

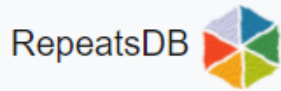


JOHANNES GUTENBERG  
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# Examining repeats with databases

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# RepeatsDB



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## News

RepeatsDB v3.0

Release: **2020-09-15**

[More info](#)

## Start

For a fast search use the top-right search box. Alternatively, visit the browse and search pages.

## Contact

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## Citing RepeatsDB

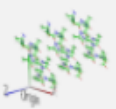
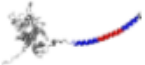
[RepeatsDB in 2021: improved data and extended](#)



**RepeatsDB is a database of annotated tandem repeat protein structures.** The database provides unit position, classification and reference to other databases. To start using RepeatsDB, please try the search box (top-right corner), the advanced [search](#) or the [browse](#) page.

Check our web server [RepeatsDB-lite](#) for interactive prediction of repeat units in protein structures.

RepeatsDB contains the following **repeat classes**:

Class	Description	UniProt	PDBs	PDB chains	Regions	Units	Example
1 	<a href="#">Crystalline aggregates</a>	0	3	3	3	0	-
2 	<a href="#">Fibrous repeat</a>	21	39	86	86	393	<a href="#">P04115</a>

# RepeatsDB

<https://repeatsdb.bio.unipd.it/structure/3vbpA>

## PDB chain sequence

Tandem repeats shown on the PDB sequence, in alternating blue and red. Insertions are in yellow.

```
1  MGSHHHHHHENLYFQ  GHMNSFYQSQEELKKI  GFLSVGKNVLIS
46  SIYNPGVISIGNNVR  IDDFCILSGKVTIGS  YSHIAAYTALYC
91  GIEMYDFANISSRTI  VYAAINDFSGNALMG  PTIPNQYKNVKT
136 ILKKHVIIGAHSIIF  PNVVIGEGVAVGAMS  MVKESLDDWYIY
181 PVRKIKARKRKIVEL  ENEFLKSMNS
```

## PDB Structure

Tandem repeats shown on the PDB structure, in alternating blue and red. Insertions are in yellow.

## Multiple structural alignment

[Download PDB file](#)

The Viewer shows the structural overlapping of units.

## Multiple sequence alignment

[Download FASTA file](#)

The Viewer shows the sequence overlapping of units.



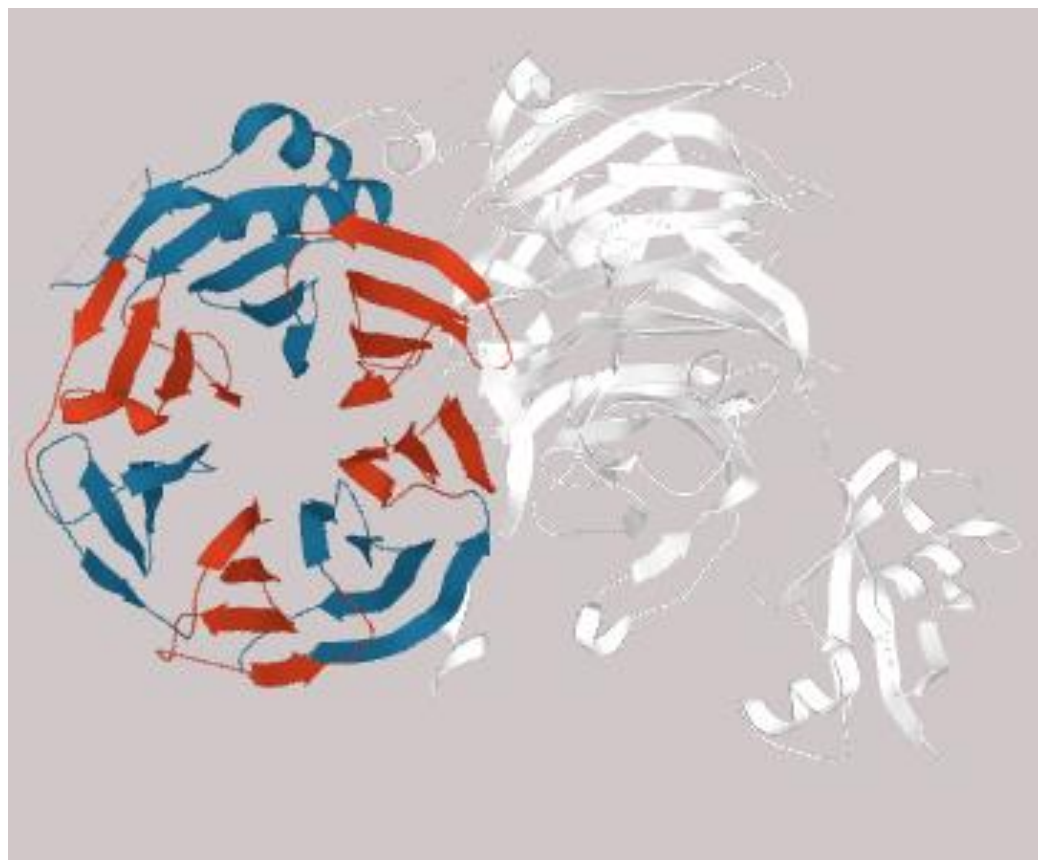
# Exercise 1. Examining repeat structures in repeatsDB

- Go to RepeatsDB: <http://repeatsdb.bio.unipd.it/>
- Click the "Search" tab, then search "Repeat unit number"
- Choose one example and write down the PDB name (e.g. 6yc3B).
- Check the assignment of the units. Is it correct? What about insertions? Are there mistakes? Write an evaluation: Looks good / one repeat wrong / many mistakes / total mess

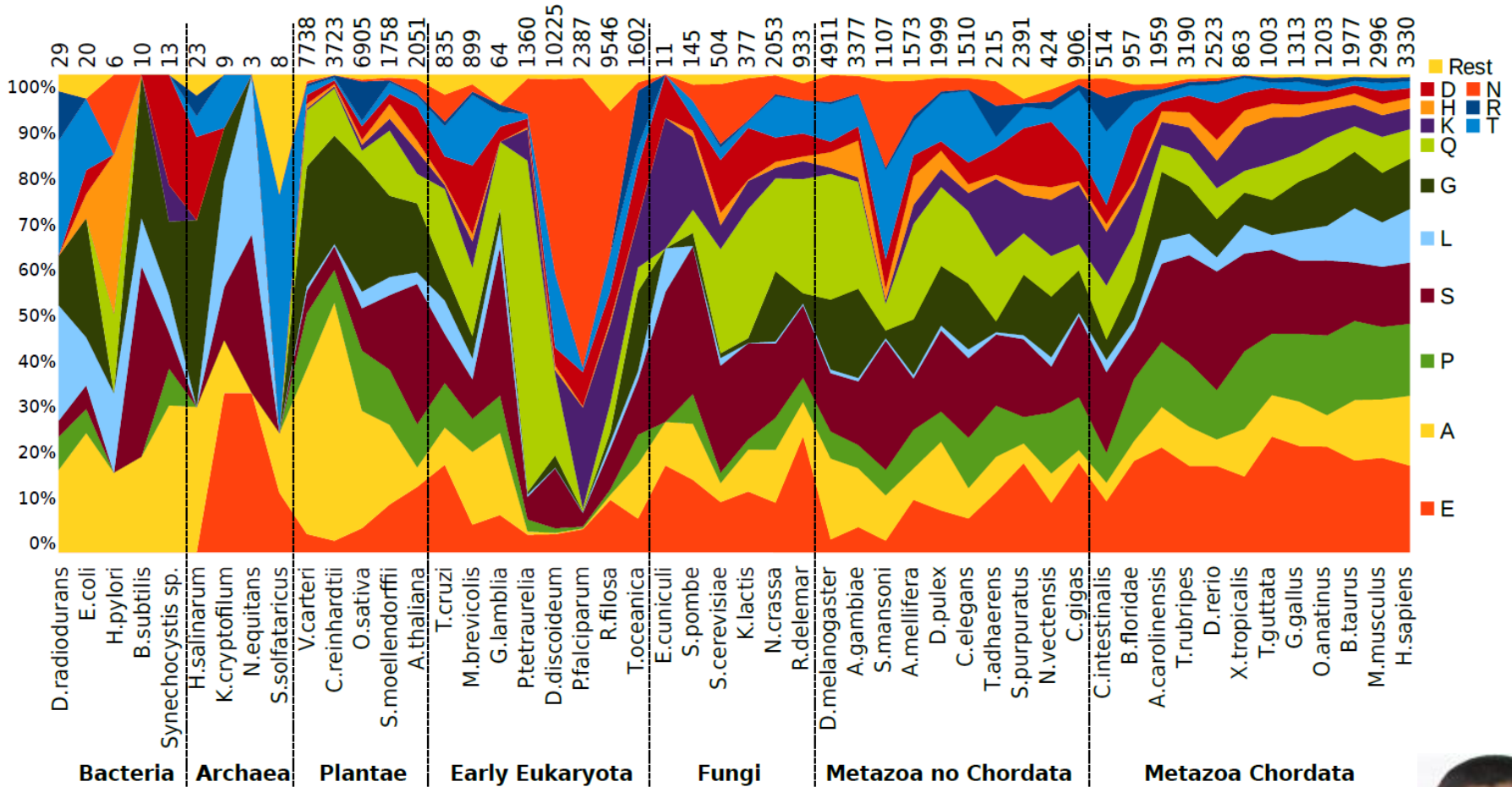
# Example

<https://repeatsdb.bio.unipd.it/structure/5cxbB>

1. looks good
2. one repeat wrong
- 3. many mistakes**
4. total mess



# Evolution of homorepeats in 50 species



Pablo Mier



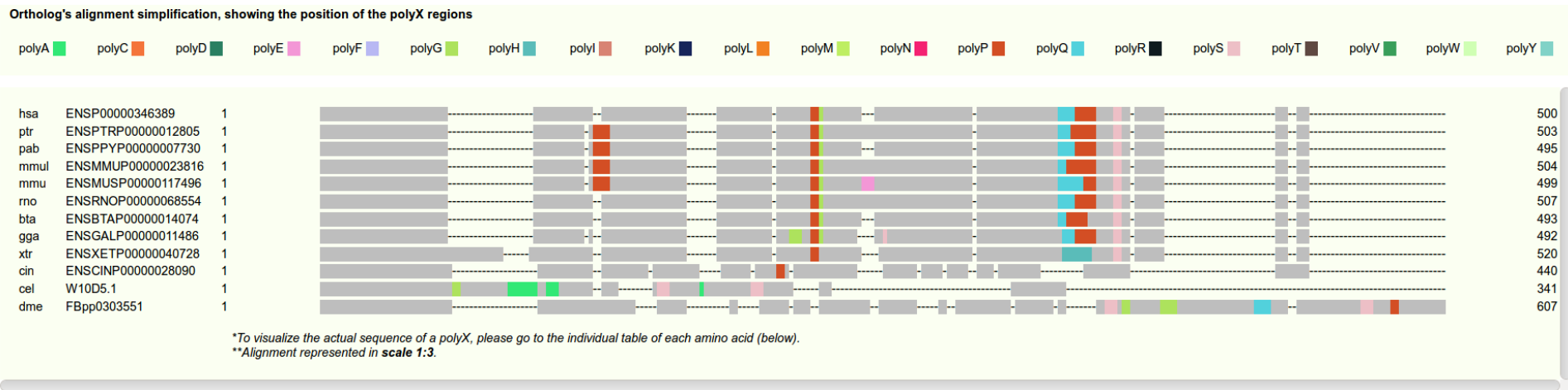
# Context and evolution of homorepeats

**Input & output overview**

Query: ENSP00000346389      Time elapsed: 1 seconds      Clustered results: [Download](#)      Ortholog's multifasta file: [Download](#)      Ortholog's alignment (fasta format): [Download](#)

Cutoff6: -      Cutoff8: -      Cutoff10: -      Cutoff12: -      Cutoff14: -      Cutoff16: -      Cutoff18: -      Cutoff20: -      Cutoff22: -

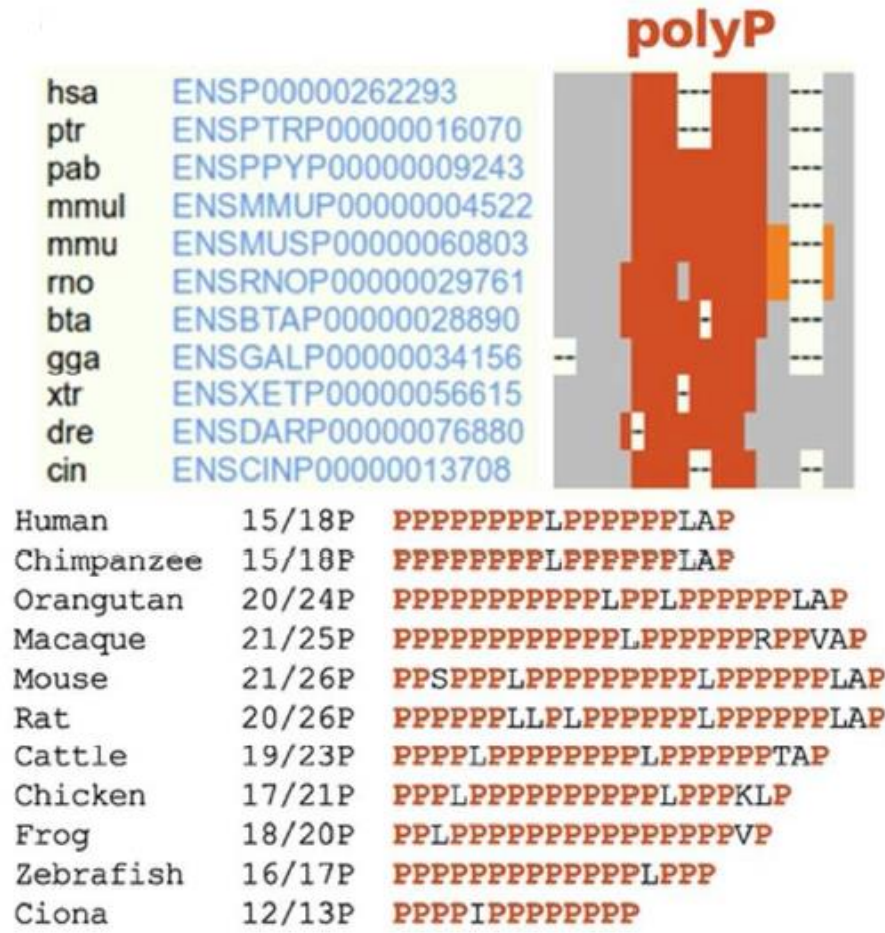
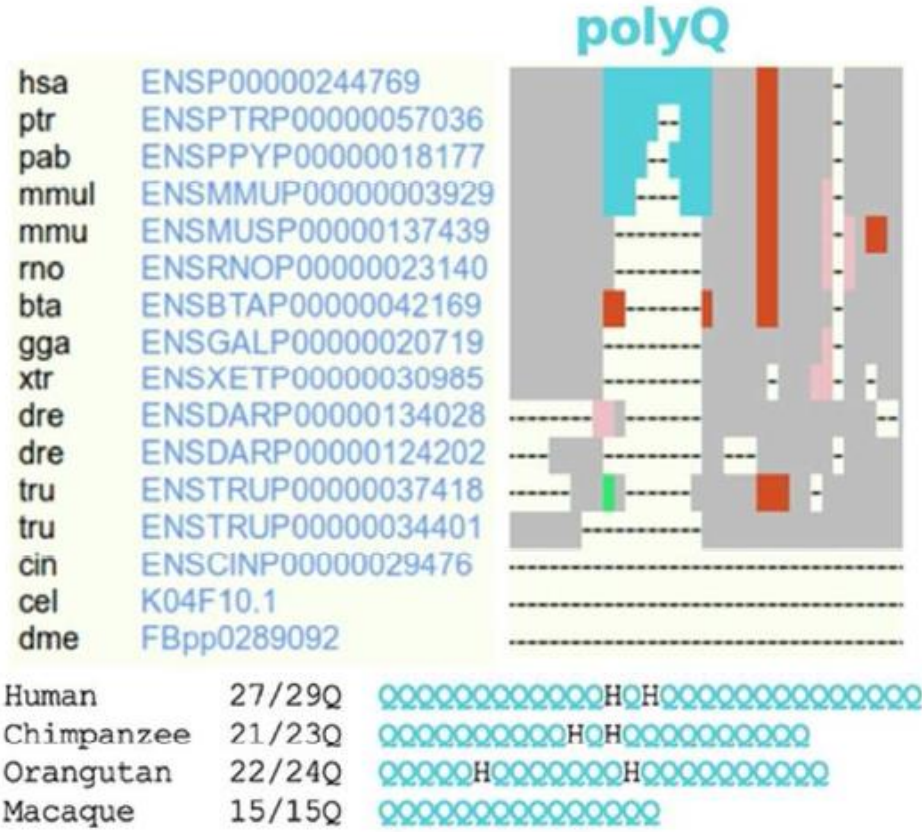
EnsemblProtein ID: ENSP00000346389  
AC: Q02078  
UniProtID: MEF2A\_HUMAN  
Description: Myocyte-specific enhancer factor 2A (Serum response factor-like protein 1)  
Gene Name: MEF2A MEF2



dAtabase of PolyX Evolution

Mier *et al.* (2016) Bioinformatics

# Context and evolution of homorepeats




dAtabase of PolyX Evolution



# Exercise 2. Viewing homorepeats in an alignment with dAPE

- Find a random human protein in **UniProt**. Make sure that it is a reviewed entry.

Write the Entry Name.

Entry ▲	Entry Name ▲	Protein Names ▲	Gene Names ▲	Organism ▲
<input type="checkbox"/> P36888 	FLT3_HUMAN	Receptor-type tyrosine-protein kinase FLT3[...]	FLT3, CD135, FLK2, STK1	Homo sapiens (Human)
<input type="checkbox"/> A0A010RCP6	A0A010RCP6_9PEZI	mRNA cleavage and polyadenylation factor CLP1	CLP1, CFIO01_00097	Colletotrichum fioriniae PJ7

## Exercise 2. Viewing homorepeats in an alignment with dAPE

- Find a random human protein in **UniProt**. Make sure that it is a reviewed entry.

Write the Entry Name.

- Copy the Entry ID (e.g. P10275).

- Go to the dAPE web page:

<http://cbdm-01.zdv.uni-mainz.de/~munoz/polyx/>

- Use the Entry ID in option A

- Hit the "Report the evolution of its polyX" button

- Write down: (1) Which type of polyX has the human protein?  
(2) Which **additional** polyX not in the human protein were found in the orthologs?

# Exercise 3. Find structures of short repeats

- Go to the PDB web page: <https://www.rcsb.org/>
- Go to Search > Advanced Search
- Type a short repeat in the Sequence Motif: as many repeats as possible; Use Mode PROSITE and RegExp (example: QQQQ / another example: [SP]SA[SP]SA[SP]SA )
- Click “count” to see if there are any cases
- Check the structure (3D View) to see if the repeat is in the structure (it could be disordered = absent)
- Write down the PDB name, RegExp and structure  
Example 3NB9 QQQQ alpha-helix  
Example 3FRC NNNN absent