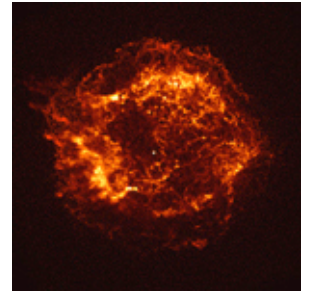




Activity: False Color Images

BACKGROUND:

Images taken by telescopes that observe at the "invisible" wavelengths are sometimes called "false color images." That is because the colors used to make them are not "real" but are chosen to bring out important details. The color choice is usually a matter of personal taste, and is used as a type of code in which the colors can be associated with the intensity or brightness of the radiation from different regions of the image, or with the energy of the emission.



The screenshot shows the SAOImage ds9 interface. The main window displays a zoomed-in view of a pixel table. The table is as follows:

Pixel Table					
	268	269	270	271	272
351	137	194	144	162	114
350	132	164	171	170	118
349	125	167	225	203	181
348	82	149	203	209	164
347	76	85	132	118	97

When the Chandra X-Ray Observatory observes an astronomical source, it records the time, position, and energy record of every photon collected. From this data, scientists can produce images like the one above of the supernova remnant Cassiopeia A (Cas A). In this chosen color scheme, the white and yellow colors represent the areas of highest X-ray intensity, the orange to red areas represent the areas of lower intensity, and the black represents little or no emission.

On the left, we have used ds9 imaging software to zoom in on individual pixels of this image. The red **225** in the pixel table represents the photon intensity of the whitish yellow square towards the center of the frame.

WHAT TO DO:

You have just discovered a brilliant new supernova remnant using the Chandra X-ray Observatory. Your mission is to turn "boring" numbers into a super-cool picture.

- ✓ In the grid on the next page, the numbers represent average number of photons per second or photon intensity values. You are allowed to use five and only five colors in drawing your image.
- ✓ Each of the five colors will represent a range of intensity values. Select the range of intensities assigned to each color. Fill in these range values and associated colors on the legend at the bottom of the image grid sheet.
- ✓ Using colored pencils, shade in the grid using your color legend.

SUPERNOVA REMNANT IMAGE GRID

0	1	1	1	1	1	1	1	1	1	1
2	5	35	42	48	48	50	51	46	18	7
23	36	52	35	30	27	21	31	38	13	0
41	43	24	8	216	155	126	120	54	21	3
36	58	37	44	36	20	33	105	62	23	4
32	60	34	106	12	138	18	96	24	50	17
24	65	32	141	41	17	12	126	64	67	21
18	69	36	237	212	146	155	114	22	74	6
16	75	38	34	26	12	14	21	77	37	4
8	71	63	54	42	23	64	79	31	16	2
3	3	2	1	0	0	2	0	1	0	0

LEGEND

AVERAGE NUMBER OF PHOTONS					
COLOR					

LABEL THE FEATURES:

In your colored image of this supernova remnant, label what you think might be a

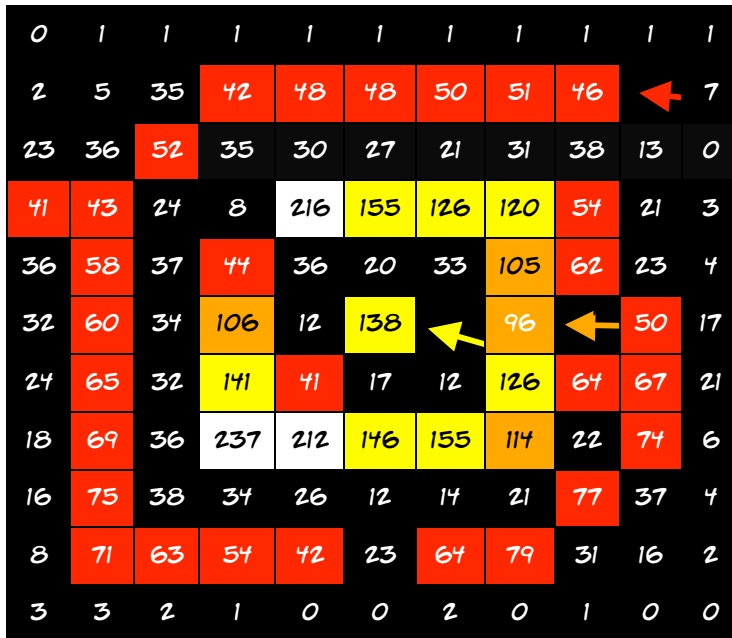
- ✓ neutron star near the center.
- ✓ fast outer shock wave.
- ✓ slower inner shock wave.





Activity: False Color Images, sample completed image

SUPERNOVA REMNANT IMAGE GRID



OUTER SHOCKWAVE

INNER SHOCKWAVE

NEUTRON STAR

LEGEND

AVERAGE NUMBER OF PHOTONS	< 40	40-79	80-119	120-159	> 160
COLOR	Black	Red	Orange	Yellow	White

FOR MORE INFORMATION ON FALSE COLOR IMAGES, VISIT:

Chandra Images & False Color
http://chandra.harvard.edu/photo/false_color.html

De-Coding Starlight: From Pixels to Images
<http://chandra.harvard.edu/edu/formal/imaging/index.html>

