Answers to Galaxies Project

Exercise 1, Questions 1–3. Answers will vary greatly. The important thing is that you create a reasonable classification system that makes distinctions between different types of galaxies without dividing them into groups that contain only one member.

Exercise 2.

Run	Camcol	Field	Galaxy Type
752	1	244	Sb
94	4	129	SBb
752	1	331	E3 or E4
125	1	321	SB0
756	4	198	Sb or Sc (technically, this galaxy is a transition galaxy from type b to c)
94	2	446	SB
752	1	432	This is an unusual galaxy…it is a transition between barred and normal and a transition between a and b. Therefore, it could be Sa, Sb, SBa, or SBb. This will keep them guessing!
752	2	16	Irregular galaxy
125	3	285	S0 (easily mistaken for elliptical E0)
125	2	182 (lower left galaxy)	S0 (actually, both galaxies in the image are S0!)
94	3	276 (upper left corner)	E3 (it's just marked E in NED and SIMBAD)
125	3	196 (3 galaxies)	Left most galaxy : SO : Center galaxy : E2 Right Galaxy : E4
94	3	291	Sa (This is a transition galaxy from Sa to Sb)
94	1	306	SBb or SBc (transition galaxy)
94	1	317	SBA (some class it as SB0)
94	3	372 (2 nice galaxies)	Left Galaxy : Sc : Right Galaxy : SBa
125	3	318	SBb (Ned lists as transition galaxy) or SBc
125	1	322	Sc
125	1	326	Sa or Sb (transition type)

Many of these galaxies lie between two different types (and some of them have different types listed in different catalogs, so even the professionals don't always agree!)

Exercise 3. The fairly large white galaxies throughout the image are the galaxies in Abell 0957. Most of the galaxies in the frame are part of Abell 0957, but the very small ones are probably more distant galaxies. The very large yellowish object in the top center of the frame is marked as a galaxy, but it is actually a star in our own Milky Way galaxy, much, much closer to Earth than Abell 0957. The table below shows a few galaxies in Abell 0957:

ObjId	type	ra	dec	u	g	r	i	z		
2255047093846140	GALAXY	153.398762	-0.874467	18.273	16.684	15.895	15.517	15.214	Explore	Navigate
2255047093846151	GALAXY	153.417378	-0.917633	18.277	16.714	15.886	15.508	15.173	Explore	Navigate
2255047093846152	GALAXY	153.422962	-0.922286	18.505	17.034	16.223	15.861	15.53	Explore	Navigate
2255047093846165	GALAXY	153.417107	-0.863698	18.362	16.871	16.149	15.798	15.55	Explore	Navigate
2255047093846172	GALAXY	153.426088	-0.907191	17.804	16.287	15.492	15.167	14.895	Explore	Navigate
2255047093846178	GALAXY	153.443426	-0.951473	17.818	16.364	15.63	15.293	15.016	Explore	Navigate
2255047093846183	GALAXY	153.445118	-0.914231	18.69	15.756	15.117	14.676	14.443	Explore	Navigate
2255047093846229	GALAXY	153.410055	-0.882004	18.406	16.867	16.064	15.72	15.434	Explore	Navigate
2255047093846237	GALAXY	153.428368	-0.936938	18.097	16.717	15.936	15.617	15.354	Explore	Navigate
2255047093846326	GALAXY	153.397296	-0.88702	18.703	17.194	16.437	16.141	15.857	Explore	Navigate

About 60 to 70 percent of the galaxies in Abell 0957 are spirals, meaning the ratio of spirals to ellipticals in Abell 0957 is roughly similar to the ratio in the universe as a whole.

The galaxies in Abell 0957 have similar magnitudes, from about 15 to about 18. They have similar sizes, and roughly similar visual colors – most look close to white. As for their astronomical colors (magnitude differences), some of them are similar, and some vary quite widely, especially u-r. Later in the project, students will learn how to use u-r to separate elliptical galaxies and spiral galaxies.

Question 4. Answers will vary depending on the classification system that you chose.

Exercise 4.

Obj ID	Type	u-r
1970861984448591	SBc (faint bar)	-1.13
1970861984252038	Sb	1.72
1970729919316027	SB0	1.93
1970729919316026	E3	2.64
1970862251180131	Sb	2.04
1970729111388230	SBc	1.60
1970729647997002	E5	2.74
1970863053144157	SB0	2.80
1970863053144121	E1	2.88
1970729110405170	Sb	1.97
1970862783266837	E6	2.64
568688839098456	E0	2.88

Note: The last galaxy is part of a nice galaxy cluster!

Question 5. All but one of the galaxy types match with the galaxy colors (the third galaxy is an SB0, which should have $u - r > 2.22$) .

Question 6. Galaxy color seems to be a pretty good (although not perfect) indicator of galaxy type for this small group of galaxies. With such a small sample, it is important not to read too much into the statistics.