

# The protein families game: a learning tool for the non scientific community

COBLET 2022



Typhaine Paysan-Lafosse

Senior bioinformatician

typhaine@ebi.ac.uk

EMBL-EBI



# Project idea

- Always fascinated by science and biology
- Wanted to develop a public engagement activity
- Love of board games
- Played the game “Jeu des 7 familles” as a child (equivalent to “GO fish” or “Happy families”)
- Work for the InterPro database: classify proteins into groups according to sequence or structural similarity
- Games are a good way to introduce people to science



# Protein classification

Protein family = group of proteins that share a common evolutionary origin

Proteins are grouped because they have:

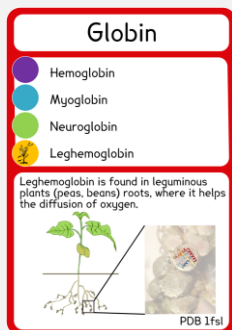
- Related functions
- Similarities in their amino acid sequence or structure

Multiple groups of scientists work on protein classification and use different methods to generate their categorisation

**InterPro** ([www.ebi.ac.uk/interpro](http://www.ebi.ac.uk/interpro))

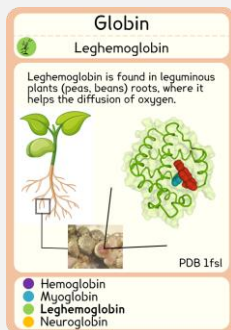
Combines predictive models from several member databases

# Game development



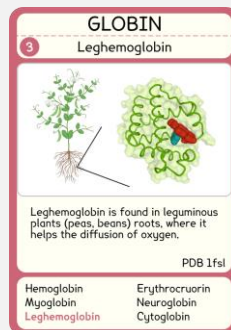
7 families of 4 protein cards

Lexi readable font for people with Dyslexia



Off-white background colour for people with Dyslexia

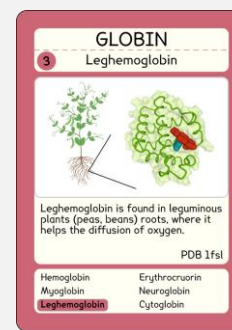
Changed card layout following survey



Addition of 2 protein cards per family

Cards colours changed to be colourblinding friendly

Design refining following survey



Added contrast to the text areas after play-test

Adjustment of bleeding area for printing

Addition of family questions cards

# About the game



2-6



10+



30-50  
min

## Game content

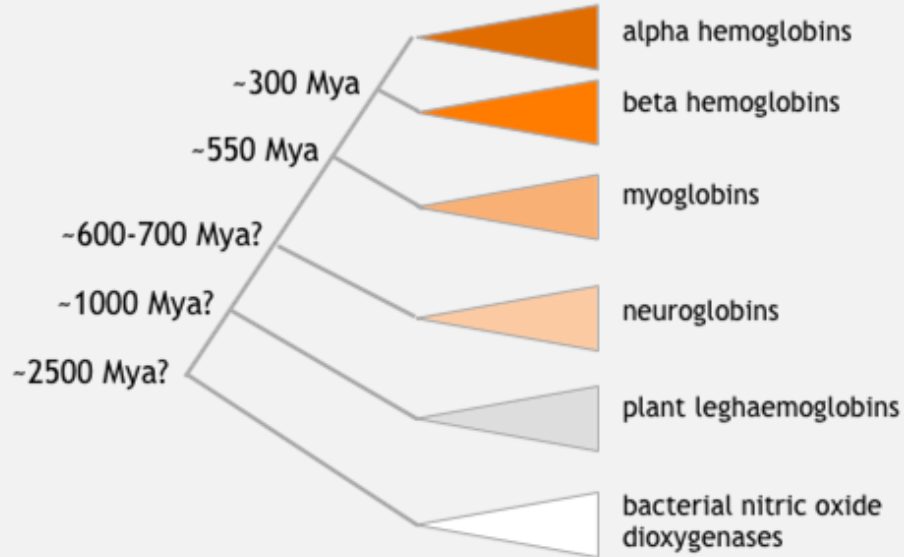
- 7 families of 6 protein cards
- 7 family question cards
- 5 rules cards

## Aim of the game

Collect the highest number of completed families by asking other players for protein cards.



# Globin family



**GLOBIN**  
Hemoglobin

1

Hemoglobin transports oxygen from lungs to other tissues in vertebrates. Each molecule is made of 4 subunits: 2 alpha and 2 beta.

PDB 6ka9

<b>Hemoglobin</b>	Erythrocytein
Myoglobin	Neuroglobin
Leghemoglobin	Cytoglobin

**GLOBIN**  
Myoglobin

2

Myoglobin is found in muscles and allows the whale to stay underwater for a long period of time.

PDB 5hu

Hemoglobin	Erythrocytein
<b>Myoglobin</b>	Neuroglobin
Leghemoglobin	Cytoglobin

**GLOBIN**  
Leghemoglobin

3

Leghemoglobin is found in leguminous plants (peas, beans) roots, where it helps the diffusion of oxygen.

PDB 1fsl

Hemoglobin	Erythrocytein
Myoglobin	Neuroglobin
<b>Leghemoglobin</b>	Cytoglobin

**GLOBIN**  
Erythrocytein

4

Erythrocytein is a giant extracellular hemoglobin. In the earthworm it consists of 144 hemoglobin subunits.

PDB 4v93

Hemoglobin	<b>Erythrocytein</b>
Myoglobin	Neuroglobin
Leghemoglobin	Cytoglobin

**GLOBIN**  
Neuroglobin

5

Neuroglobin increases oxygen availability in the brain.

PDB 4mpm

Hemoglobin	Erythrocytein
Myoglobin	<b>Neuroglobin</b>
Leghemoglobin	Cytoglobin

**GLOBIN**  
Cytoglobin

6

Cytoglobin is used by marine mammals. It helps the transfer of oxygen from arterial blood to the brain.

PDB 2dc3

Hemoglobin	Erythrocytein
Myoglobin	Neuroglobin
Leghemoglobin	<b>Cytoglobin</b>

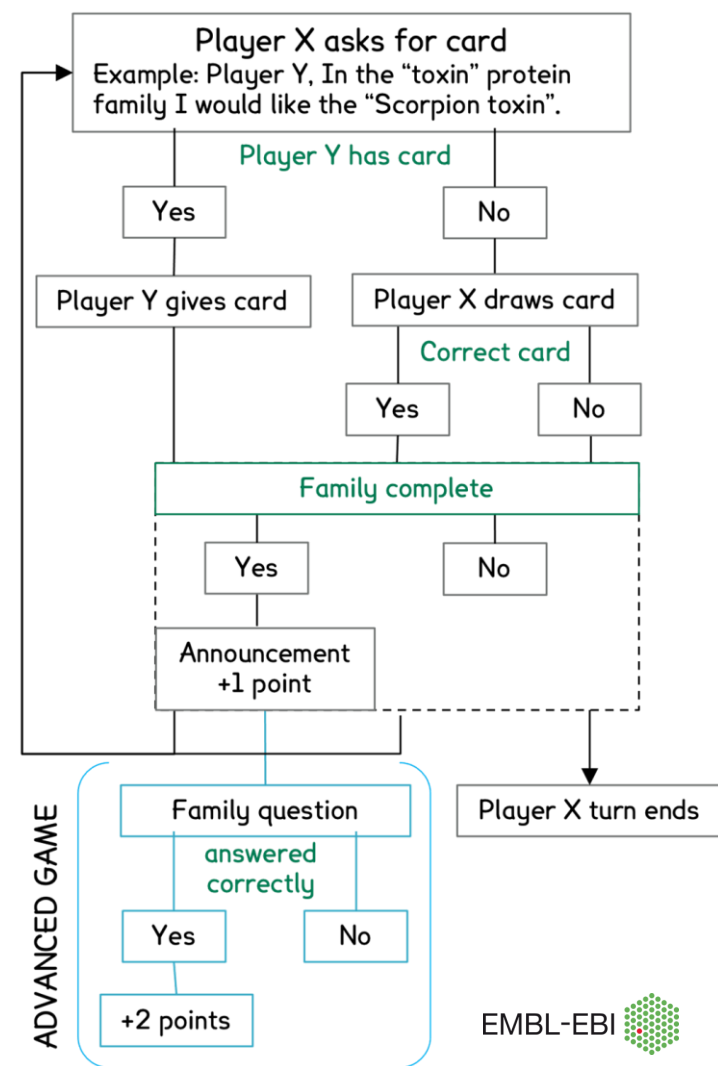
# Game logic

Game logic is similar to the *Happy families* or *Go fish* games: players need to complete the maximum number of protein families.

Completed family = 1 point

Different playing modes:

- Easy: use families colours and cards numbers
- Medium: use families and proteins names
- Advanced: same logic as the medium mode, but players can get 2 additional points if they answer correctly to a “family question”



# Card content

Protein family name  
Explore in [www.ebi.ac.uk/interpro](http://www.ebi.ac.uk/interpro)

Protein card number in the family

Fun fact about the protein

Members of the protein family to collect

The current protein in the family is highlighted with a coloured background

**PEPTIDASE**

4 Collagenase

Collagen is found in connective tissues, such as bones and skin. Collagenase breaks the bonds in collagen.

PDB 4fvl

Pepsin  
Trypsin  
Papain  
**Collagenase**  
Neprilysin  
Aminopeptidase A

Protein name

Protein structure

PDB structure identifier  
Explore in [www.pdbe.org](http://www.pdbe.org)

Different background colour for each family

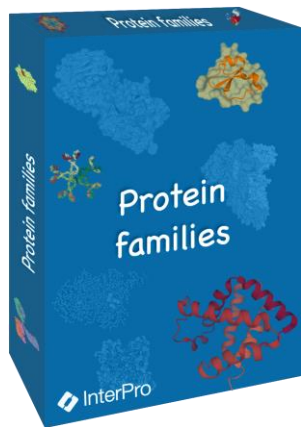


# Where can I find the game?

Printed copy: [typhaine@ebi.ac.uk](mailto:typhaine@ebi.ac.uk)

Online: <https://tabletopia.com/games/protein-families>

[Trailer](#)



PLAYGROUND WORKSHOP ABOUT HELP

HOME FIND & PLAY ALL GAMES PLAYERS Go Premium

Search games, #room or @player

## Protein families

*I want them all!*

InterPro

Teach Play

New Releases Free

10+ 2-6 30m - 50m 11h

### Credits

Designer  
Typhaine Paysan-Lafosse

### Leaderboard

MONTH ALL TIME

Typhaine.pl  
Online  
Beginner 2h

### Rules

Rules

Proteins can be grouped together into protein families when they have a similar sequence, shape or function. The Protein families game contains 42 cards divided in 7 families (6 protein cards each), the goal is to collect the maximum number of families by asking the other players for the protein cards you are missing in your hand to complete your families. The game logic is similar to the Happy families and Go Fish games.

Interacting with the game objects

# Game highlights

- Main objective: have *fun* whilst *learning* new things about proteins
- Target audience: *16-18* years old
- Introduce concept of proteins and protein families
- Thoughtful design for audiences with *dyslexia* and *color blindness*
- Online version suitable for people in the *neurodiverse* spectrum
- *Strategy* game

# EMBL-EBI summer fair 2022

First official presentation to the public

Enthusiasts comments: “Fun way to learn”,  
“Educational”, “Strategic”, “Fun”, “Addicting”



# Future developments

Go to schools to present the game to teachers and students

Develop an educational page in the InterPro website:

- List of resources introducing the concept of protein classification
- Link to play the online game
- Contact form

Translate the game in different languages

**Acknowledgement:**  
Wellcome Trust enabling fund  
EMBL-EBI

**Thank you!**

**Contact: [typhaine@ebi.ac.uk](mailto:typhaine@ebi.ac.uk)**

Follow us on Twitter: [@InterProDB](https://twitter.com/InterProDB) [@typhainePL](https://twitter.com/typhainePL)

