

# Scientist How-to

Welcome to the four-color universe simulation! You and your team are astronomers and cosmologists at a research institution studying the structure of the universe.

In this simulation, the universe is a 12-by-12 array of cells. Each cell contains one color: red, yellow, green, or blue.

To study the universe, you need data. To make an observation, you will specify a 3-by-3 or 2-by-2 subarray for the universe. When you make your observation, you will learn the distribution of colors in your subarray. For example, if you do a 3-by-3, you might learn that the 9 cells contain one red, two yellows, two greens, and four blues.

## Getting started

Click the link below to start the simulation.

CODAP



<https://codap.concord.org/releases/latest/static/dg/en/cert/index.html?di=https://codap.xyz/nos/scen/univ/univ.html>

You will see something like the illustration on the left (though it will have changed somewhat by the time you read this, the functionality will be the same):



Your instructor will give you a world code (two words separated by a period; we'll use `due.fill` as an example) to enter into the box. Do so, and click **join**. Next, you will see a page with a list of institutions, maybe like the illustration on the right, above.

You will have been assigned to a team. Click **join** for the correct team.



Note: this simulation is in early development. There is very little security. It would be easy to join a different team and do things to make their lives miserable. Please don't. As you will discover, you need them to do well.

Once you have joined a team, you go to the "observatory," where you can make observations, review your data, create illustrations based on the data that you will put into research papers, and read the journal where your fellow cosmologists publish their work.

To actually write papers, you need a different tool, which you should open in a different browser tab. Or, since you are in a team, different team members might be in charge of different functions. The "writer" tool is here:

#### Writer

You need to get a world code from someone who has created a world.



<https://codap.xyz/nos/nosJournalWriter.html>

Just as in the "observatory" tool above, you will enter your game code and then choose your institution.

## "Observatory" functions

In the first window you opened, you will see a box labeled "observatory." Above it you can see a number of tools such as a map button and a calculator. Those are all part of CODAP, a data analysis package. You will probably not need much—if any—CODAP functionality for this activity.



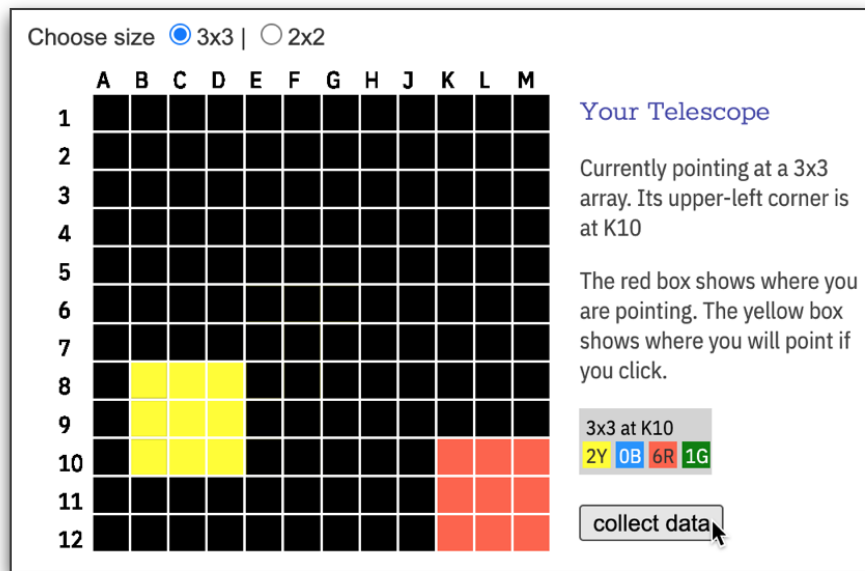
The observatory interface is mostly self-explanatory, but we will describe its five tabs here for reference.

## Observations

You'll see the 12-by-12 array with row and column labels. If you move your mouse over it, you can highlight a yellow 3-by-3 sub-array, which you can change to 2-by-2 using some buttons at the top.

If you click, the yellow box turns red. That shows where your telescope is pointing. Text shows the "coordinates" of the upper-left corner of the red box, for reference.

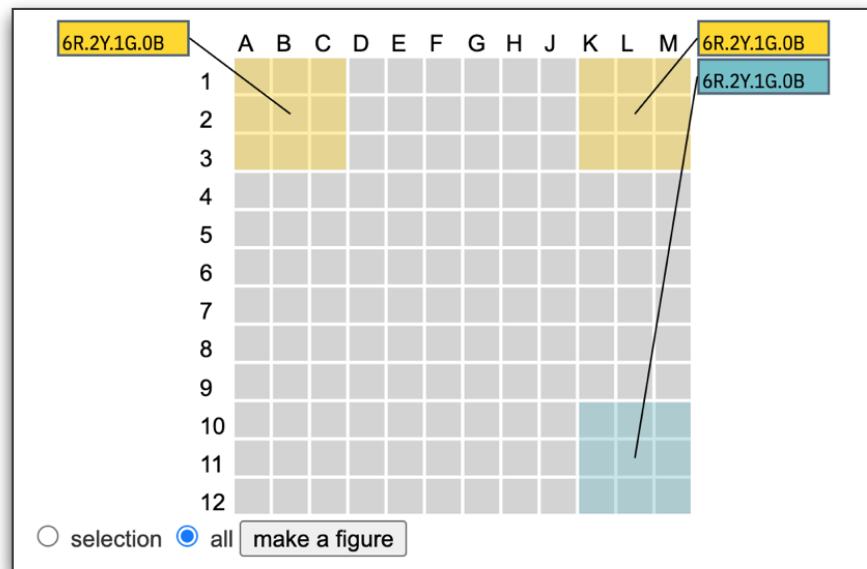
If you click `collect data`, you will get results from the sub-array you have specified (the one in red). In the illustration, we've just gotten data from the red square in the lower right. Its "upper-left corner" is at K10.



When you make your first observation, a CODAP table appears. It keeps a record of all of your team's results.

## Data

The data tab gives you a visual summary of all of your results plus any results you have learned about by reading the journal. You can select observations by clicking on them in the "universe," by clicking on the "plaques" that label them, or by clicking on rows in the CODAP table.



This shows that we know about three observations in our universe. We made one ourselves, and learned about the other two by reading in the Journal.

## Making figures

When you submit a paper to the journal, you probably want a figure to illustrate your findings (it also shares the data that was involved in making the figure).



*You begin making figures in the **Data** tab of the observatory.*

The selection and all buttons there restrict or expand the set of observations you want to include. If you are making a particular point, you probably want to restrict the observations to the set that's relevant.

Once you are showing the observations you want, click **make a figure**. You will then be taken to the next tab...

## Edit Figure

In the **Edit Figure** tab, give the figure

- a title—a nickname so you can remember it,

- a caption (this will appear in the paper), and
- any notes you want to record.

Once you have the text you want, click **Save this figure**. It is not saved until you do!

Note: you cannot change the "illustration" part of the figure here! To get a different illustration, you must go back to the **Data** tab and make a new figure.

## Figures Storage

Once you have saved a figure, it will show up on the **Figures Storage** tab. There, if you have not yet attached it to a paper submitted for publication, you can edit it (i.e., change it nickname, caption, or notes) or delete it.

## Journal

In this tab, you can read the Journal.

## "Writer" functions

You can think of this other web page (probably in a different tab in your browser) as an office at the research center where you can put together papers for publication.



It is unrealistic that, as a scientist, you have to create your figures at the observatory but can only write at the office! We know. Sorry. Cope. The various "figures" tabs in the other window represent all of your data storage and graphics capabilities.

## list

This tab shows what papers you have written and what their current status is, for example, "published," "submitted," etc.

## writing

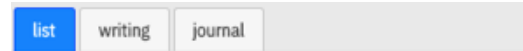
Write your papers in this tab. Enter a title, the names of the authors, and the text of your paper. These papers are *short*!

You can also choose a figure from a menu. One figure only at this time.

When you have it set the way you want for now, you can save it as a draft (it will appear in the **list** tab, where you can edit it more); save it and submit it for publication; or just discard it.

Below the figure menu, there are three expandable areas.

- **view figure** lets you see what that figure looks like in case you forgot.
- **references** lets you refer to other published papers; if your work builds on others, acknowledge them. If your paper includes data published elsewhere, they get referenced automatically.
- **messages with reviewers** will show messages from the journal editors, for example, if they want revisions before publication.



### Paper Status

title	authors	status	action
	Mello	resubmitted	<button>view</button>
Universe is Constant	Trollo	published	<button>view</button>



### Writing Papers

save as draft  
save and submit  
discard this paper

status: (draft)  
team: Massachusetts Institute of Technology  
title:   
authors:   
write your text here  
text:   
figure: 

(none)

Constant?

✓ Constant 2

▶ view figure(s)  
▶ references  
▶ messages with reviewers

# journal

This shows the journal, like the similar page in the observatory window.

The journal is not just for reading, however. When you read a paper published by another team, you have the option of "learning" the data that they used in their paper. In this simulation, that means, the data they used to make any figure(s).

In the example, you could press the learn 4 results button, and then the four corner observations from that paper would appear in your data store.

