Explore 1. You should select your own stars. The table below gives a few examples.

Object ID	Color	u	g	r	i	z
568689642242303	Orange	23.712	20.426	18.958	17.283	16.384
568689642242317	White	24.422	21.318	19.814	18.249	17.45
1970728867921900	Red	18.993	16.258	14.929	14.31	13.992
1970728867922000	Yellow	21.181	18.417	17.004	15.844	15.212
1970728867922010	Blue	20.868	18.234	17.025	16.534	16.253
1970728867922170	White	22.953	20.987	19.629	18.174	17.404
1970730198303290	Yellow	25.299	23.019	21.735	19.11	17.662
1970862004568160	Blue-white	19.556	17.733	16.962	16.641	16.438
1970862004633640	Orange	20.347	17.853	16.41	15.028	14.273
1970862272872480	Red	20.587	18.079	16.931	16.479	16.217
1970862272872810	Red	22.569	20.412	18.94	18.012	17.445
1970862274183190	Blue	16.039	16.238	16.725	17.007	17.288
1970862542618690	Red	17.758	17.361	17.366	17.451	17.601
1970863052947590	Blue	19.519	19.23	19.555	19.788	19.98
2255047899545600	Yellow	17.858	16.258	15.981	15.773	15.696

Explore 2. You should have discovered that the color of a star is related to the difference between two of its magnitudes: u-g, g-r, r-i, or i-z. Generally, using g-r gives the clearest color trend.
Blue stars have low (often negative) g-r values, and orange and red stars have high g-r values. Yellow and white stars have mid-range values. The table below shows the magnitude differences for the 15 stars in the table above, sorted by increasing g-r.

Object ID	u-g	g-r	r-i	i-z	Color
1970862274183190	-0.199	-0.487	-0.282	-0.281	Blue
1970863052947590	0.289	-0.325	-0.233	-0.192	Blue
1970862542618690	0.397	-0.005	-0.084	-0.15	Red
2255047899545600	1.33	0.547	0.208	0.077	Yellow
1970862004568160	1.823	0.771	0.321	0.203	Blue-white
1970862272872480	2.508	1.148	0.452	0.262	Red
1970728867922010	2.634	1.209	0.491	0.281	Blue
1970739198303290	2.28	1.284	2.625	1.448	Yellow
1970728867921990	2.735	1.329	0.619	0.318	Red
1970728867922170	1.966	1.358	1.455	0.77	White
1970728867922000	2.764	1.413	1.16	0.632	Yellow
1970862004633640	2.494	1.443	1.382	0.755	Orange
568689642242303	3.286	1.468	1.674	0.899	Orange
1970862272872810	2.157	1.472	0.928	0.567	Red
568689642242317	3.124	1.504	1.565	0.799	White

Question 1. Other common logarithmic scales include the decibel scale for sound, the Richter scale for earthquakes, and the pH scale in Chemistry.

Question 2. As the rainbow spectrum shows, the star emits most of its light in blue wavelengths, so it would appear blue. Its g-r color would be less than zero, because the star emits more green light than red (and the magnitude scale is reversed).

Explore 3. As the temperature of the simulated star increases, its peak wavelength decreases. A simulated star with a temperature of about 8000 K has a peak wavelength in the blue region, but the color is a very pale blue. A 4500 K star has a peak in the red part of the spectrum, but appears much closer to white. The peak wavelength of a human's thermal radiation (~310K) is well into the infrared.

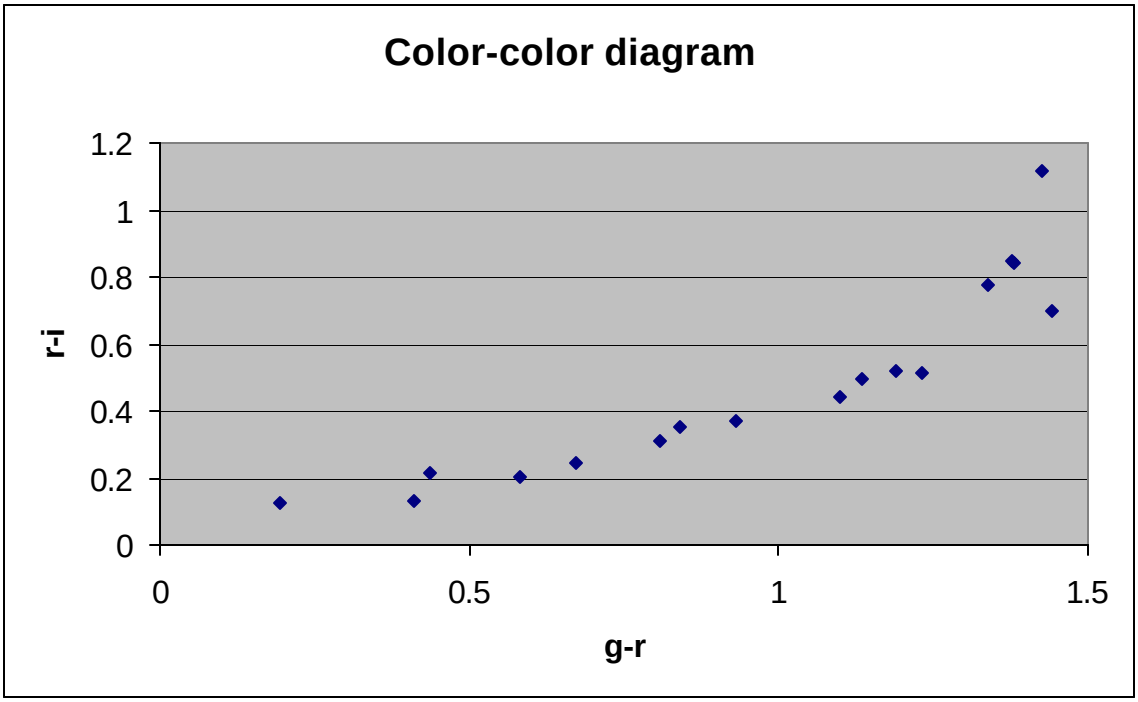
Challenge Question: You cannot find a simulated star that appears green. When an object has a peak wavelength in green, it also gives off a lot of red and blue light. Therefore, the object appears white.
Notice that an object's peak wavelength does not automatically tell you its color; you also have to take into account all the other colors of light that it emits.

Explore 4. The observed spectra of stars actually have lots of peaks and valleys. The peaks and valleys are caused when gas in the star's atmosphere emits or absorbs light. However, notice that the general shape of the observed spectrum looks like the stellar light curves you saw in the last section; it is frequently easy to pick out a star's peak wavelength from its observed spectrum.

Explore 5.

Object ID	Ultraviolet (u)	Green (g)	Red (r)	Near infrared (i)	Infrared (z)
1970729672507509	22.384	19.701	18.276	17.159	16.571
2255048166408350	22.003	19.495	18.113	17.274	16.818
1970862253998178	21.635	19.663	18.855	18.543	18.341
1970862800109655	19.276	18.419	18.224	18.097	18.109
2255047092863113	20.714	19.03	18.359	18.113	17.941
2255029916926068	22.397	19.775	18.543	18.029	17.728
2255030454517938	23.297	20.273	18.934	18.156	17.716
568774739427593	22.364	19.868	18.427	17.73	17.375
1970862268285318	22.496	20.42	19.043	18.196	17.718
2255047369556043	21.205	19.106	18.175	17.803	17.579
2255047094698155	21.462	19.416	18.576	18.224	17.997
2255047395246316	20.207	19.136	18.698	18.482	18.353
2255030725247124	22.798	20.098	18.909	18.387	18.037
2255030998401119	20.02	18.683	18.274	18.141	18.057
2255030460809362	20.539	18.965	18.382	18.177	18.072
1970729654157453	22.25	20.006	18.907	18.466	18.159
2255047928906000	22.138	19.777	18.641	18.147	17.869

Object ID	u-g	g-r	r-i	i-z
1970729672507509	2.683	1.425	1.117	0.588
2255048166408350	2.508	1.382	0.839	0.456
1970862253998178	1.972	0.808	0.312	0.202
1970862800109655	0.857	0.195	0.127	-0.012
2255047092863113	1.684	0.671	0.246	0.172
2255029916926068	2.622	1.232	0.514	0.301
2255030454517938	3.024	1.339	0.778	0.44
568774739427593	2.496	1.441	0.697	0.355
1970862268285318	2.076	1.377	0.847	0.478
2255047369556043	2.099	0.931	0.372	0.224
2255047094698155	2.046	0.84	0.352	0.227
2255047395246316	1.071	0.438	0.216	0.129
2255030725247124	2.7	1.189	0.522	0.35
2255030998401119	1.337	0.409	0.133	0.084
2255030460809362	1.574	0.583	0.205	0.105
1970729654157453	2.244	1.099	0.441	0.307
2255047928906000	2.361	1.136	0.494	0.278



Question 3. Because cooler stars emit most of their light at longer wavelengths, toward red and infrared, they have high values of both g-r and r-i. Cooler stars graph into the top right of the color-color diagram. Likewise, hotter stars graph into the bottom left of the color-color diagram.

Question 4. If you graphed the two thermal radiation curves on a color-color diagram, you would get two points. The 5000 K source would graph above and to the right of the 4000 K source, for the reasons listed in Question 3.
Imagine sliding the thermal radiation curves left and right. You should see that the curves change smoothly, and that the colors g-r and u-g appear to change linearly with temperature. Therefore, a graph of many thermal sources would make a straight line.

Question 5. The cool, red stars fall off the straight line in the color-color diagram. The fact that the cool, red stars do not fit on the line means those stars are not thermal sources.