



Radio Galaxy Zoo: LOFAR



Erik Osinga (Leiden University)
on behalf of the RGZ:LOFAR team

with special thanks to M. Hardcastle & H. Dickinson

The Low Frequency Array: LOFAR



The Low Frequency Array: LOFAR



The LOFAR Two Metre Sky Survey: LoTSS

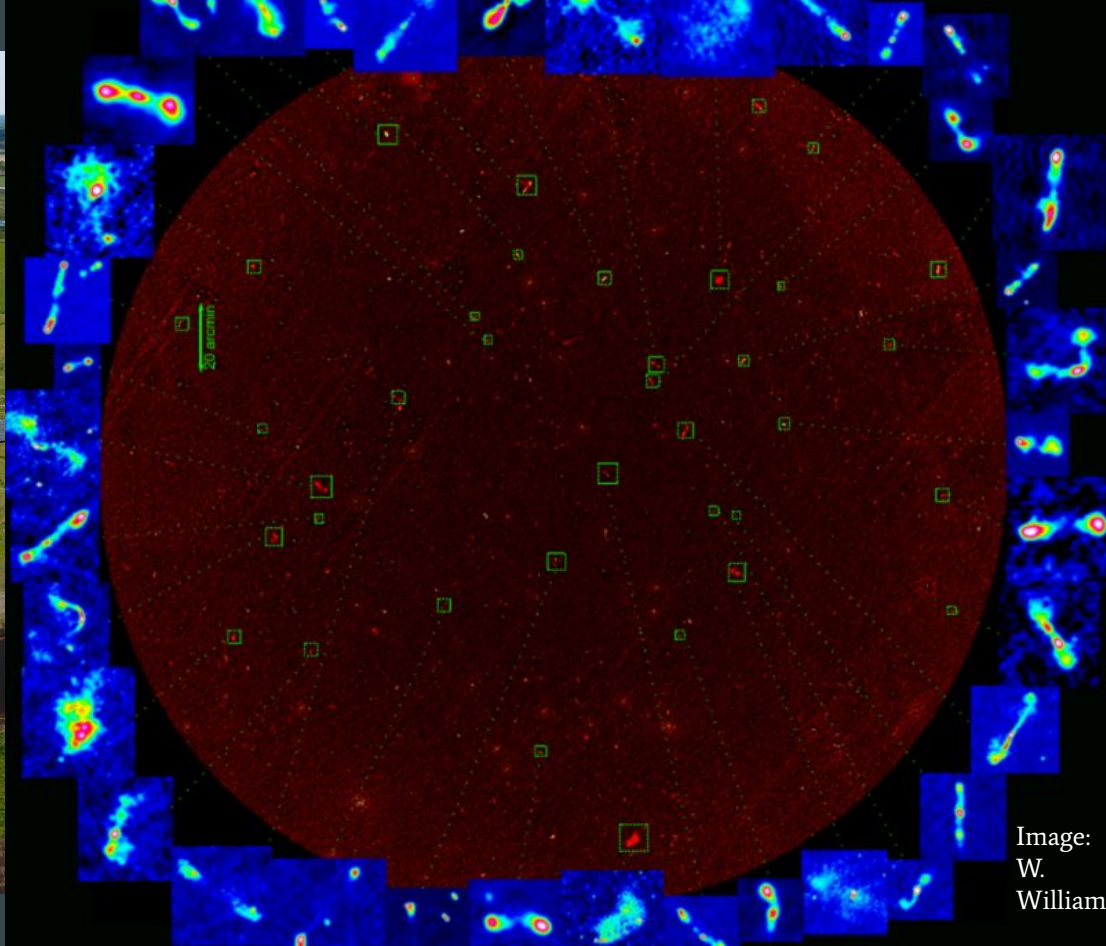


Image:
W.
Williams

The LOFAR Two Metre Sky Survey: LoTSS

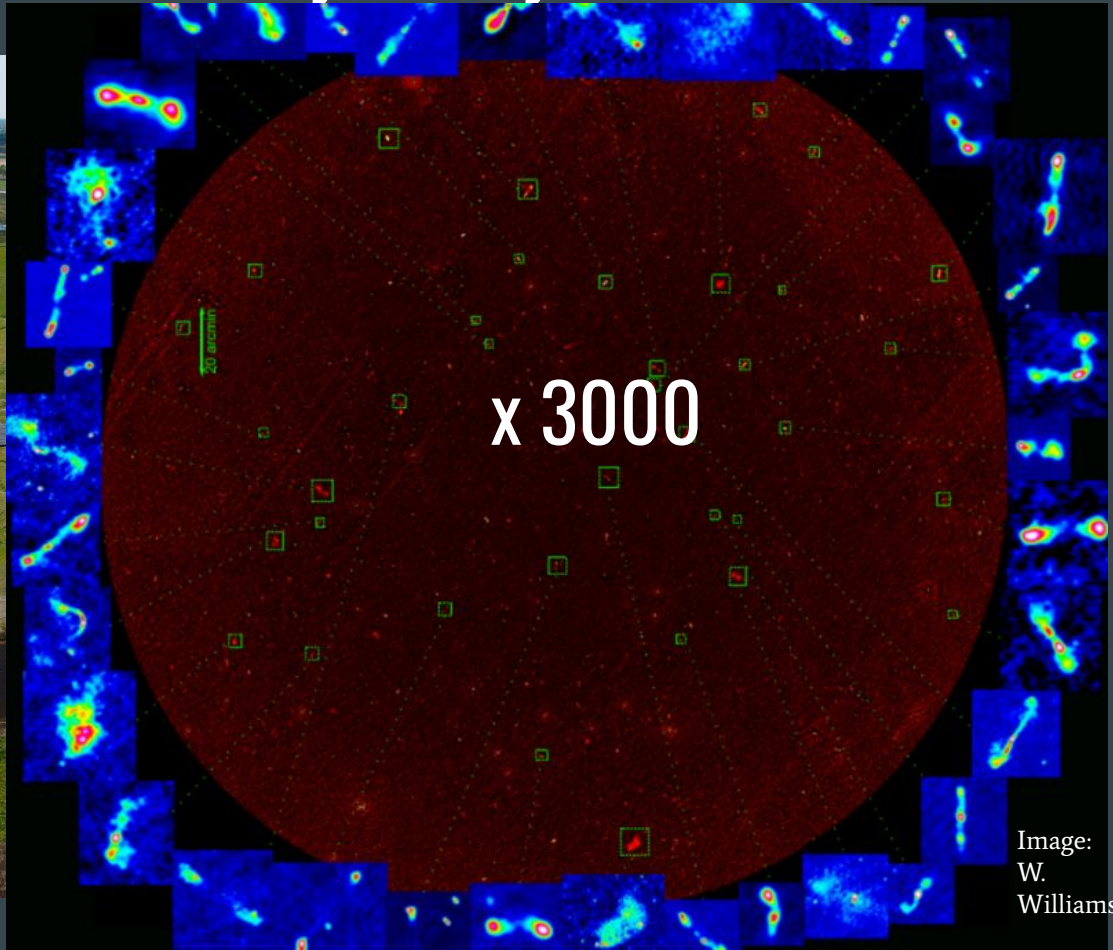


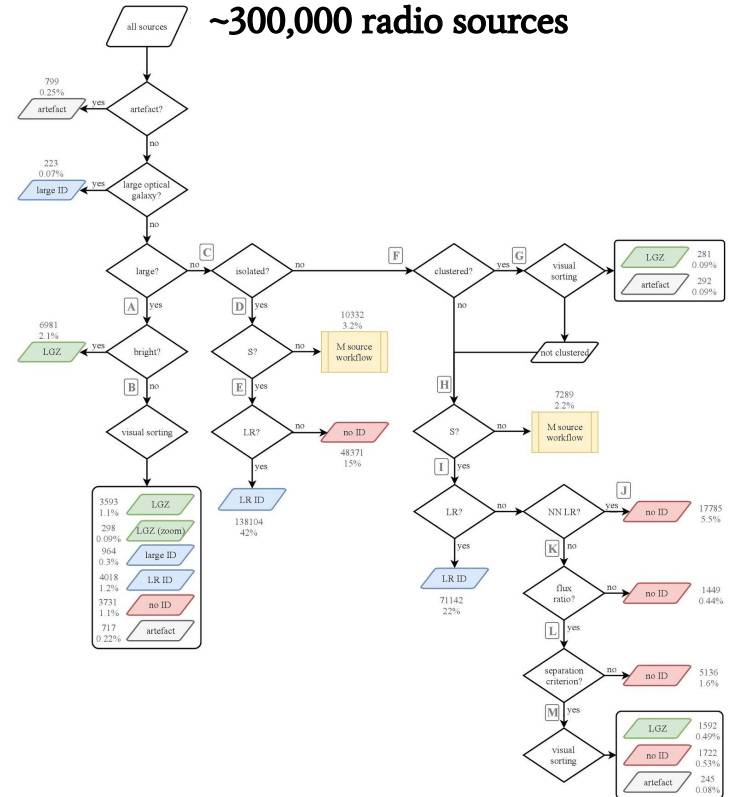
Image:
W.
Williams

Why do we need citizen Science?

Williams et al.: LoTSS-DR1 optical identifications

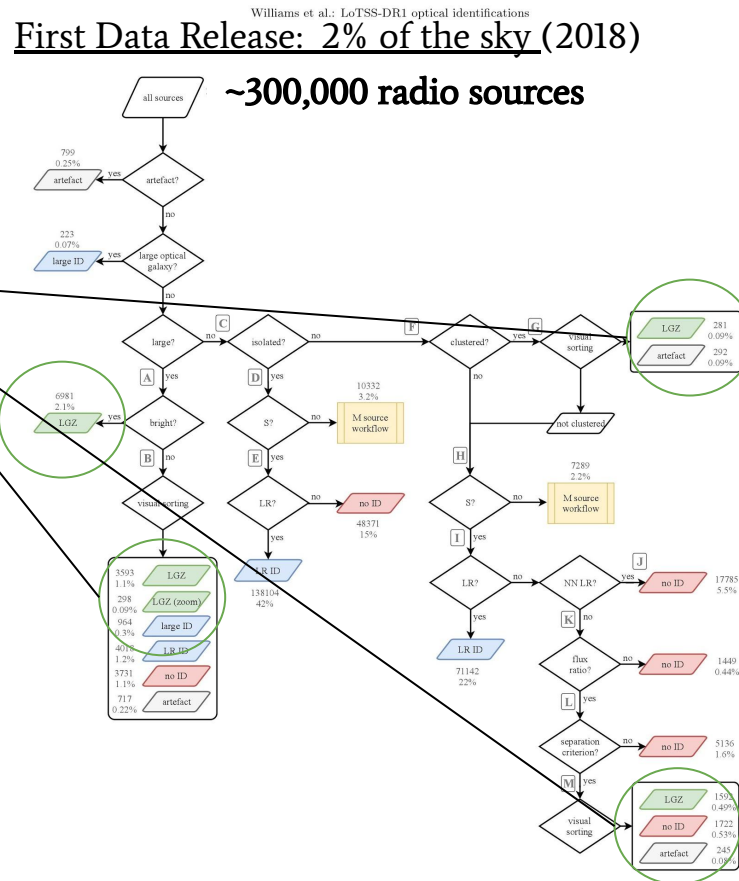
First Data Release: 2% of the sky (2018)

~300,000 radio sources



Why do we need citizen Science?

**12,745 complex sources
required visual inspection**



Why do we need citizen Science?

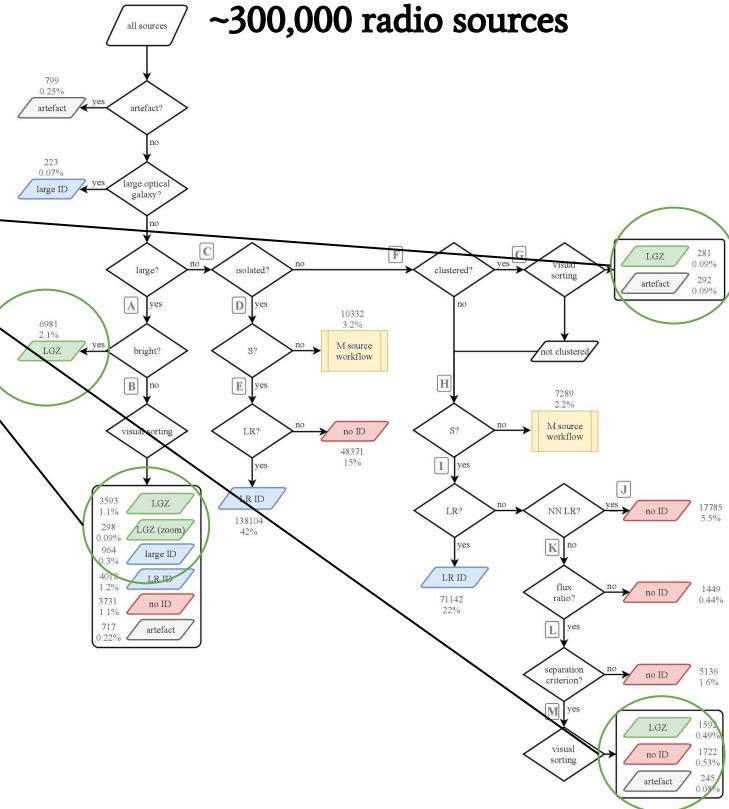
12,745 complex sources
required visual inspection

>100,000 require visual
inspection for the second
release

First Data Release: 2% of the sky (2018)

Williams et al.: LoTSS-DR1 optical identifications

~300,000 radio sources



Radio Galaxy Zoo: LOFAR

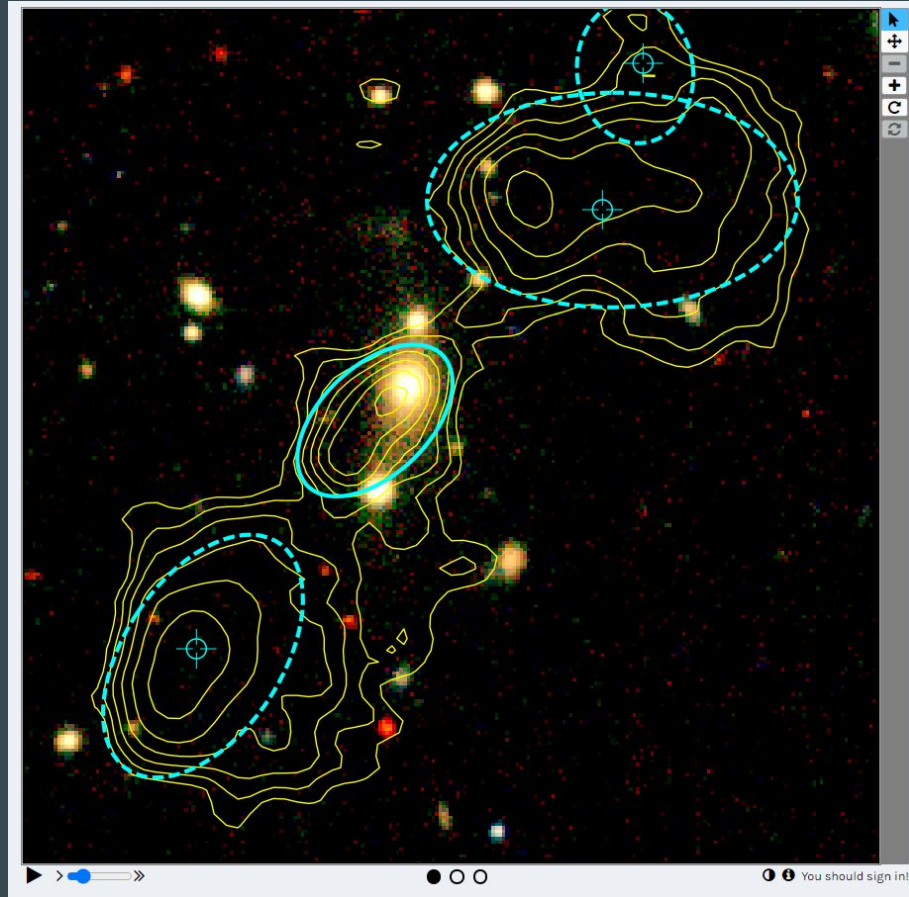
Help astronomers locate and
identify supermassive black holes
and starforming galaxies!

[Learn more](#)

<http://lofargalaxyzoo.nl/>

What are the tasks?

What are the tasks?



Radio
Optical
Components

What are the tasks?

PROJECTS ABOUT GET INVOLVED TALK BUILD A PROJECT NEWS SIGN IN REGISTER

Language English

IFY TALK COLLECT

Radio Galaxy Zoo

Selection marker

Task 1: Marking Ellipses

Your first task is to place a marker inside all of the **dashed ellipses** that you think surround parts of the same radio structure as the **solid ellipse**.

Normally, this means that the radio contour lines within the **solid ellipse** are connected to those within the **dashed ellipses** that you mark.

You can **mark a dashed ellipse** by clicking somewhere **close to its centre**. This will drop a light blue crosshair where you clicked, which you

Continue

FIELD GUIDE

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inside the **solid ellipse**.

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WITH THIS TASK?

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ZOONIVERSE

association

What are the tasks?

PROJECTS ABOUT GET INVOLVED TALK BUILD A PROJECT NEWS SIGN IN REGISTER

Radio Galaxy Z

Source selection marker

Language English

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TUTORIAL

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Task 2: Marking the optical counterpart

For some images, it might be possible to identify a **single source** in the optical background image that seems to be generating the radio emission. We call this the "optical counterpart".

To get a clearer view of the optical image, it can help to toggle the yellow contour lines by clicking on the small circles below the subject image.

If you can see an obvious **single** optical

Continue

◀ ○ ○ ○ ○ ○ ○ ● ○ ○ ▶

ZOOVERSE

FIELD GUIDE

identification

What are the tasks?

PROJECTS ABOUT GET INVOLVED TALK BUILD A PROJECT NEWS

Radio Galaxy Z

Source selection marker

Task 2: Marking the optical counterpart

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Language

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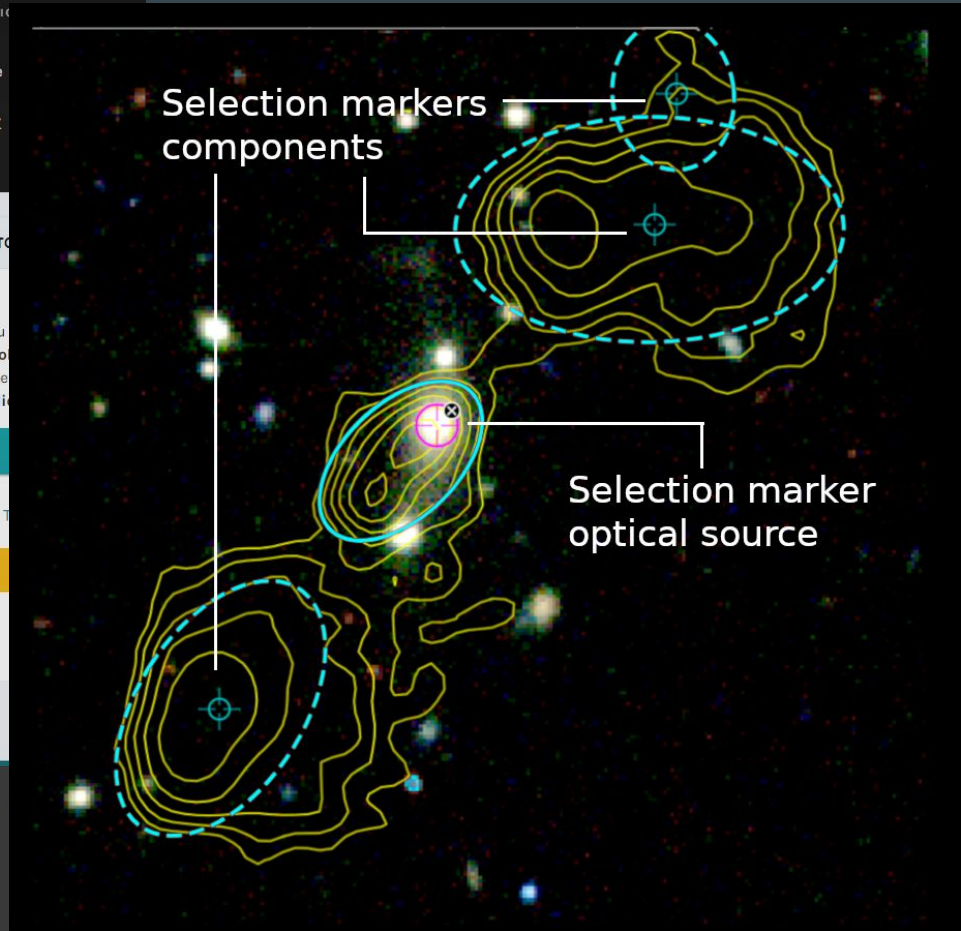
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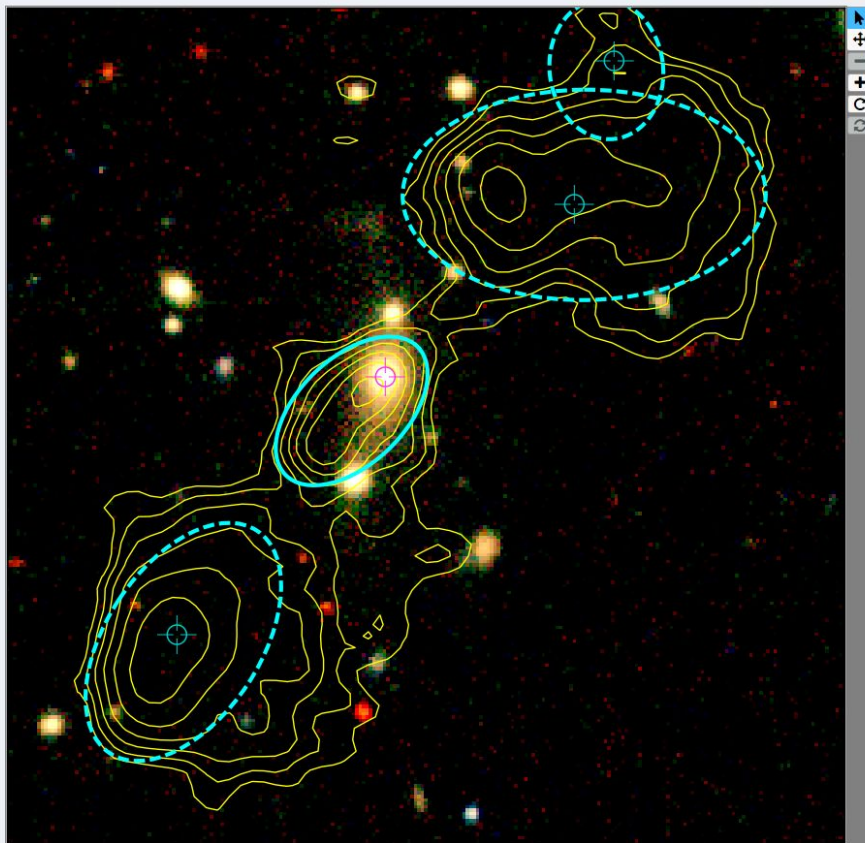
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ZOONIVERSE



What are the tasks?



TASK

TUTORIAL

Additional information

Does it not look like a natural source (artefact)? Does it look like several distinct radio sources form part of the same ellipse (blend)? Do you think there is more emission associated with the source outside the image shown (Too zoomed in)? Is part of the optical image missing (image missing)? Or is something else wrong? Let us know!

For examples of these cases, check out the **complex cases and pitfalls** section in the **field guide**!

When you are done you can go on to the next image. Do not forget that you can also click on "Talk" if you have a question or want to discuss this image with others.

Artefact

Blend

Too zoomed in

Image missing

Other

NEED SOME HELP WITH THIS TASK?

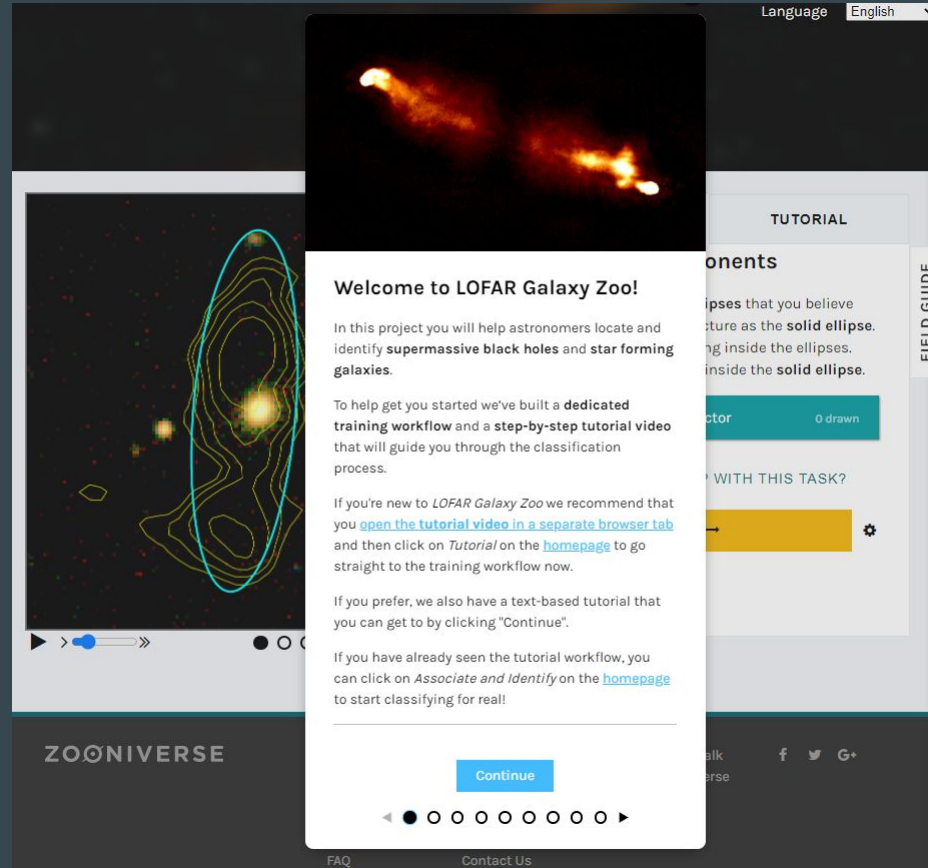
Back

Done & Talk

Done

Training the volunteers

Training the volunteers



First time: Tutorial pop up

Training the volunteers

The screenshot shows the LOFAR Galaxy Zoo interface. At the top, there are navigation links: PROJECTS, ABOUT, GET INVOLVED, TALK, BUILD A PROJECT, NEWS, SIGN IN, and REGISTER. A language dropdown is set to English. The main area displays a radio galaxy image with yellow and green contours. A feedback pop-up is overlaid on the image. The pop-up has a 'Feedback' title and a 'COLLECT' button. It shows a 'HITS' section with one match: 'Well done, this is part of the source (2 matches)'. It also shows a 'MISSES' section with one match: 'You missed a source component (1 match)'. There is an 'OK' button at the bottom right of the pop-up. The background interface includes a 'FIELD GUIDE' sidebar and a 'ZOOVERSE' logo at the bottom.

Feedback

English

COLLECT

FIELD GUIDE

HITS

- Well done, this is part of the source (2 matches)

MISSES

- You missed a source component (1 match)

OK

Hugh Dickinson will cover Feedback in a workshop

The screenshot shows the LOFAR Galaxy Zoo interface with a tutorial pop-up. The pop-up is titled 'Welcome to LOFAR Galaxy Zoo!' and contains the following text: 'In this project you will help astronomers locate and identify supermassive black holes and star forming galaxies.' It then says: 'To help get you started we've built a dedicated training workflow and a step-by-step tutorial video that will guide you through the classification process.' It continues: 'If you're new to LOFAR Galaxy Zoo we recommend that you open the tutorial video in a separate browser tab and then click on Tutorial on the homepage to go straight to the training workflow now.' It also mentions: 'If you prefer, we also have a text-based tutorial that you can get to by clicking "Continue".' Finally, it says: 'If you have already seen the tutorial workflow, you can click on Associate and Identify on the homepage to start classifying for real!'. There is a 'Continue' button at the bottom right of the pop-up. The background interface includes a 'TUTORIAL' sidebar and a 'ZOOVERSE' logo at the bottom.

Language English

TUTORIAL

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ture as the **solid ellipse**.
ng inside the ellipses.
inside the **solid ellipse**.

0 drawn

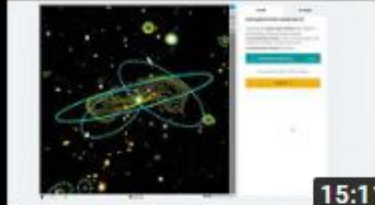
WITH THIS TASK?

ZOOVERSE

Continue

First time: Tutorial pop up

Training the volunteers



15:11

LOFAR Galaxy Zoo Instructievideo (Nederlands)

694 views • 9 months ago

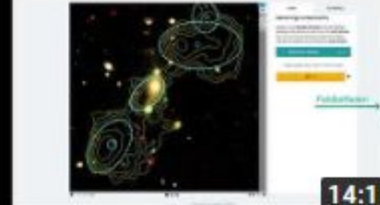


14:29

LOFAR Galaxy Zoo Tutorial (English)

15K views • 9 months ago

Subtitles

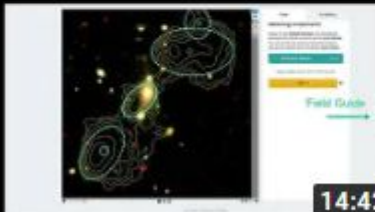


14:11

LOFAR Galaxy Zoo Tutorial (Deutsch)

1.8K views • 9 months ago

Subtitles

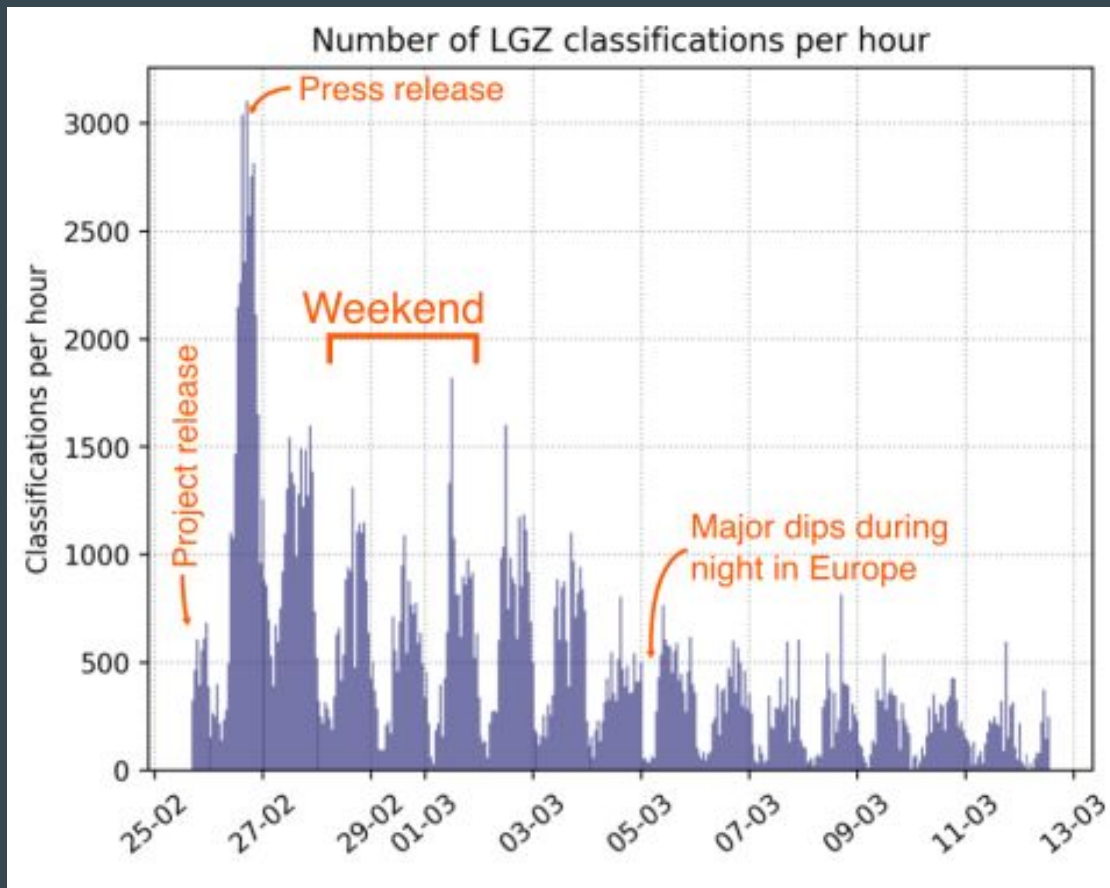


14:42

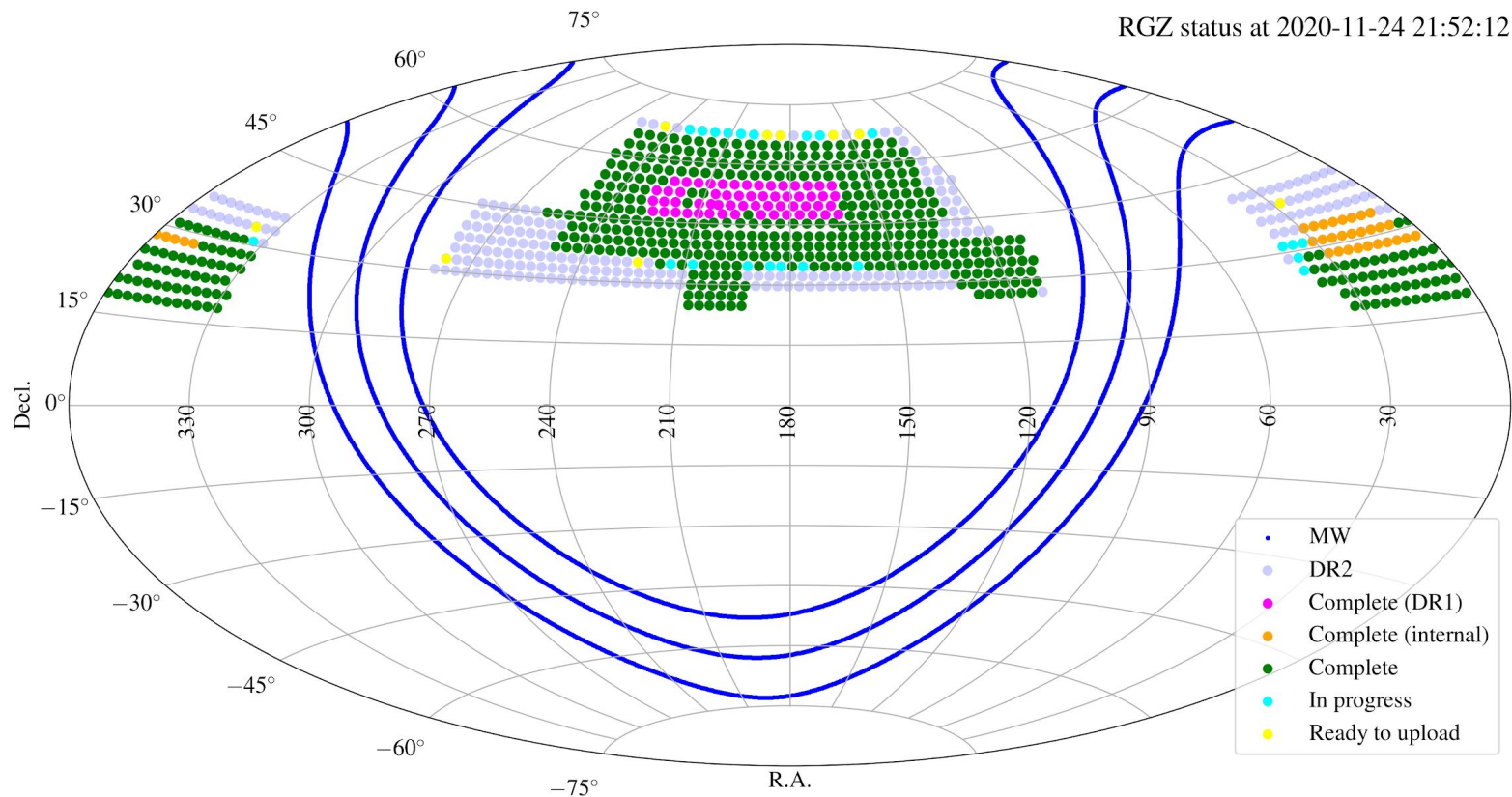
LOFAR Galaxy Zoo Tutoriel (Français)

7.7K views • 9 months ago

The release - First month



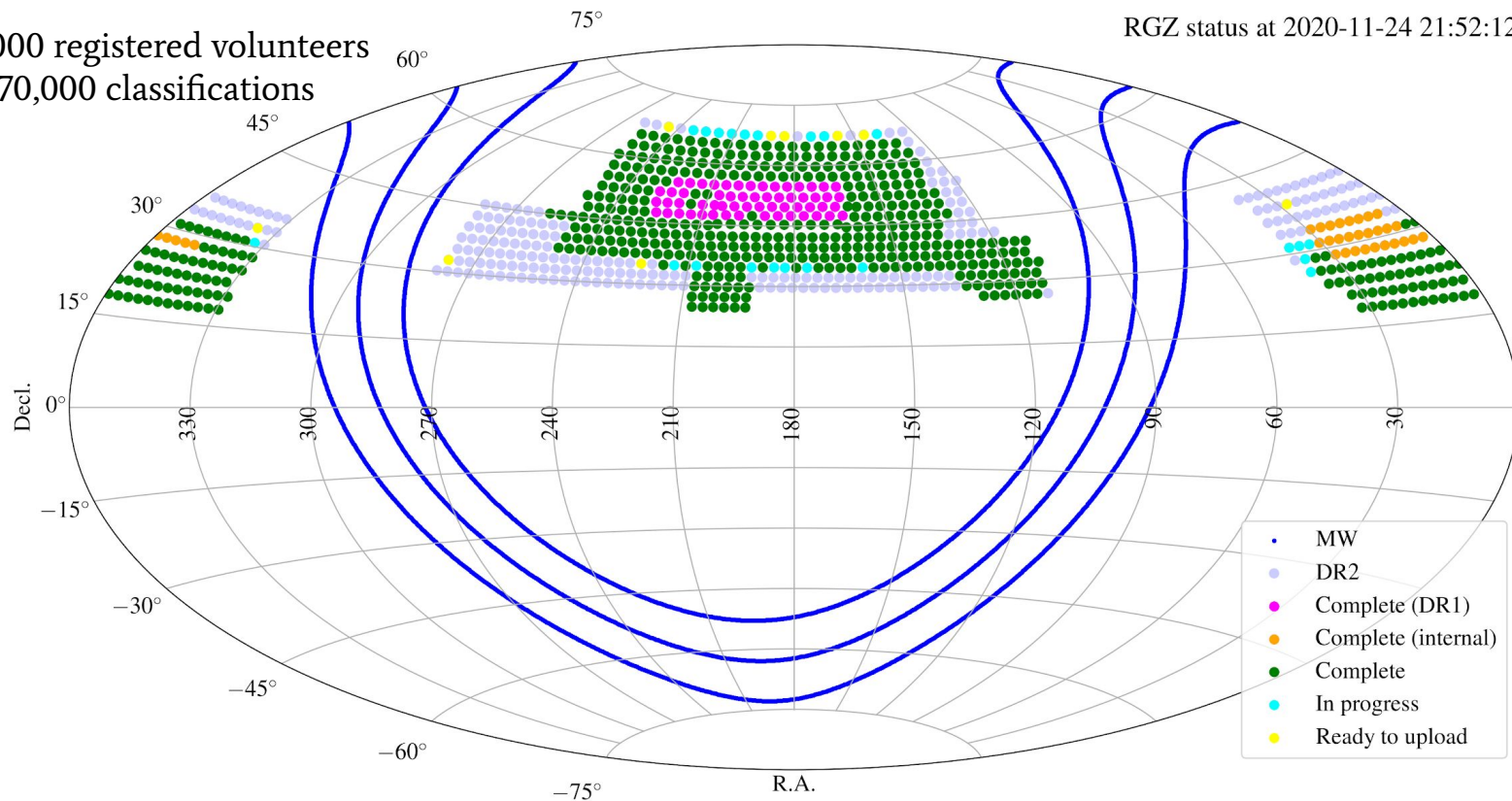
Progress thus far



Progress thus far

RGZ status at 2020-11-24 21:52:12

6,000 registered volunteers
>170,000 classifications

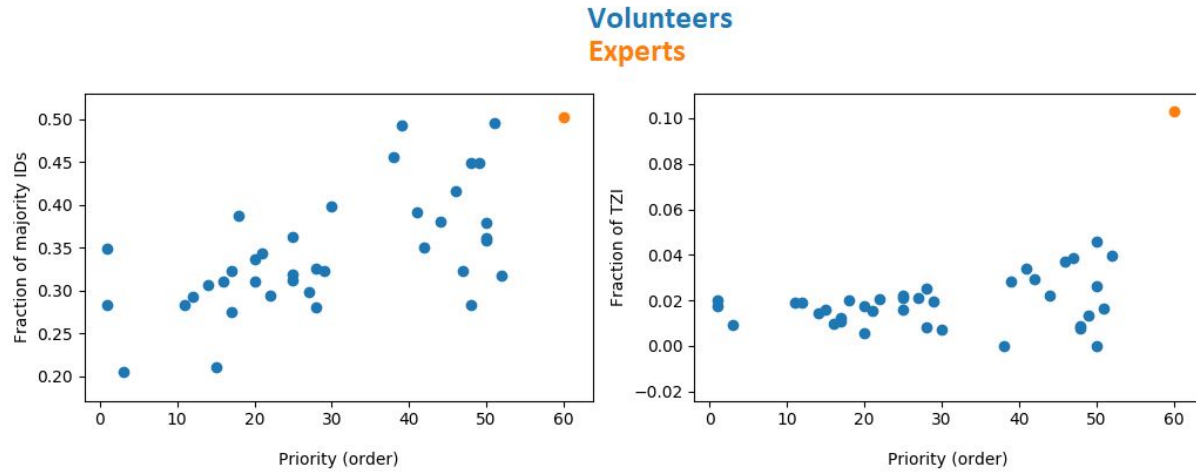


Data Reduction

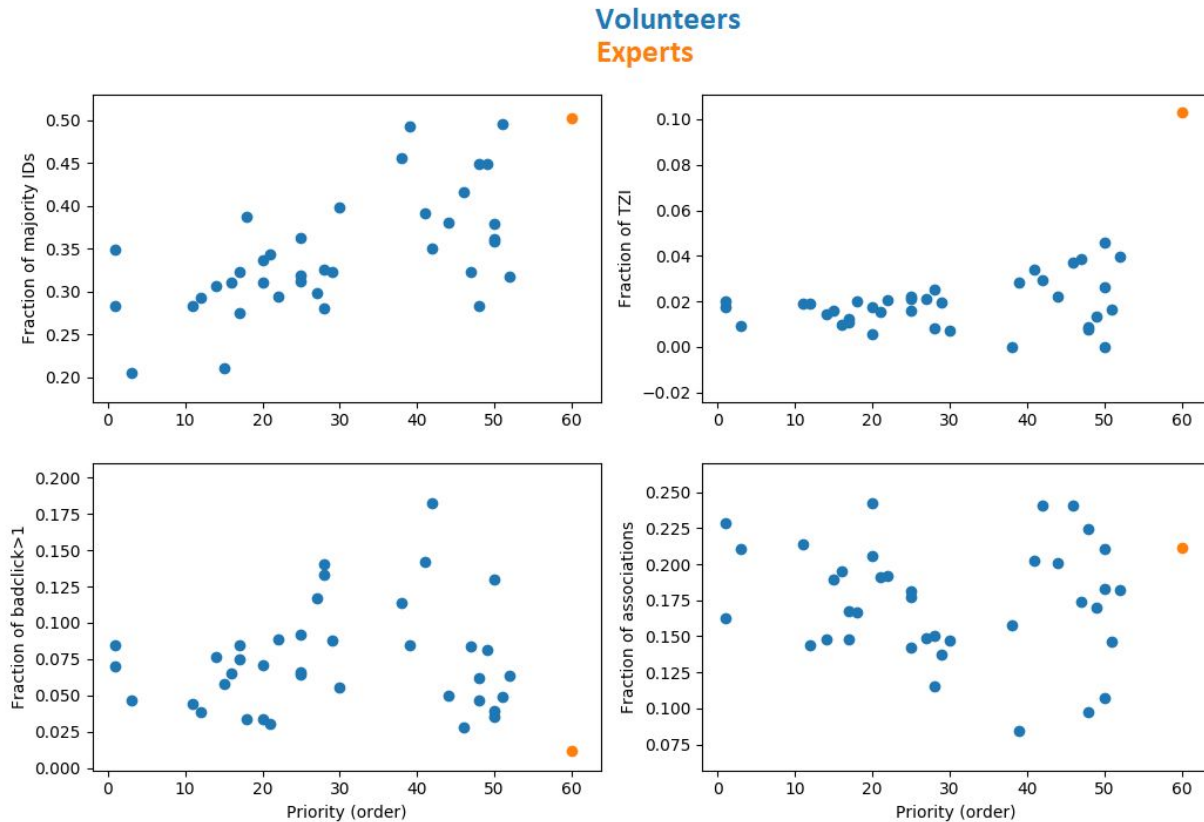
- Each **component** is seen 5 times
- Group all **components**
- Require 60% consensus



Quality

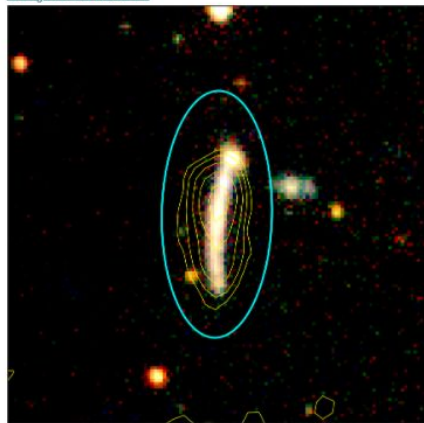


Quality



July 3rd 2020, 8:13 am

[Subject 44123005](#)



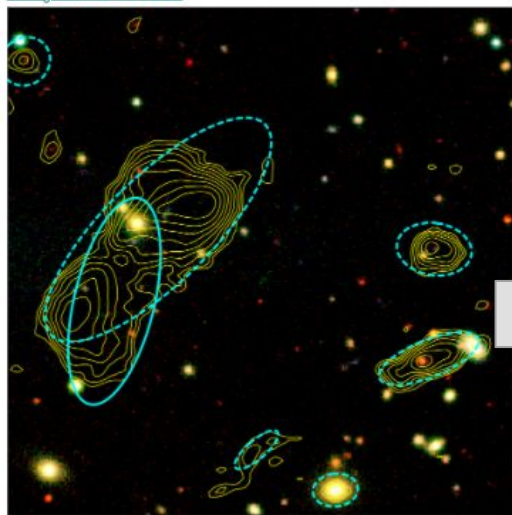
What is it ? Some kind of warped spiral ? (No ID in Simbad)



Serendipitous Discovery

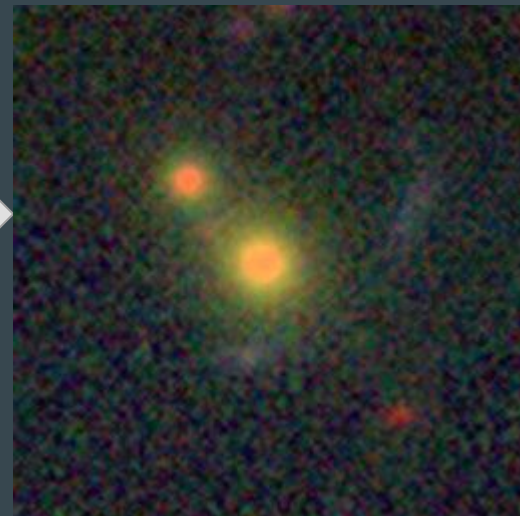
April 17th 2020, 8:27 pm

[Subject 42453237](#)



Middle left, probable optical host (at RA/DEC 164.2522, 40.4341) has gravitational lens

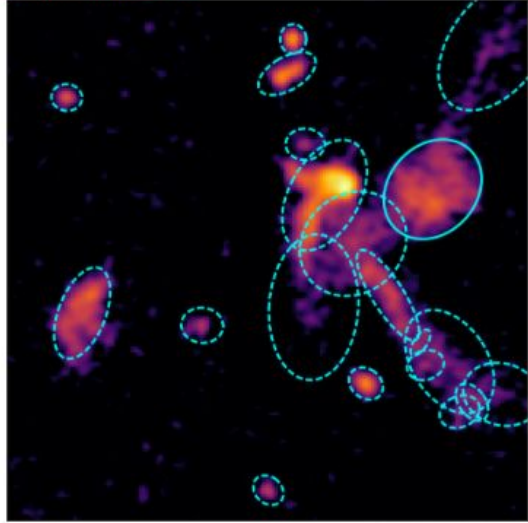
 Example Alt Text



Serendipitous Discovery

February 29th 2020, 1:32 am

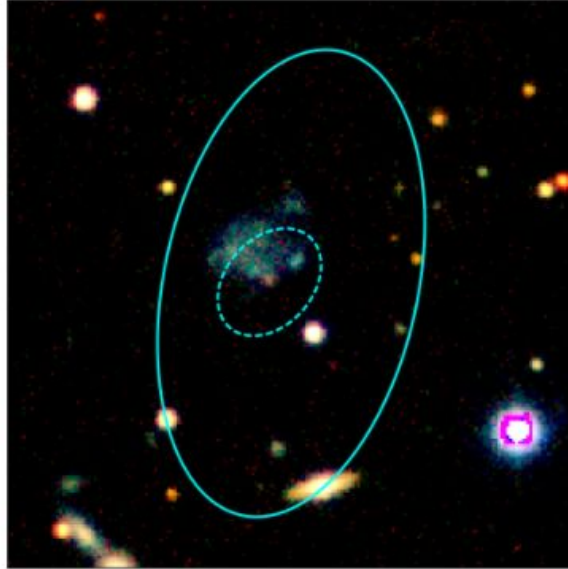
[Subject 40654239](#)



This [#difficult](#) and [#complex](#) mess of a [#blend](#) needs an expert to review it, I can't even hazard a guess to explain what all's going on here!

[Helpful \(1\)](#) [Reply](#) [Link](#) [Report](#)

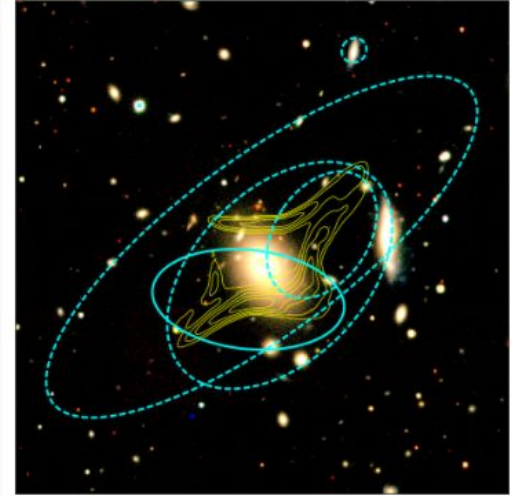
[Subject 41688925](#)



Which kind of galaxy is this ?

February 29th 2020, 10:58 am

[Subject 40656399](#)



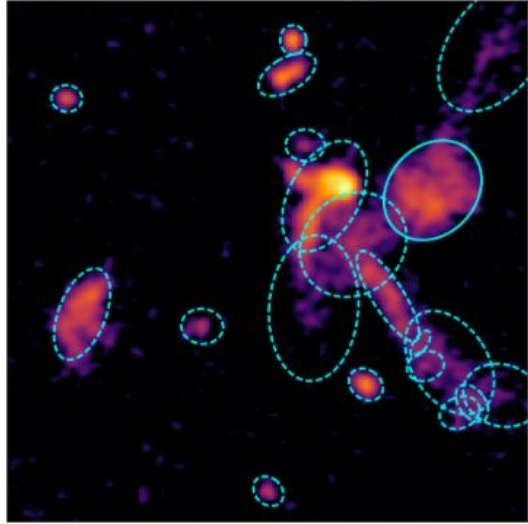
I don't understand that image. Has the optical galaxy applied a graviational lens effect on a distant radio source ?

[Helpful \(1\)](#) [Reply](#) [Link](#) [Report](#)

Serendipitous Discovery

February 29th 2020, 1:32 am

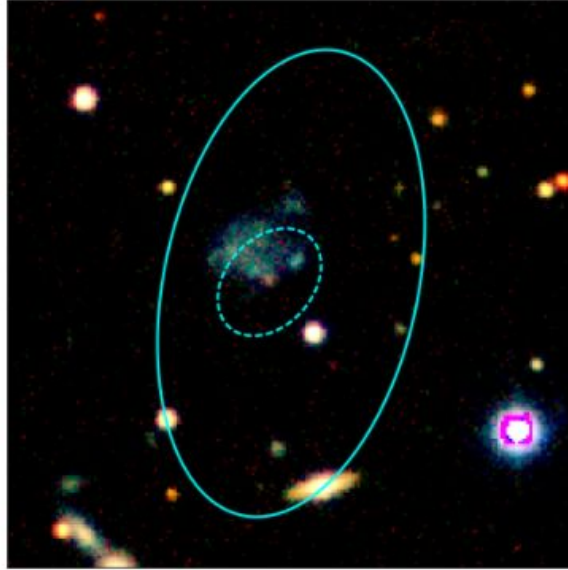
[Subject 40654239](#)



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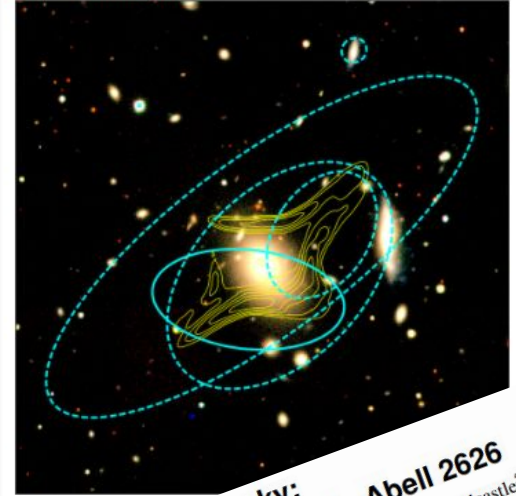
[Subject 41688925](#)



Which kind of galaxy is this ?

February 29th 2020, 10:58 am

[Subject 40656399](#)



**The great Kite in the sky:
a LOFAR observation of the radio source in Abell 2626**
A. Ignesti^{1,2*}, T. Shimwell^{3,4}, G. Brunetti², M. Gitti^{1,2}, H. Intema^{4,6}, R. J. van Weeren⁴, M. J. Hardcastle⁵, A. O. Clarke^{7,8}, A. Botteon⁴, G. Di Gennaro⁴, M. Brüggen⁹, I. Browne⁸, S. Mandal⁴, H. J. A. Röttgering⁴, V. Cuciti⁹, F. Gasperin⁹, R. Cassano², A. M. M. Scaife³
... image. Has the optical galaxy
... gravitational lens effect on a distant radio source

[Helpful \(1\)](#) [Reply](#) [Link](#) [Report](#)

Thank-you!

**Help astronomers locate and
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[Learn more](#)

<http://lofargalaxyzoo.nl/>