



Introduction to your Mission

The Astrophysics Research Institute of Liverpool John Moores University is working on refining how galaxies are classified. They have gathered a set of galaxy images taken by professional telescopes and need your help!

As a team of amateur astronomers, your task is to classify these galaxies using the Hubble Tuning Fork Classification Scheme.

To push your classification skills further, you will also explore some galaxies that don't fit perfectly into the Hubble system, challenging your classification skills!

Activity: The Hubble Classification Scheme

Step 1: Watch the '[What is a Galaxy](#)' video.

Step 2: Cut out the galaxy cards packs.

Step 3: Start your classification with the first pack (Easy), then move on to the second pack (Medium), and finish with the Extended pack (Hard).

Step 4: Read the information on the back of each card to learn more about the galaxy you are classifying.

Step 5: Use the Hubble Tuning Fork Diagram in page 2 to decide whether the galaxy you are classifying is an elliptical (E), lenticular (S0), normal spiral or barred spiral (S), or whether it does not fit under any of the types – i.e. some galaxies can only be described as irregular (irr).

Step 6: Look at subgroups (0-7 for ellipticals, a-c for the two kinds of spiral).

Step 7: When you have decided, write down the card number, galaxy name, and your classification in the table in page 3. You may want to add notes to explain your decision, or if there is anything odd about the image.

HUBBLE TUNNING FORK DIAGRAM



Sa



Sb



Sc



E0



E3



E5



S0



SBa



SBb



SBc



First Pack

Card number	Name	Class
1	NGC 4567	Sc
2	NGC 7457	E5
3	NGC 7479	SBc
4	Messier 49	E3
5	NGC 5357	Sb
6	NGC 5850	Sba
7	NGC 4278	E0
8	NGC 524	S0
9	NGC 2487	SBb
10	Messier 94	Sa



Second Pack

Card number	Name	Class
1	NGC 5846 & NGC 5864A	E0 & E5
2	NGC 3507	SBb
3	NGC 1600	E3
4	NGC 3187	SBc
5	NGC 6632	Sb
6	NGC 6674	SBb
7	Messier 74	Sc
8	NGC 1073	SBc
9	NGC 691	Sb
10	NGC 2776	Sc



Third Pack

Card	Name	Class	Notes
1	NGC 7626	E2 or E3	Classified as an elliptical galaxy due to its featureless, round shape; however, it contains a faint jet-like structure, suggesting more dynamic activity. This is caused by material falling into a central supermassive black hole and being ejected from it at great speed. Although most massive galaxies contain these supermassive black holes at their core, not all of them are considered 'active', with material falling into them. Most typical ellipticals do not show these jet features.
2	NGC 2339	SBc	Classified as a barred spiral with loosely wound arms but its irregular arm structure highlights how barred spirals can vary.
3	ESO 162-17	Irr	Has no defined spiral or elliptical structure, classifying it as irregular. This emphasizes that not all galaxies fit neatly into the Hubble Tuning Fork system.
4	Messier 104	Sa	Its edge-on appearance and prominent dust lane make it hard to classify.
5	NGC 4389	SBc	Its small size and irregularities demonstrate how galaxies may transition between spirals and irregulars through, for example, interactions with other galaxies.
6	NGC 4216	SABb	While it appears as an edge-on spiral, preventing a clear view of its structure, studies based on de Vaucouleurs' classification scheme indicate it has a weak bar and moderate winding arms, placing it between barred (SB) and unbarred (S) spirals, known as SAB.