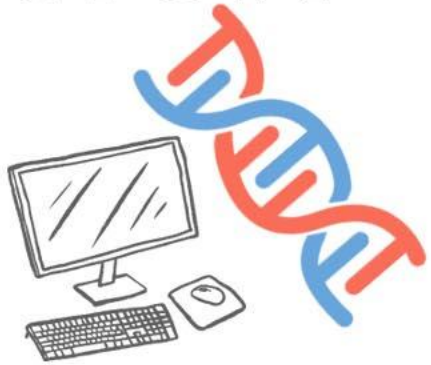
GENE EXPRESSION ANALYSIS WORKSHOP



June 20 - 21, 2024

The Carvunis Lab

Change and Innovation in Biological Systems

Workshop Team

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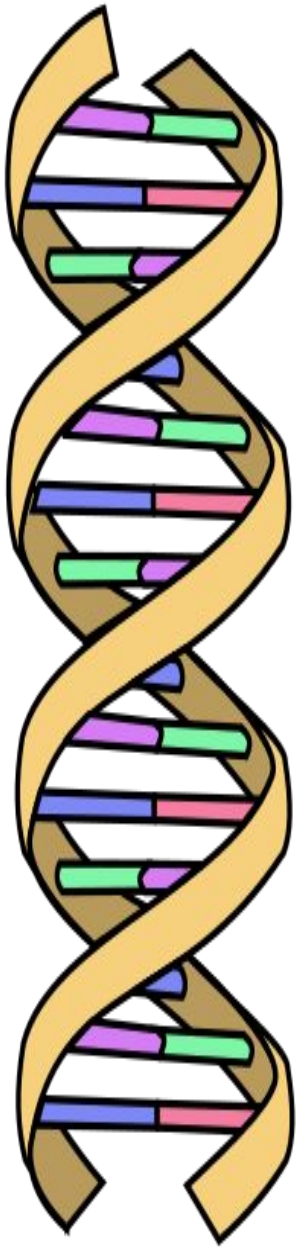


Schedule

June 20th:

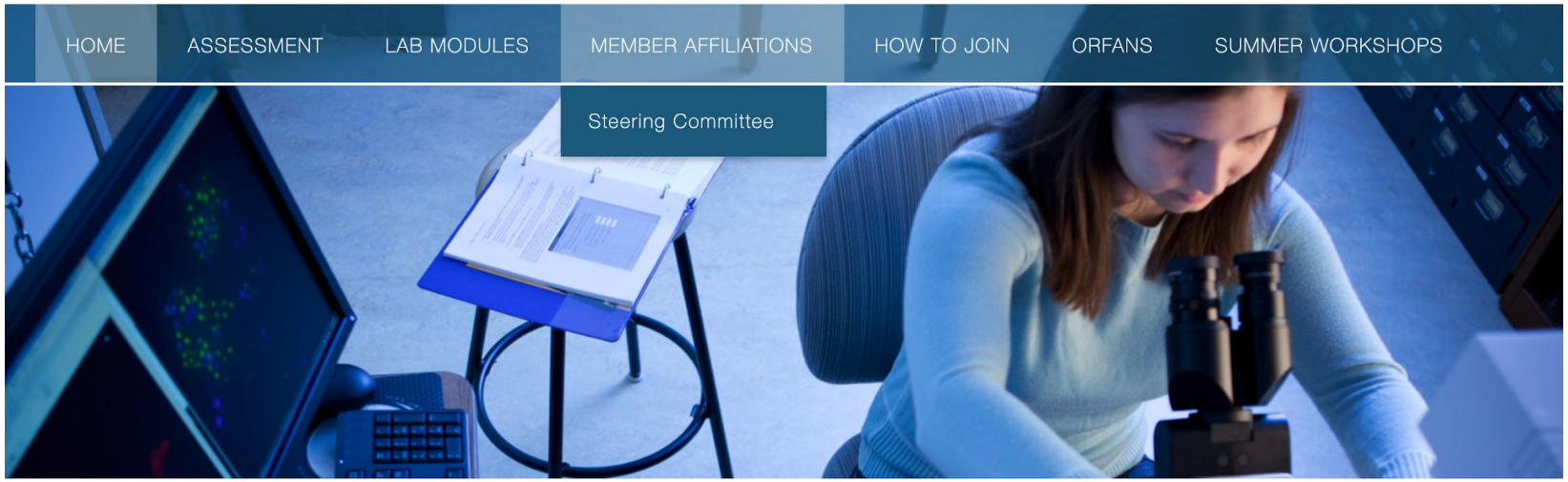
12:00 - 1:00 (4-5 UTC)	Introduction, background and goals
1:00 - 2:30 (5-6:30 UTC)	Work through modules in groups
2:30 - 3:00 (6:30-7 UTC)	Break (feel free to “visit” in the main room)
3:00 - 4:00 (7-8 UTC)	Continue working through modules in groups
4:00 - 4:30 (8-8:30 UTC)	Recap & assign homework

June 21st:

12:00 - 2:00 (4-6 UTC)	Work through modules in groups cont.
2:00 - 3:00 (6-7 UTC)	Presentations/discussions (in breakout rooms)
3:00 - 4:00 (7-8 UTC)	Discussion on how to incorporate in the classroom (all)

RCN-UBE: Yeast ORFan Gene Project

Finding a place for ORFans to GO



Welcome

The Yeast ORFan Gene Project is a consortium of undergraduate researchers and faculty at primarily undergraduate institutions (PUIs) to coordinate resources and design strategies to assign molecular functions to genes of unknown function in the model organism *S. cerevisiae* (Baker's yeast).

PAGES

Assessment
Lab Modules
Yeast "adopt a proto-gene" project
Member Affiliations
Steering Committee

2017-2022

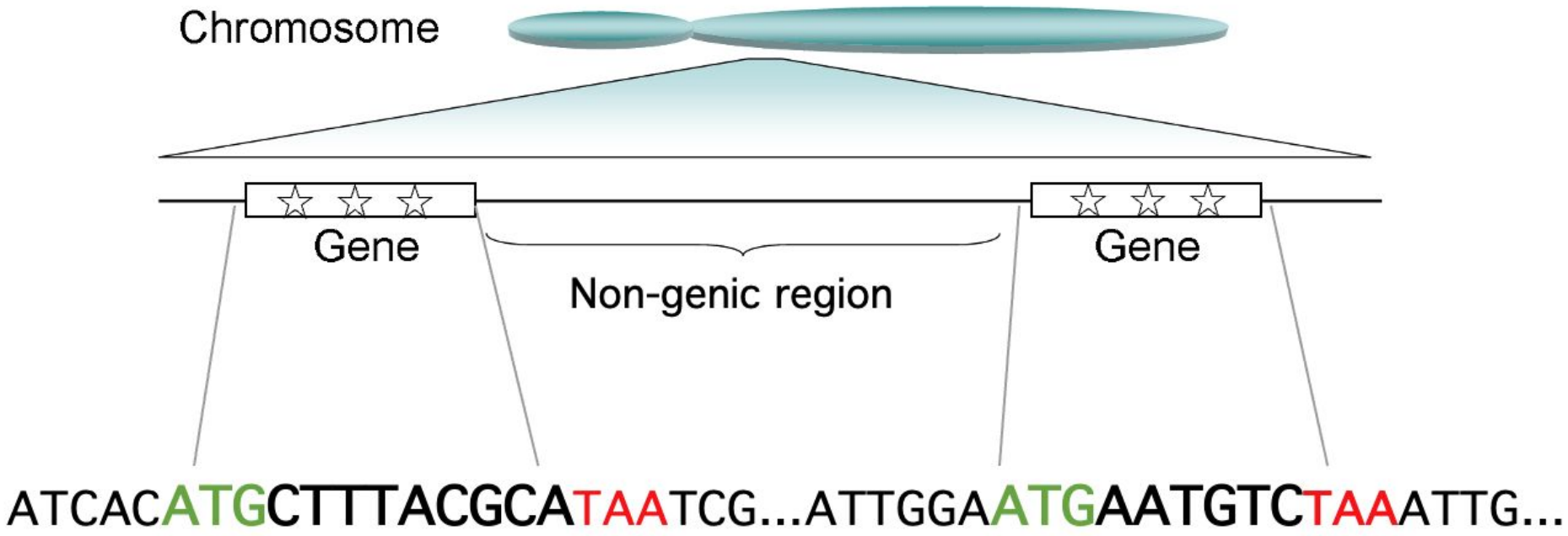
National Science Foundation

Adopt a Proto-gene Initiative

2022-2026

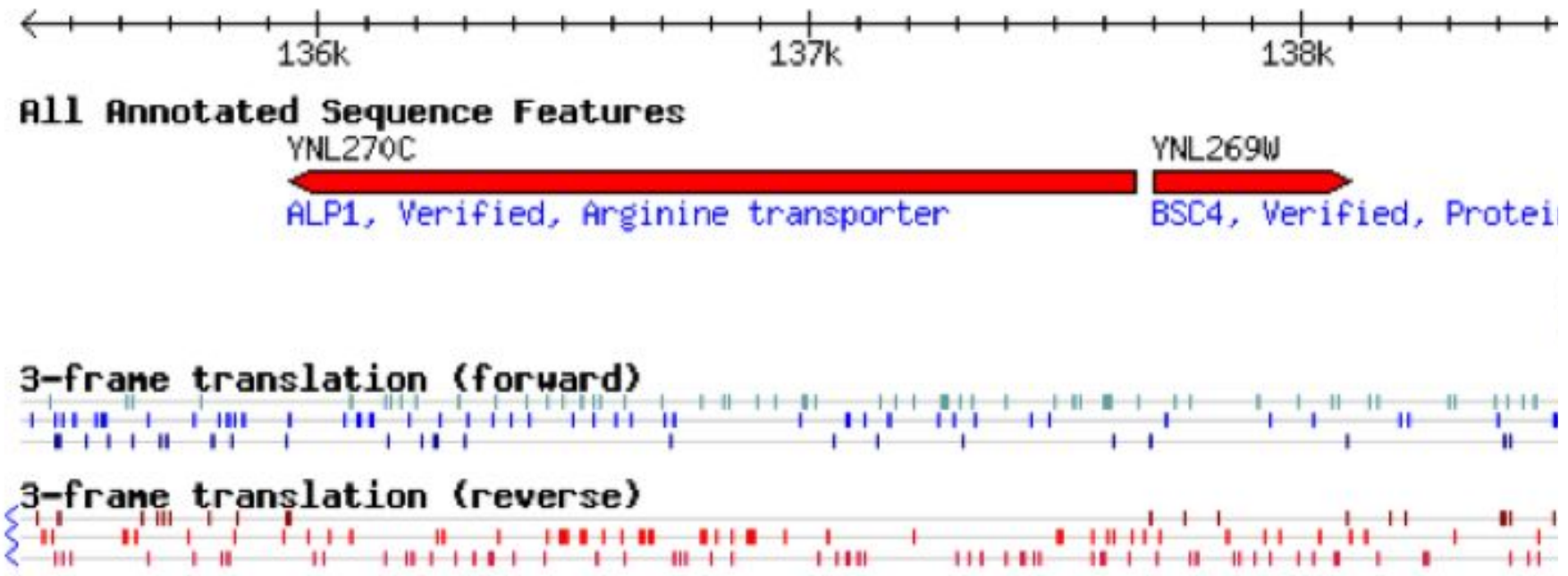
Genome = genes + non-genic sequences

Gene = DNA sequence coding for a functional protein



(intergenic, non-coding)

Yeast genome : 6,000 genes and a multitude of random open reading frames (ORFs)

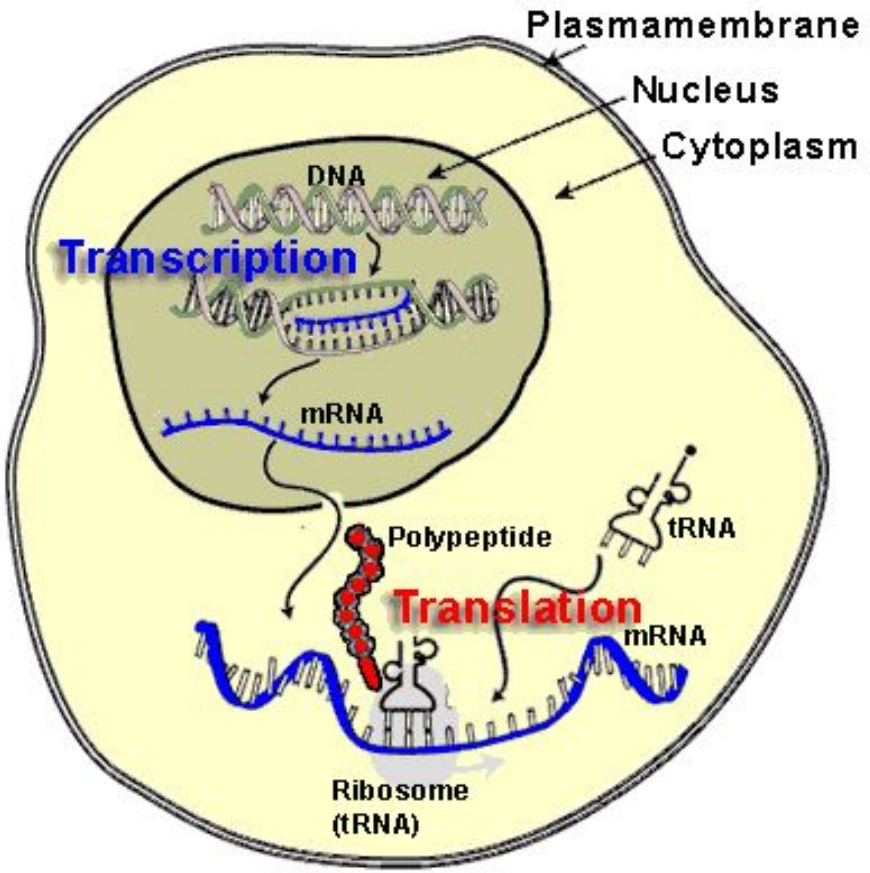


STOP codons

SGD screenshot

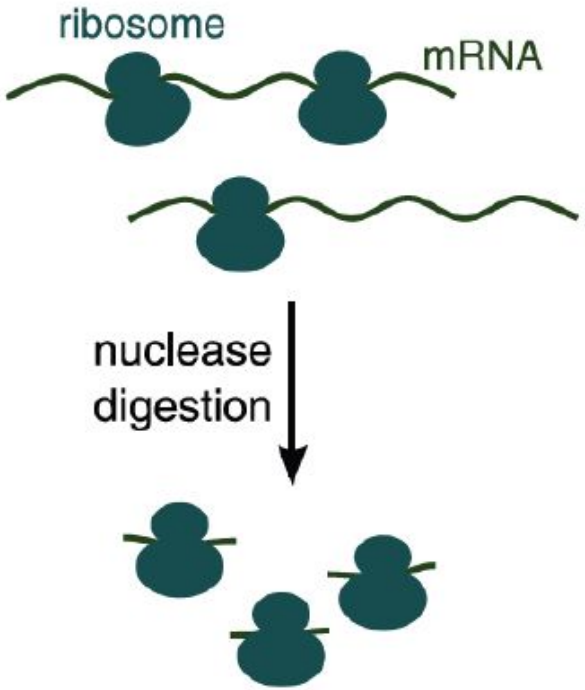
~6,000 protein-coding genes including 700 ORFans (Genes of Unknown Function)
>150K non-genic ORFs

What is translated?



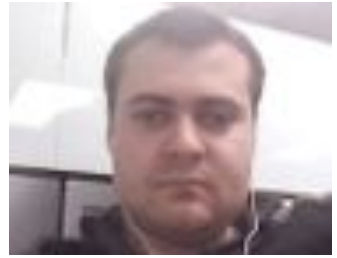
Talking Glossary of Genetics

Ribosome profiling



Ingolia et al., Science 2009

iRibo

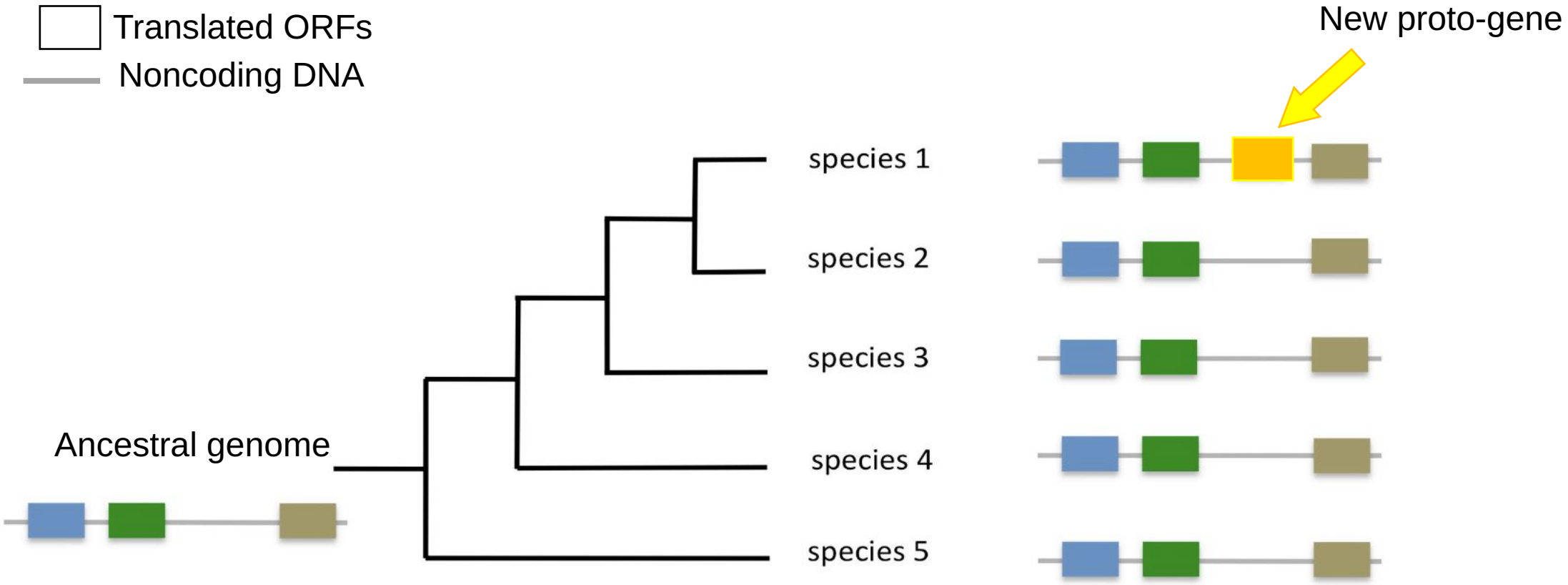


Dr Aaron Wacholder

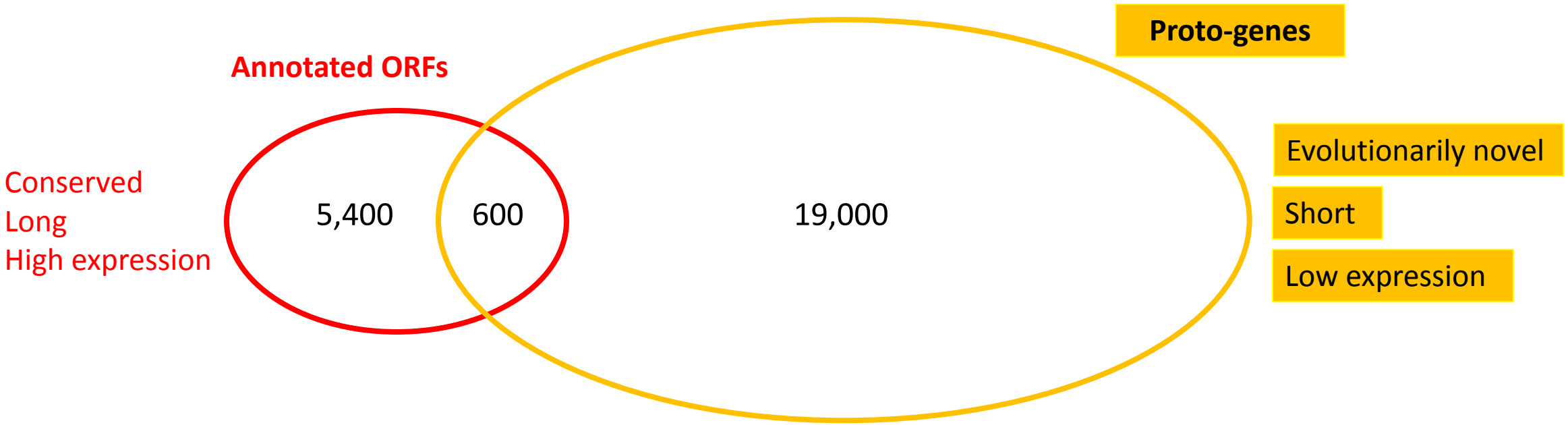
Wacholder et al, Cell Systems, 2023

6,000 genes + 19,000 proto-genes

Proto-genes: translated ORFs of recent '*de novo*' origins



An immense number of ORFans in need of scientific care! Help characterize them with your students



Our research: What do they do? How do they evolve? Do they participate in making each species unique?
This workshop: proto-genes as a teaching tool for **gene expression**

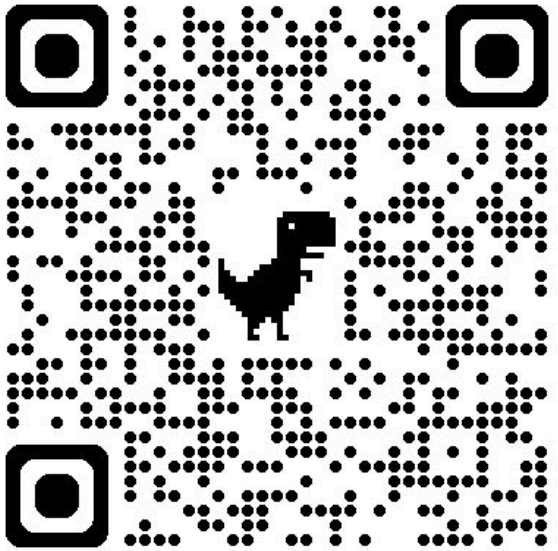
Gene Expression: how to access modules and resources

This workshop is an expansion of the Yeast ORFan/GUF project

Modules are accessed at the following web site:

https://www.yeastorfanproject.com/lab-modules/yeast-adopt-a-proto-gene-project/

- Five modules
- Available as both PDF and a read-only link to a google doc for download



Workshop goals:

1. Explore a proto-gene through completion of the five modules

   A list of sample proto-genes can be found in Table 1 of the introduction

2. Make a short (1-3 minute) presentation to deliver to your breakout room on Day 2.

   a. Summary of what was discovered about your proto-gene
   b. Time and goals for use in a selected course. Template is provided
      i. Alternate template for student participants who are not currently planning for a specific course.
   c. Leave workshop with a specific plan for incorporating gene exploration in one of your courses and/or research projects

3. Provide us with feedback on the modules

Thursday schedule

now - 2:30 PM ET now - 6:30 PM UTC	work through modules in groups start with the Introduction followed by Module 1
2:30 - 3:00 PM ET 6:30 - 7:00 PM UTC	break
3:00 - 4:00 PM ET 7:00 - 8:00 PM UTC	continue working in groups
4:00 - 4:30 PM ET 8:00 - 8:30 PM UTC	Recap & introduce tomorrow's agenda

You do not need to finish all the modules today,
there will be time to work on them tomorrow

The modules

1. Differential Expression
2. Regulatory Motifs
3. Genome Browser
4. Coexpression
5. Localization

Each module has an associated guide and worksheet with questions for you to answer

Groups are small to encourage discussion and working together

If you have questions

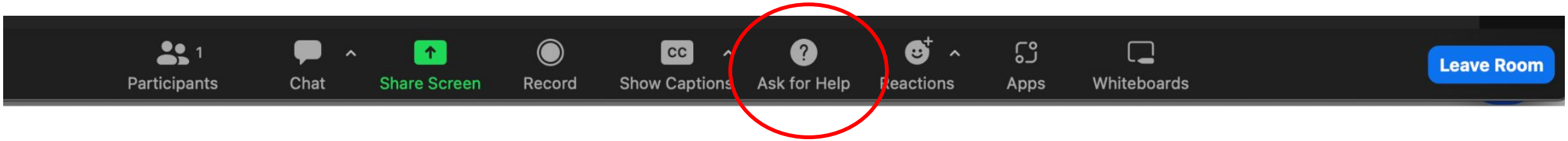
Nelson

Lin

April

Nozomu

If you have questions



Slack: for feedback and announcements

- There is a slack channel for each module
  - If you have comments or suggestions, please type any feedback into the corresponding module's slack channel.

    #module1-differentialexpression
    #module2-regulatorymotif
    #module3-genomebrowser
    #module4-coexpression
    #module5-localization

- Any updates or announcements will be posted in the **#announcements** slack channel and also posted in the zoom chat

Any questions?

type any questions in the chat

Wrap-up Day 1

- Hope everyone made some progress on the modules
- **Homework!** Download the template for the presentation to your computer. Links on slack (**#announcements**) and the web site.
- Name the file as your protogene_first name_last name.
  - For example: YBR196CA_Jill_Keeney
- Be thinking about what you want to put in it (and start if you want!)
- Day 2, Friday:
  - Noon-2 (4-6 UTC): work on modules and your presentation
  - 2-3 (6-7 UTC): in small groups, present to each other and discuss plans
  - 3-4 (7-8 UTC): all together, report back and discuss

Gene expression workshop Day 2

12:00 - 2:00 (4-6 UTC): Work on modules and presentation

2:00 - 2:10 (6 UTC): Main room for instructions

2:10 - 3:00 (6-7 UTC): In breakout rooms present and discuss

3:00 - 4:00 (7-8 UTC): Full group discussion and wrap-up

Day 2, **Instructions for presentations/discussion** (~2-3 pm)

In your breakout groups (for ~1 hour)

1. Assign a moderator and a spokesperson
2. Each participant makes a presentation.
   a. Moderator keeps time, 3 minutes maximum for each presentation
   b. UPLOAD your presentation to the **#presentations** slack channel
3. Following presentations, discuss the following (spokes-person takes notes to summarize in full group discussion):
   a. Did you learn anything new/useful in the modules?
   b. Which modules/tools would be most useful in your courses?
   c. Do you have enough background information to adapt the modules for your courses?
   d. What other/additional resources are needed for the modules to be successful?
   e. Would you be likely to have students adopt-a-protogene for a course or for research?

Day 2, 3-4 pm, Full workshop discussion

Using modules in your courses

1. Report from each break out room
2. Open discussion/questions
3. Wet lab resources
4. Workshop assessment

We’d love to hear your feedback

Please take time to complete the survey!

tinyurl.com/Protogene2024Feedback