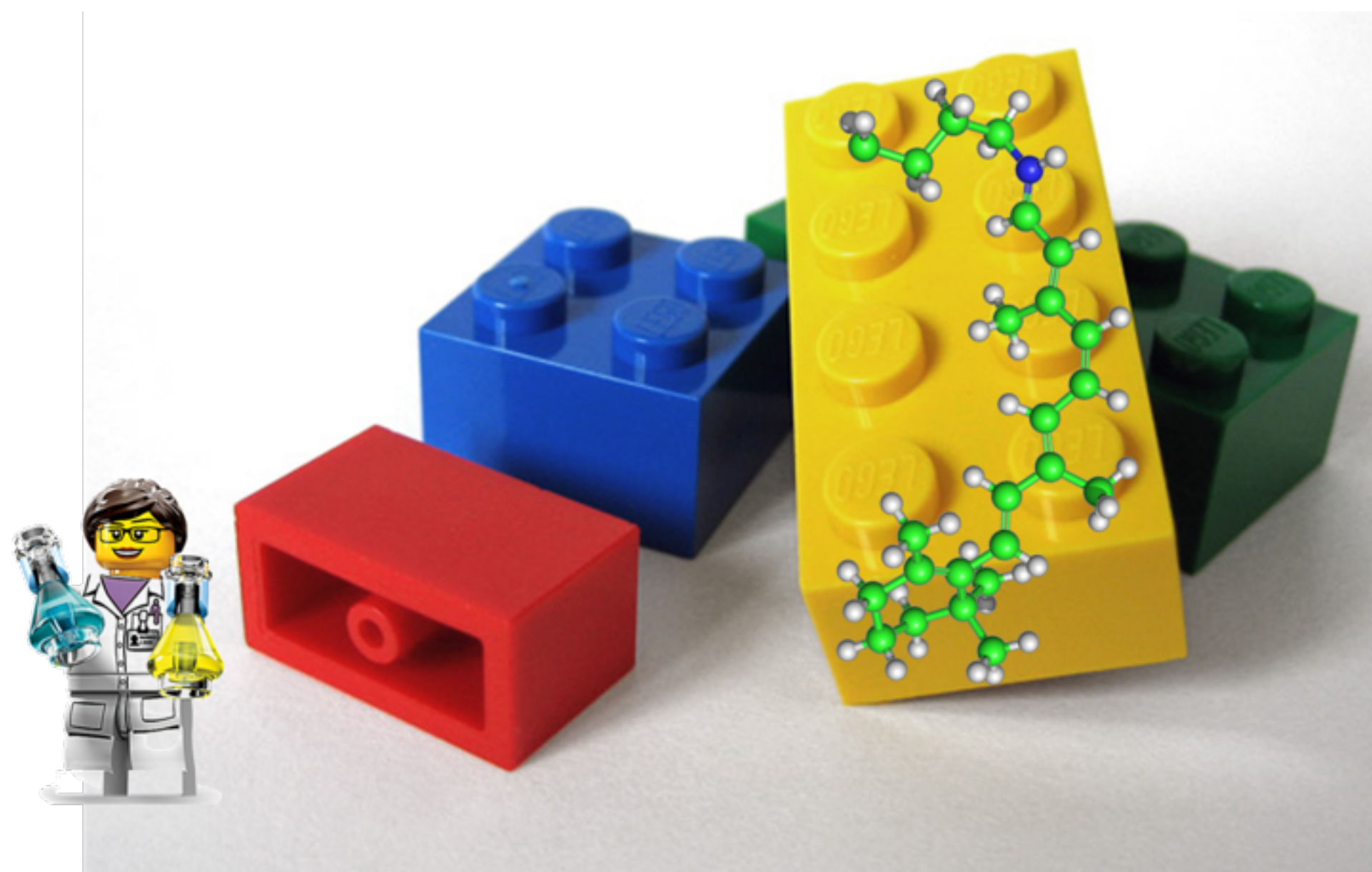


Protein Environment

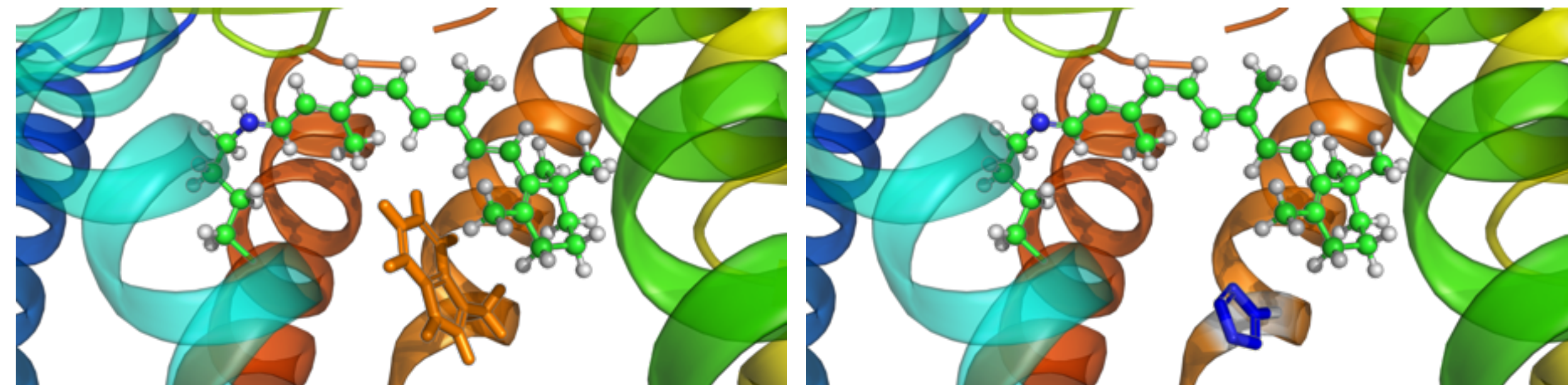
Synthetic Biology (合成生物学)

Let's talk about Science! (科学について話しましょう!)

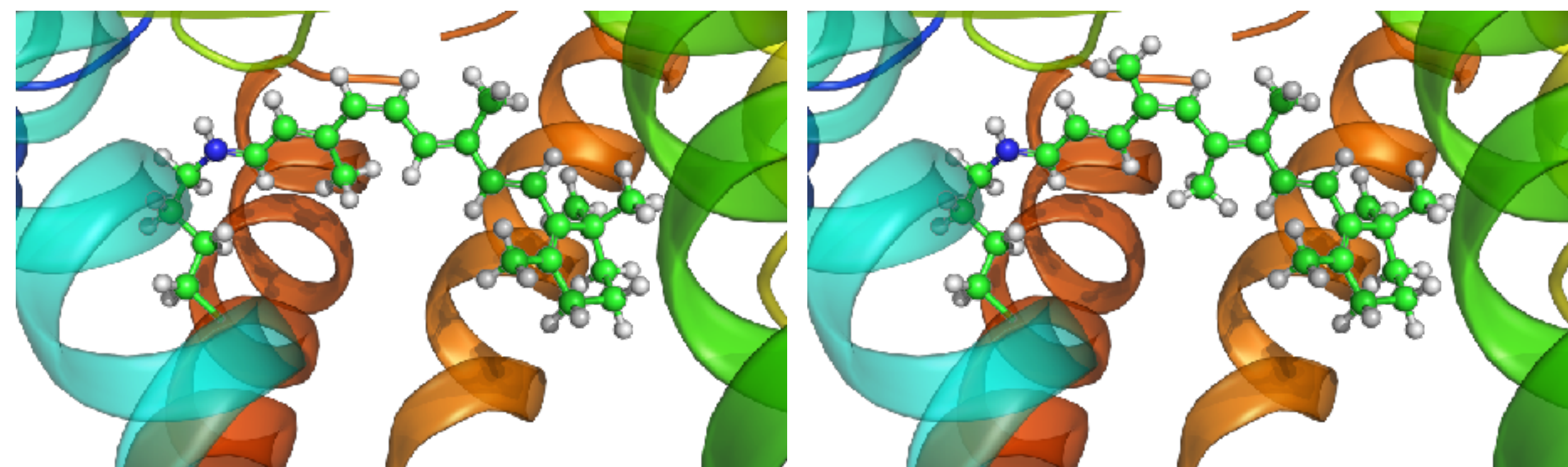
What is Synthetic Biology?



Rhodopsin Mutants



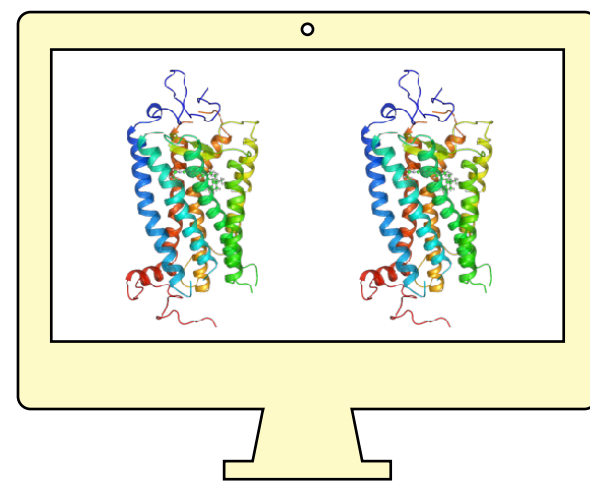
Artificial Retinal



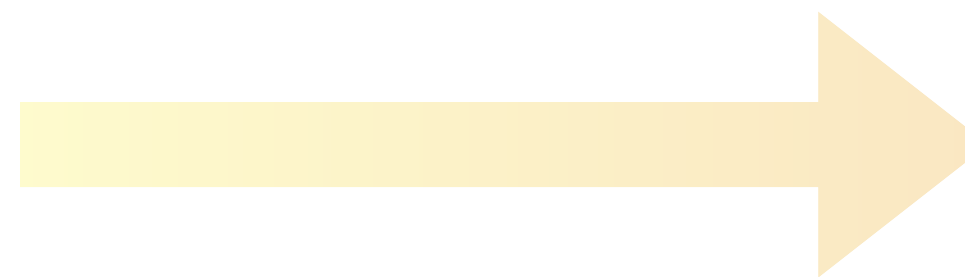
My research in Japan (日本での私の研究)

Let's talk about Science! (科学について話しましょう!)

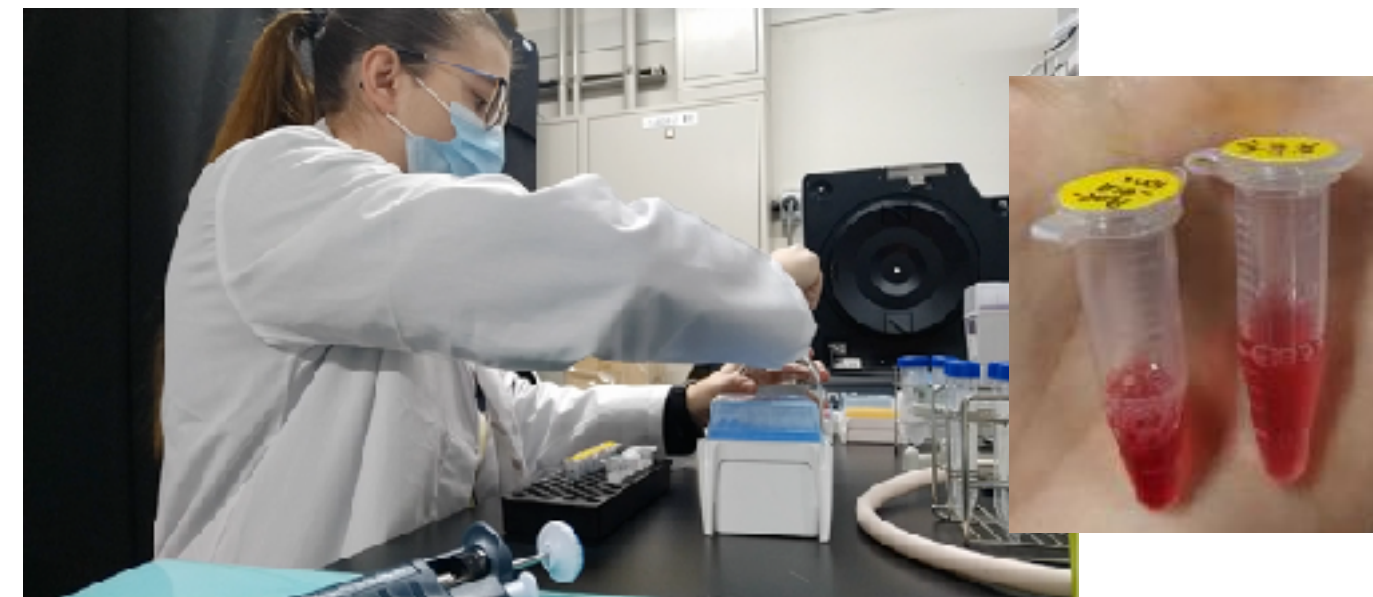
**Computational
Chemistry**



**I was looking the rhodopsin
proteins though a window, and
now...**



Biophysics



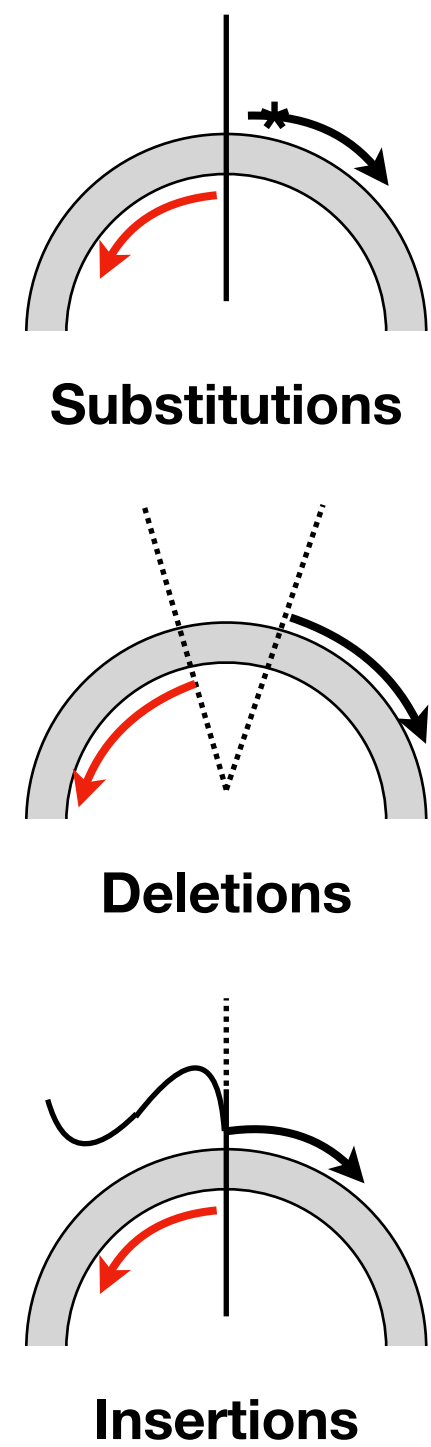
**I can touch the rhodopsin proteins
with my hands!**

My research in Japan (日本での私の研究)

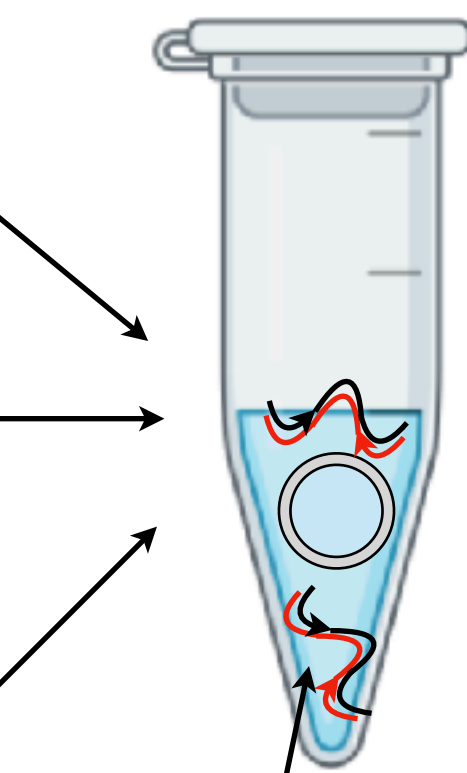
Let's talk about Science! (科学について話しましょう!)

- What kind of experiments do I perform in the lab?

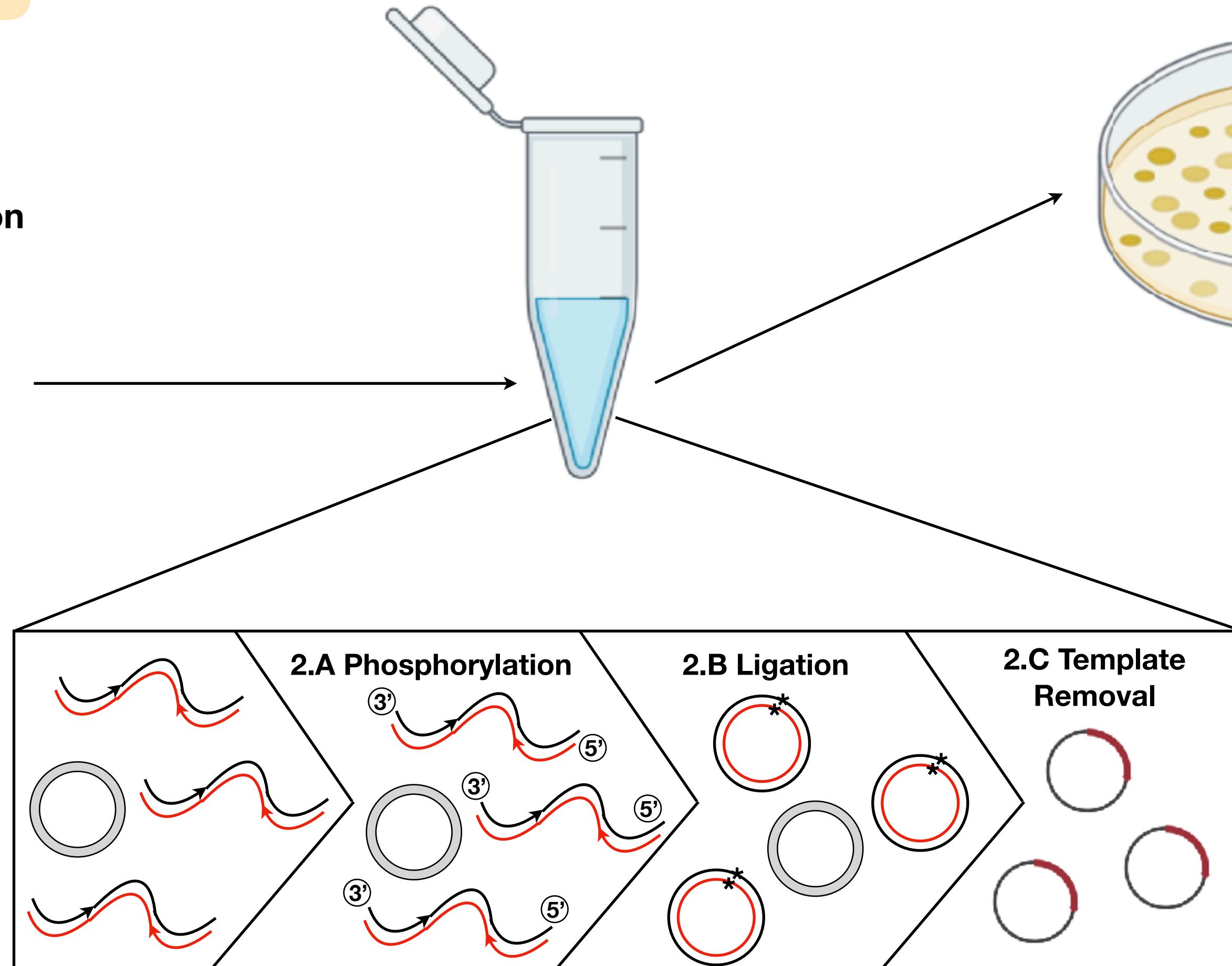
- Site-Direct Mutagenesis Protocol**



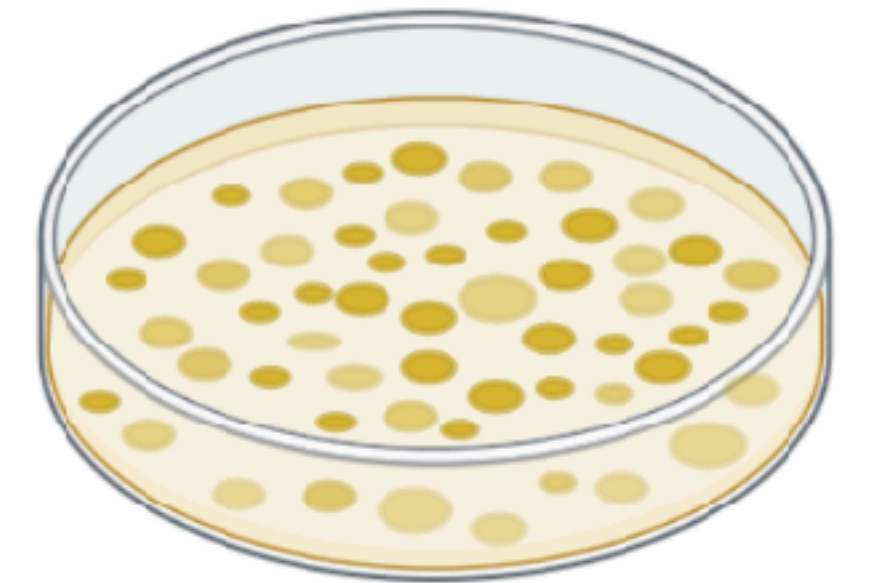
1. PCR Amplification



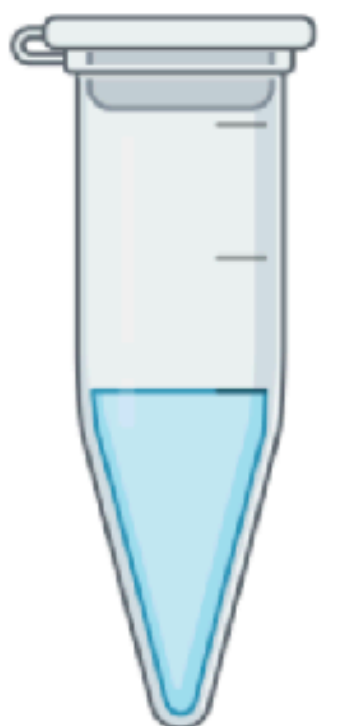
2. Treatment and Enrichment



3. High-Efficiency Transformation



4. Plasmid Purification

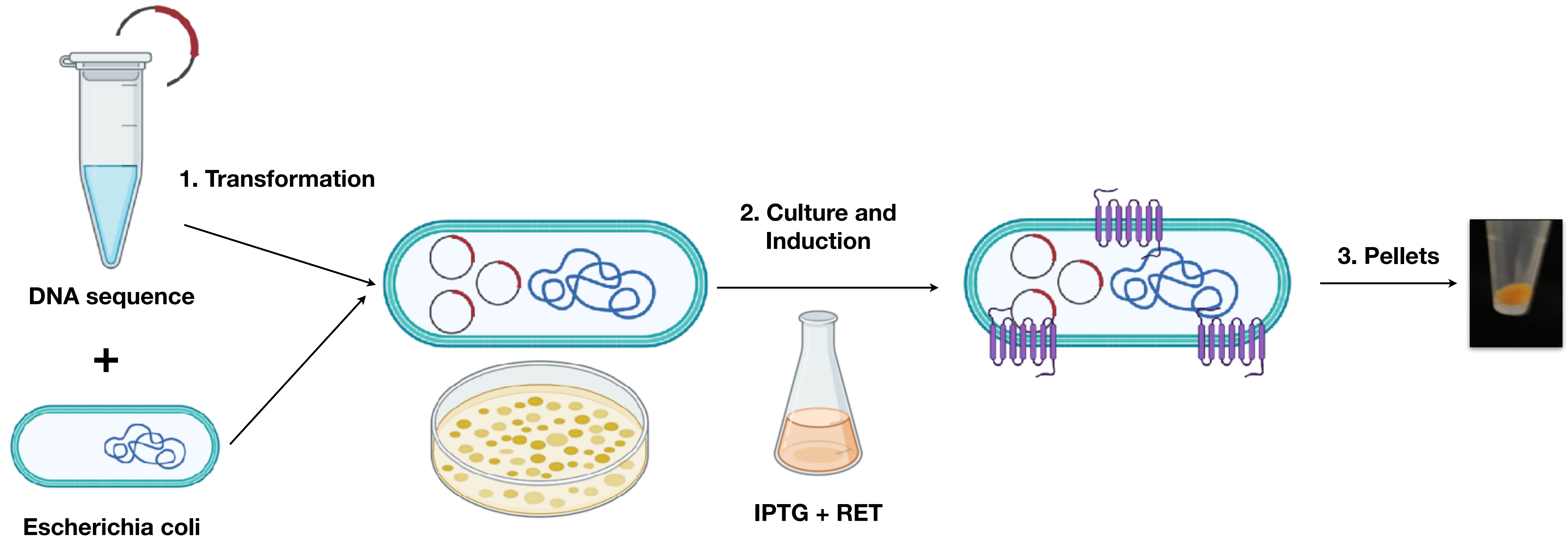


My research in Japan (日本での私の研究)

Let's talk about Science! (科学について話しましょう!)

- What kind of experiments do I perform in the lab?

- **Escherichia Coli Expression**

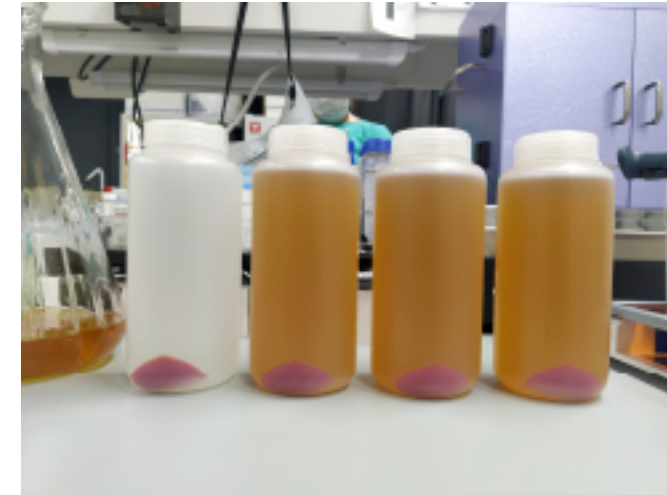
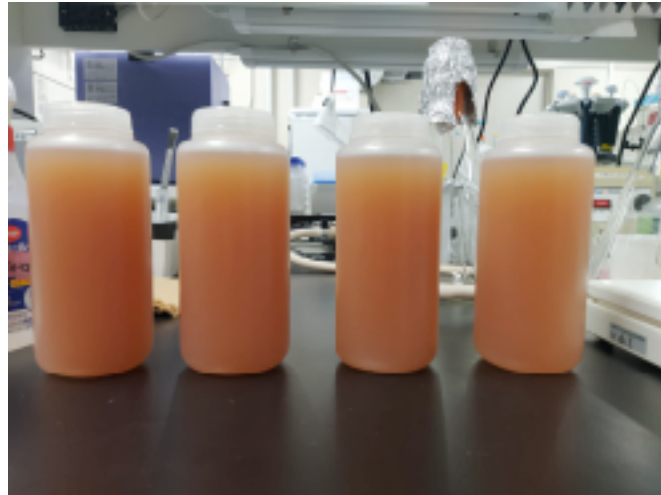


My research in Japan (日本での私の研究)

Let's talk about Science! (科学について話しましょう!)

Protein Purification

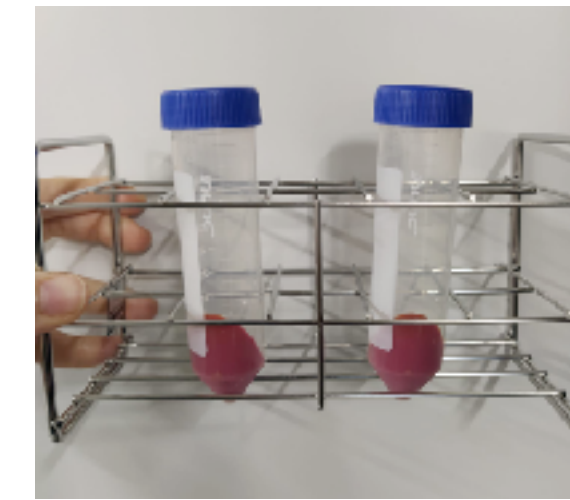
1 2 L Culture + Centrifuge (8000 rpm, 10 min, 4°C)



2 Pellets Suspension in Buffer A



3 Pellets after Centrifuge (8000 rpm, 10 min, 4°C)



4 Pellets after Sonication and Centrifuge (8000 rpm, 10 min, 4°C)



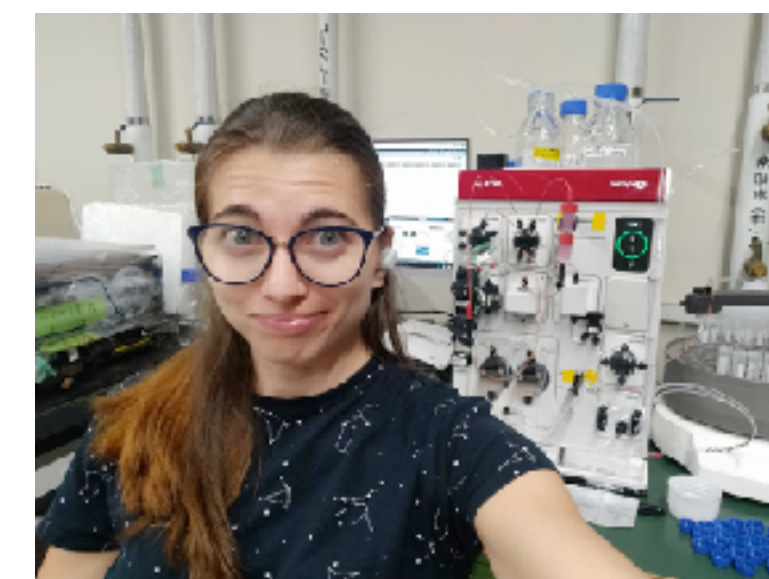
4 Pellets after high speed Ultracentrifuge (35000 rpm, 1 hour, 4°C)



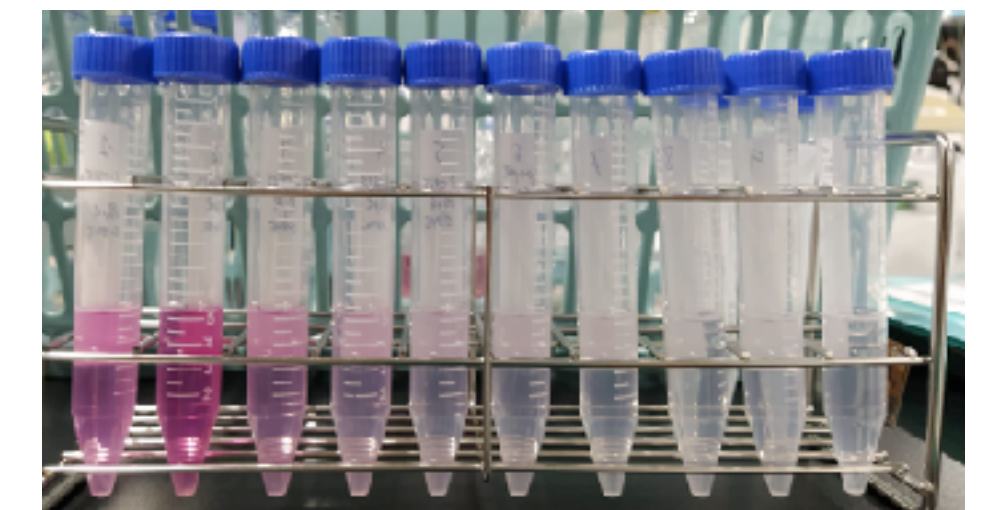
5 Overnight + Pellets after high speed Ultracentrifuge (35000 rpm, 1 hour, 4°C)



6 AKTA Purification (Co Column)



7 Fractionating



And many other techniques to characterize rhodopsin proteins!

If you want to become a scientist... (科学者になりたいなら...)

**You must have
PASSION for
Science**

(科学への情熱が必要です)

Study Languages

(言葉を学ぶ)

**Patient will be
your best friend**

(忍耐があなたの親友になります)

**Travel. Leave
your home place**

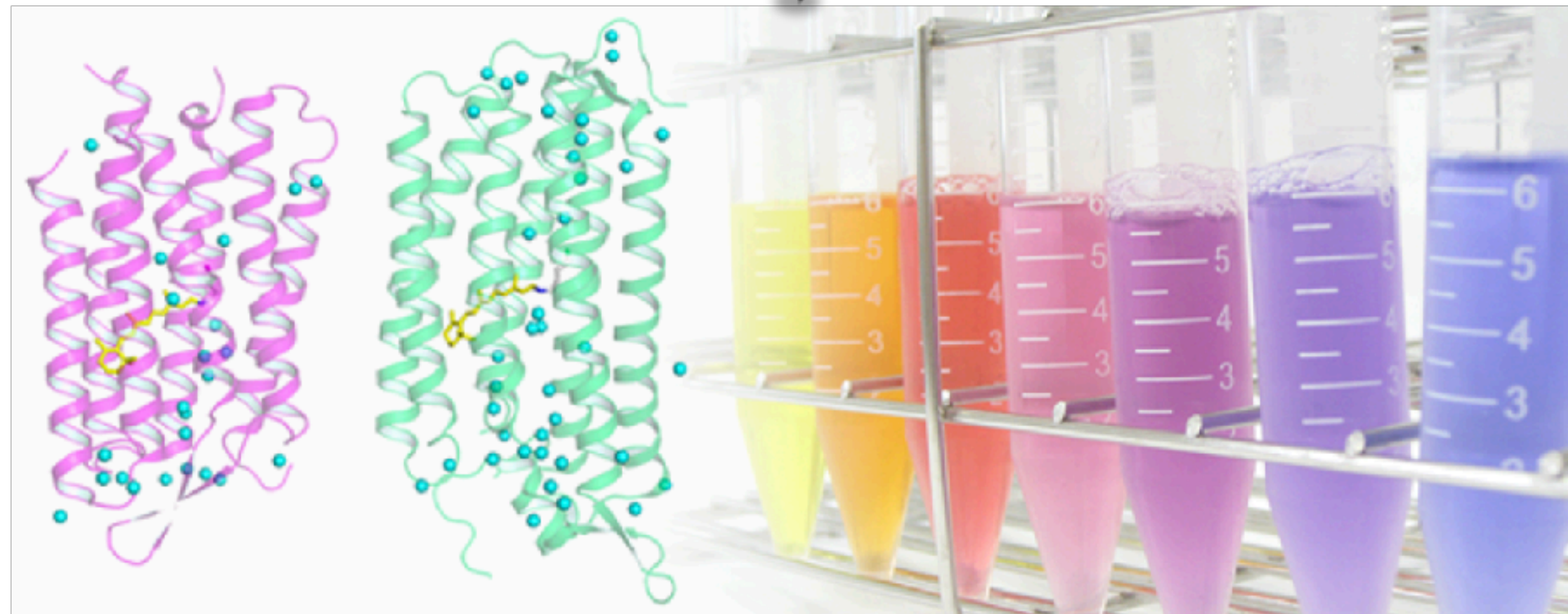
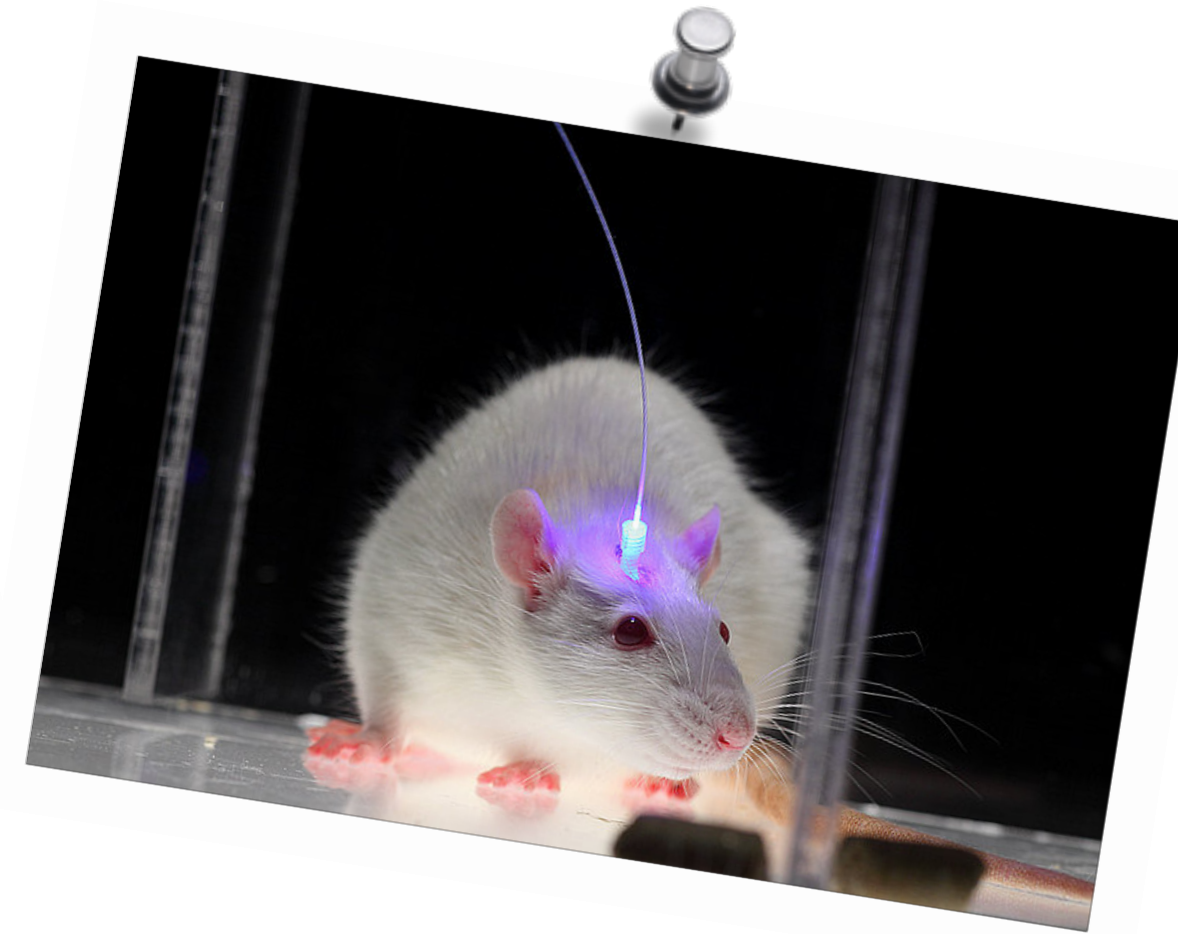
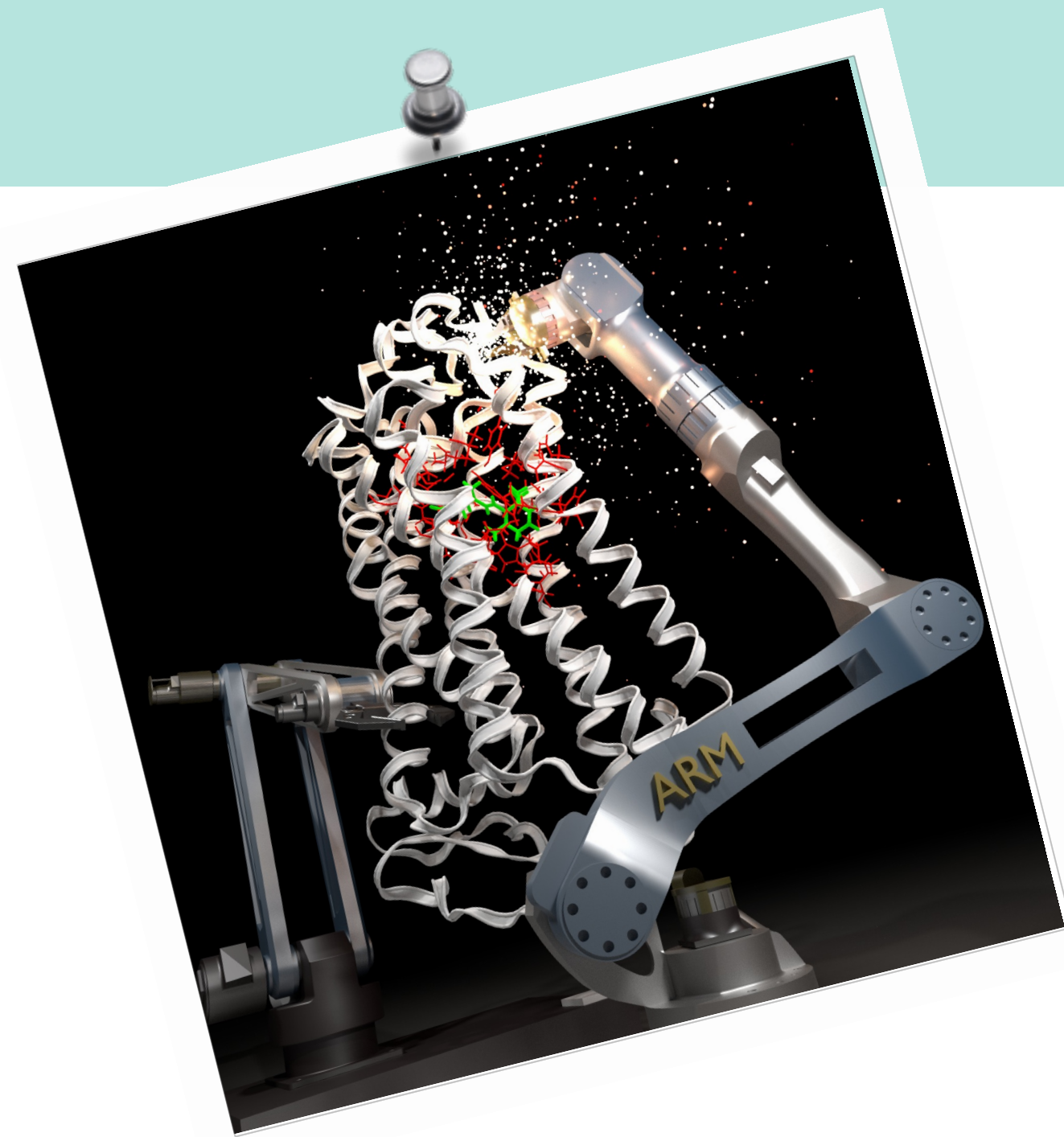
(新しい環境に飛び込むことを恐れないで)

**Never stop
asking questions**

(質問をするのをやめな
いでください)

Enjoy!

(楽しんで!)



Thanks for your attention!

**Please, questions are
welcome!**

**Dr. María del Carmen Marín Pérez
JSPS Postdoctoral Fellow**

**The Institute for Solid State Physics
The University of Tokyo
Japan**



@LabInoue (INOUE Ia. (ISSP, The Univ. Tokyo))