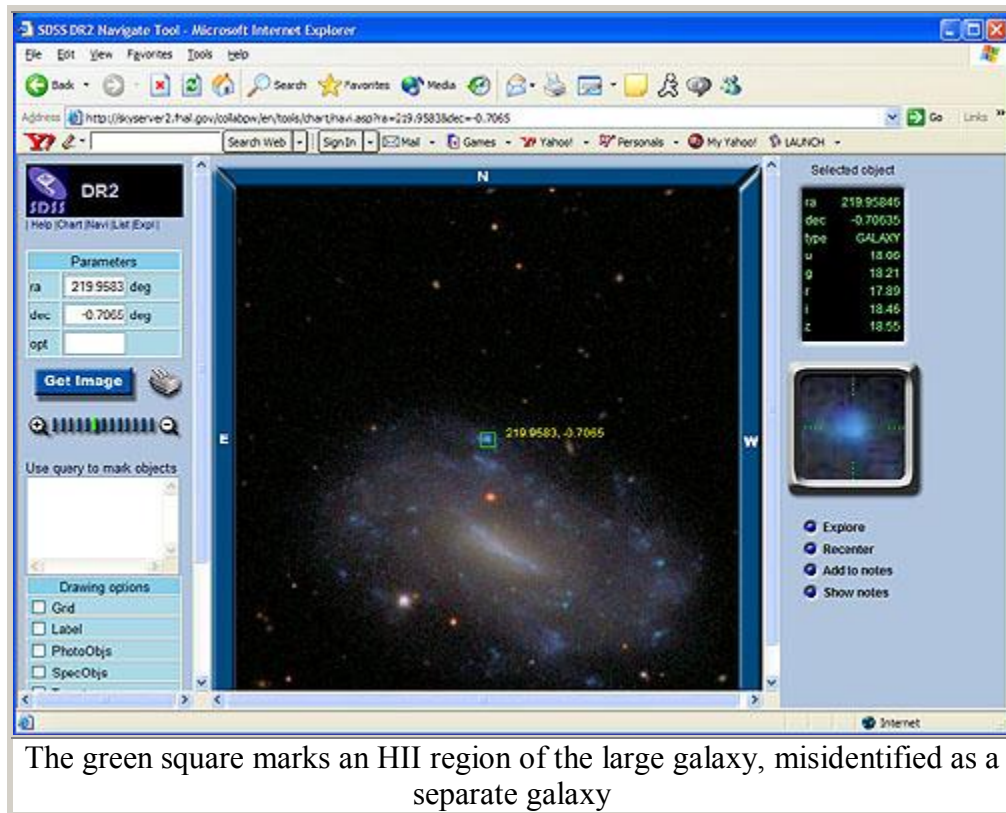


HII Regions

Most spiral galaxies contain star-forming regions rich in ionized hydrogen. Ionized hydrogen is also known as HII, so the star forming regions are known as "HII (pronounced 'H-two') regions." Because stars are actively forming inside HII regions, astronomers are very interested in studying the regions.

The SDSS has almost certainly seen hundreds of HII regions in nearby galaxies. But using the SDSS to study HII regions presents a problem. Because the SDSS sees so many objects in the sky, the survey uses a computer program called Photo to classify the objects as stars, galaxies, cosmic rays, ghosts (false optical images), or moving objects. Overall, Photo does a very good job of identifying the objects SDSS sees.

But, nearby spiral galaxies that appear large in our field of view cause problems for Photo. When Photo examines a galaxy like the one below, instead of classifying it as one galaxy, Photo breaks it up into several parts! Photo often mistakes the core and the HII regions in a galaxy for separate galaxies. Sometimes Photo can look at a single galaxy and mistakenly see up to six separate galaxies.



To tell the difference between a single galaxy with misidentified HII regions and genuine multiple galaxies, a program called Plate selects objects for the SDSS will measure spectra. The SDSS can't measure spectra for all the objects it sees, so Plate selects which objects to

examine. Sometimes Plate selects HII regions for spectral analysis. By looking at both images and spectra for the same galaxy, you can tell which places are HII regions misidentified by Photo, and which are actually separate galaxies.

The next version of Photo should fix the problem of HII region misidentification. But until astronomers know how many regions have been misidentified by the current version of Photo, they'll never know whether the next version is actually an improvement. And although astronomers agree that a catalog of misidentified HII regions is important to checking the accuracy of the survey, none of them has made such a catalog. You can help.

Your mission, should you choose to accept it, is to find the HII regions for which the SDSS has acquired spectra. This information will allow you to study HII regions in detail, learn how well our Photo program works, and give us a comparison for when we start using a new, and hopefully improved, version of Photo.

The only way to be sure you have identified an HII region is to visually inspect the SDSS field that contains the galaxy. Data Release 3 (the data you see on SkyServer) contains spectra of over 350,000 galaxies, so you cannot visually inspect every one. Additionally, some of the galaxies are very small, and it can be hard to tell what you are seeing, so you need other evidence to tell whether you are looking at an HII region or a whole galaxy. This process may seem tedious, but it's an important part of astronomy: SDSS astronomers have visually inspected hundreds of galaxies for papers they have written.

On the next page, you will get some clues on what characteristics might be helpful in searching for HII regions.