

# Determining the nature, size and age of the Universe

## Appendix B: Galaxy Images

These are the images for the Determining the nature, size and age of the Universe Activity. They have all been taken by the Harvard-Smithsonian's MicroObservatory telescopes. The images all have a fixed angular size, with a width of 0.9 degrees and height of 0.7 degrees.

The images are given as negatives – with black and white reversed in the images. Part of the reason is to save on toner when printing these for a classroom. However, astronomers will often look at images in negative to pick out details that they might not otherwise see. The images are also processed to make the galaxies stand out.

To illustrate this, here is an image 1) unprocessed, 2) processed so that the grayscale is on a log scale rather than a linear scale (this makes faint points stand out more), and 3) inverted.

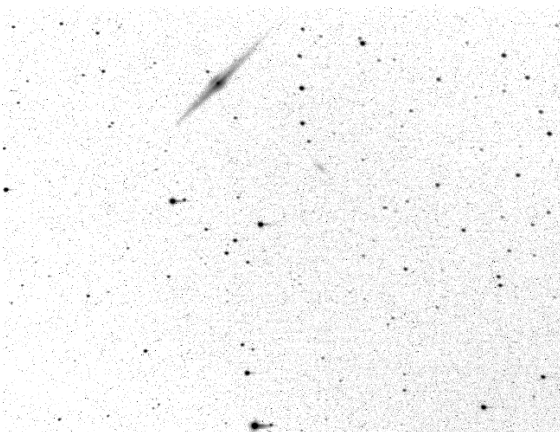
1)



2)



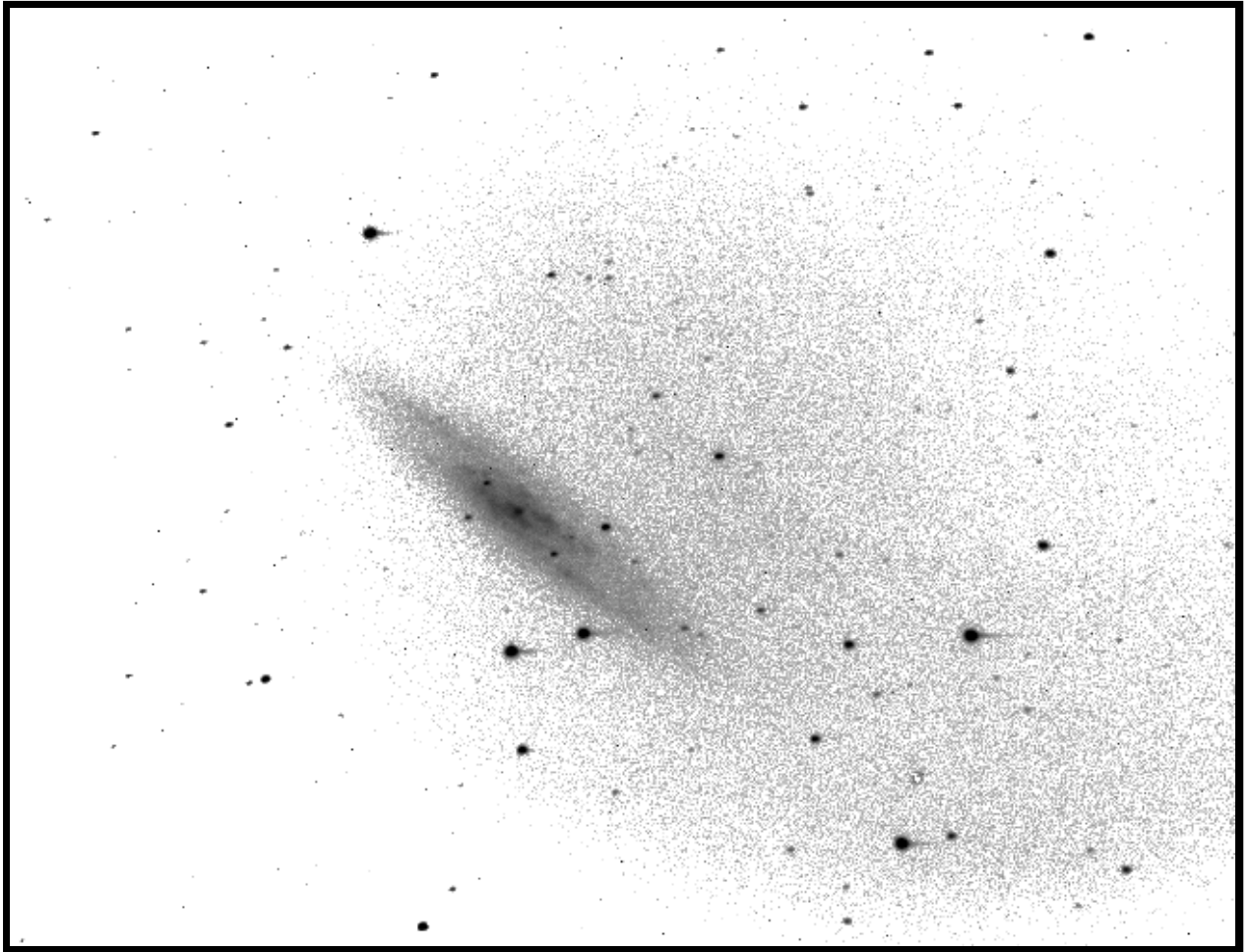
3)



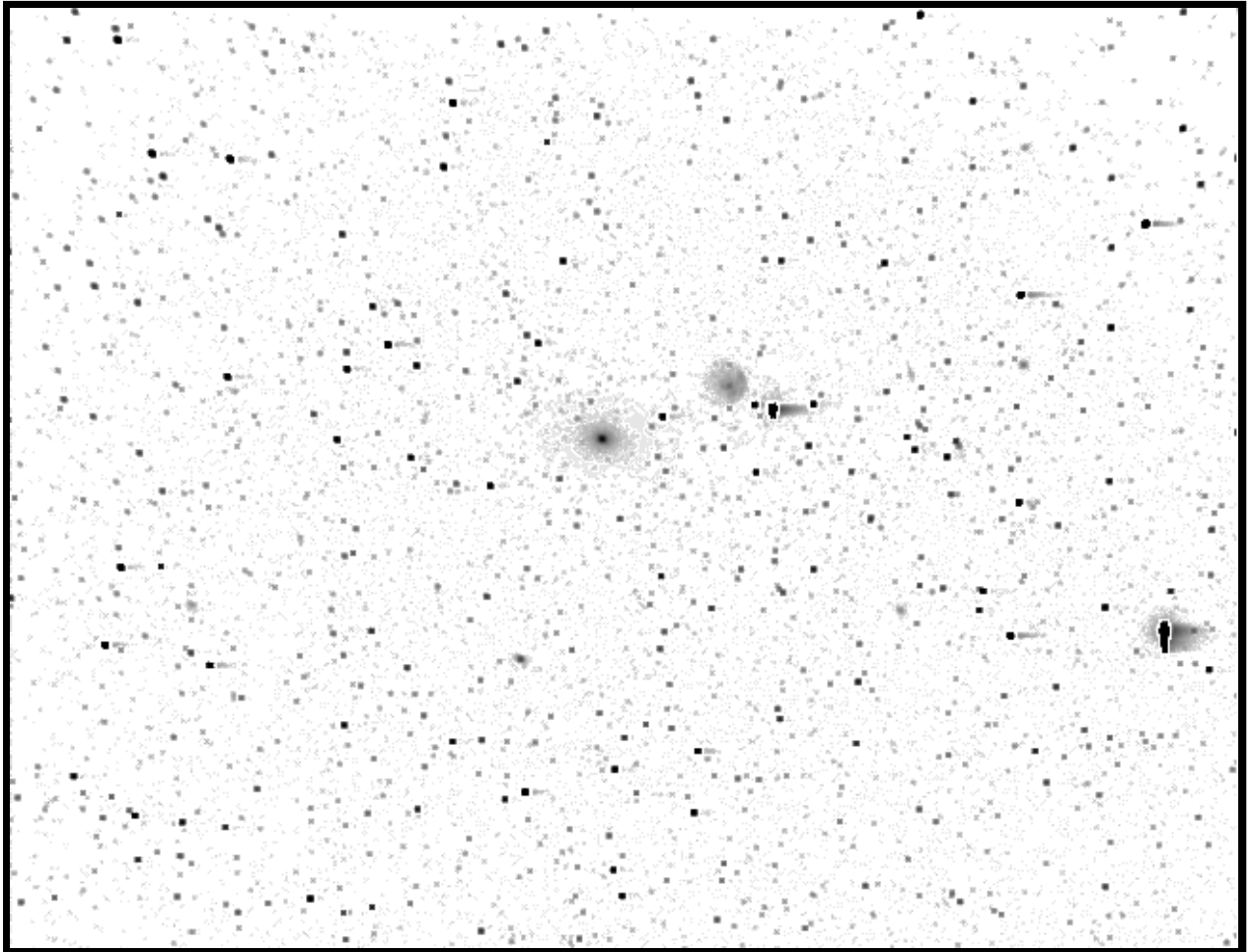
For 3 groups, one suggested distribution of galaxies is shown in the table below, and the galaxies are organized in this order. Each group would get a taste of various sizes of galaxies. However, it is just as effective to give out the galaxies randomly to the groups:

Group 1	Group 2	Group 3	Bonus Galaxies
NGC 253	NGC 891	NGC 4565	NGC 4124
NGC 2300	NGC 2543	M 58	NGC 5907
NGC 4013	NGC 2903	M 81	M 65
M 31	M 33	M 96	M 101
M 51	M 109	M 104	M 106

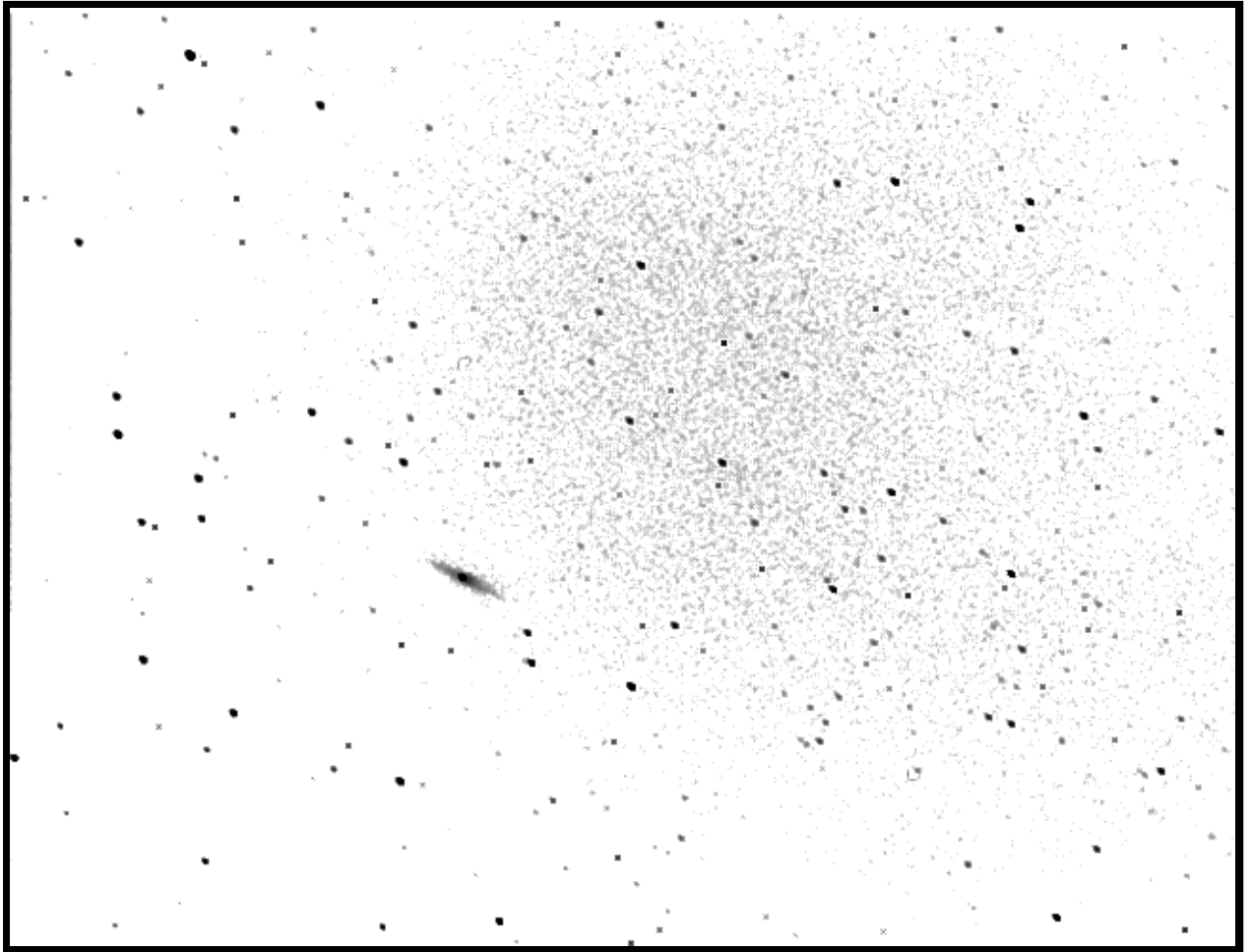
**NGC 253**



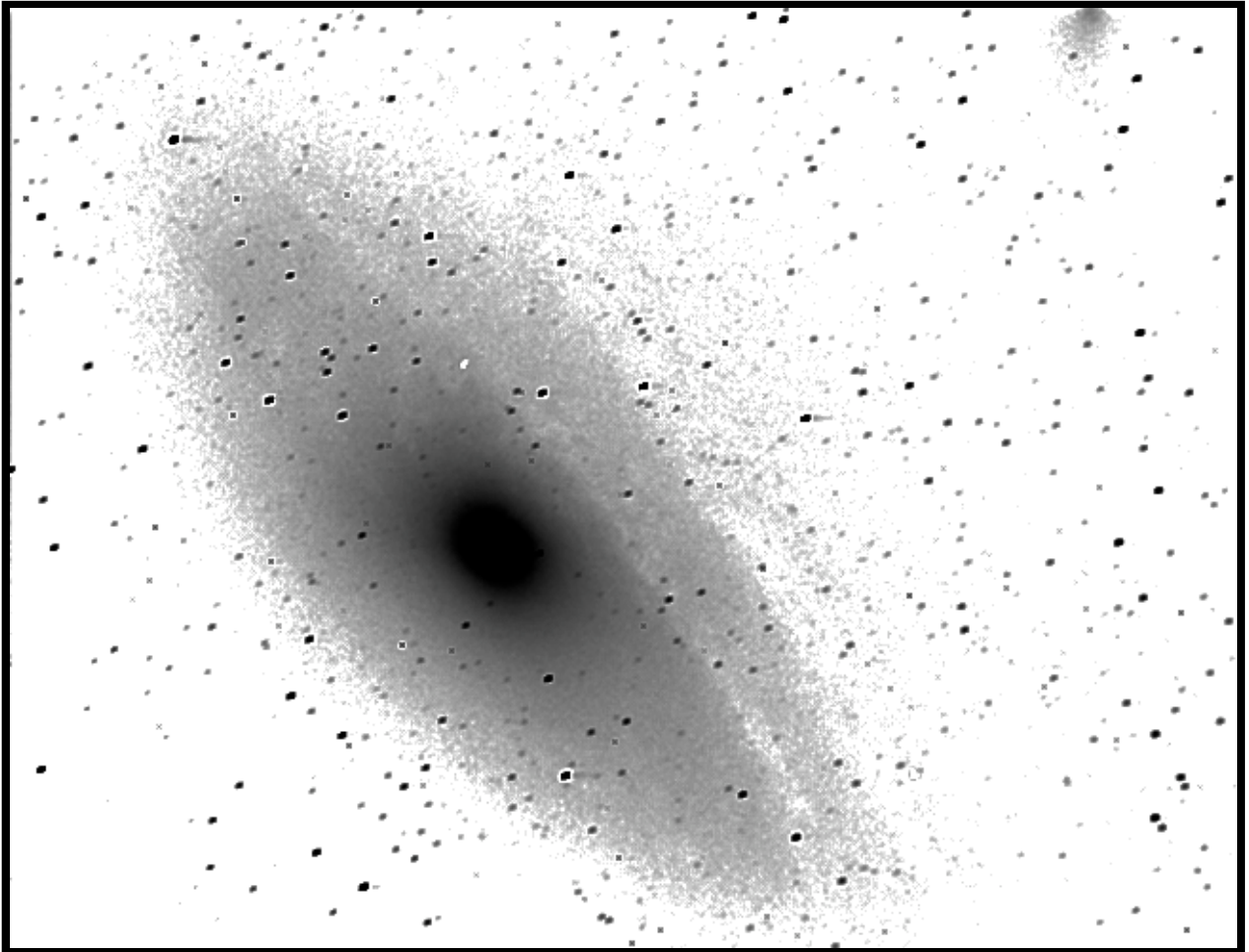
# NGC 2300



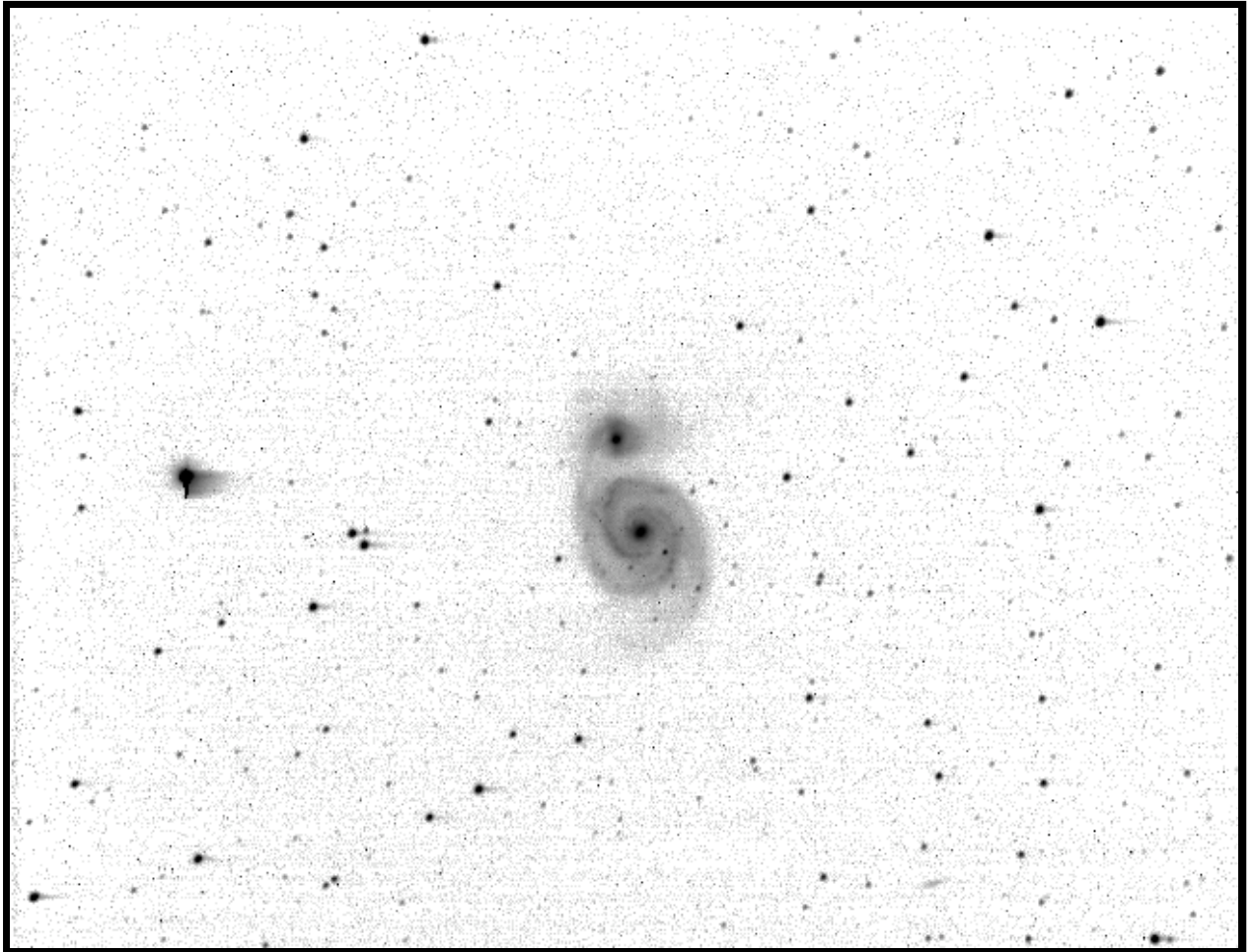
# NGC 4013



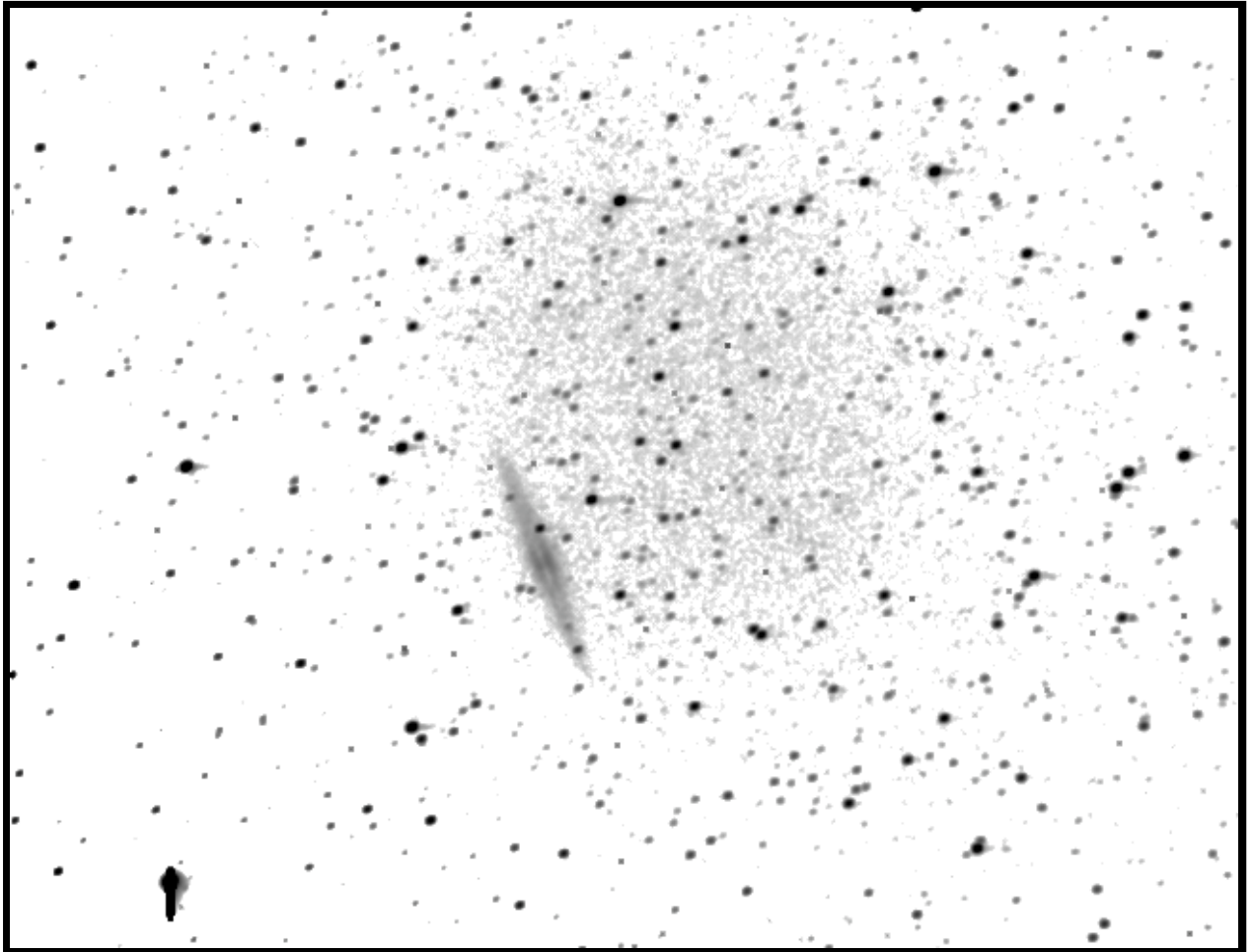
**M 31**



**M 51**

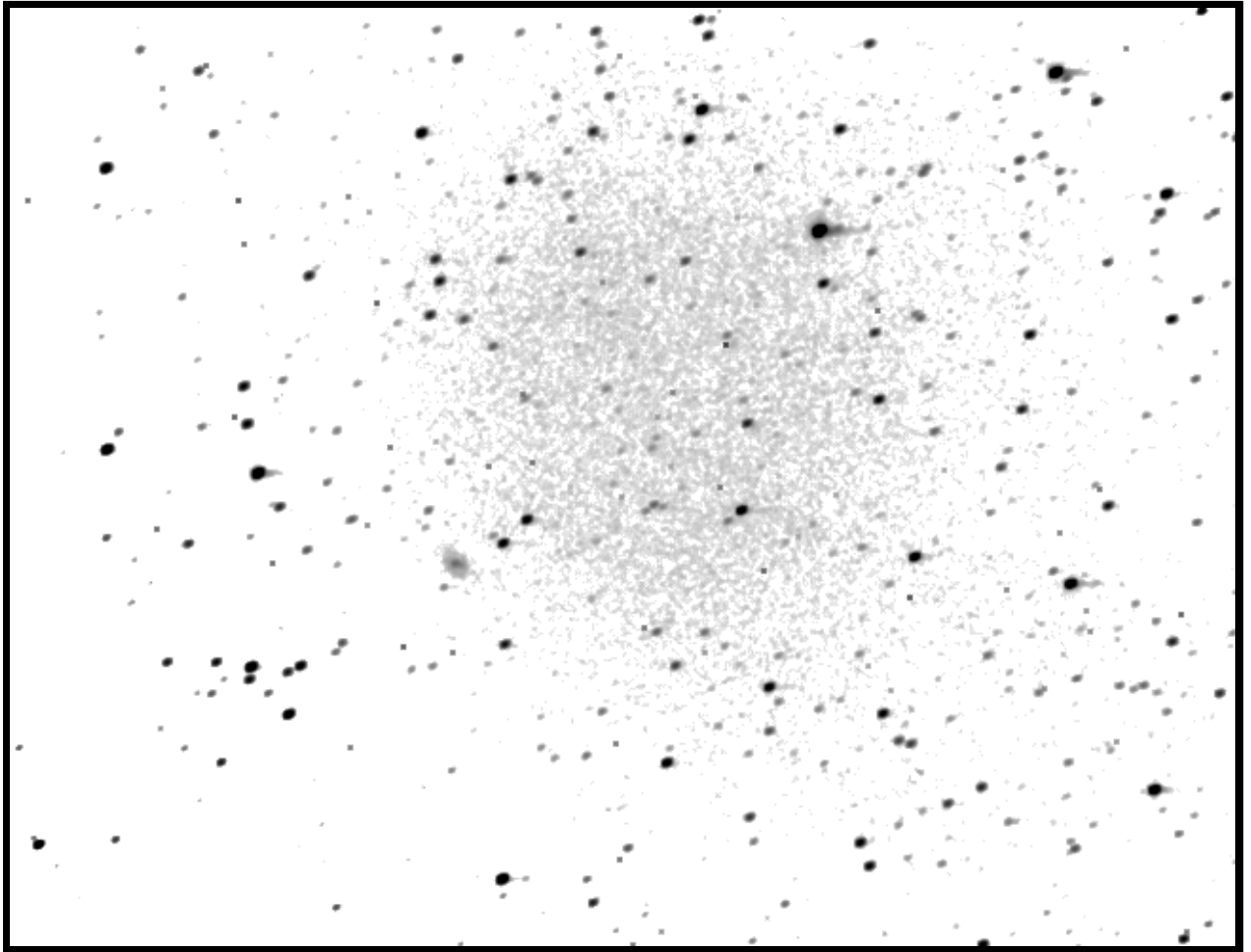


# NGC 891

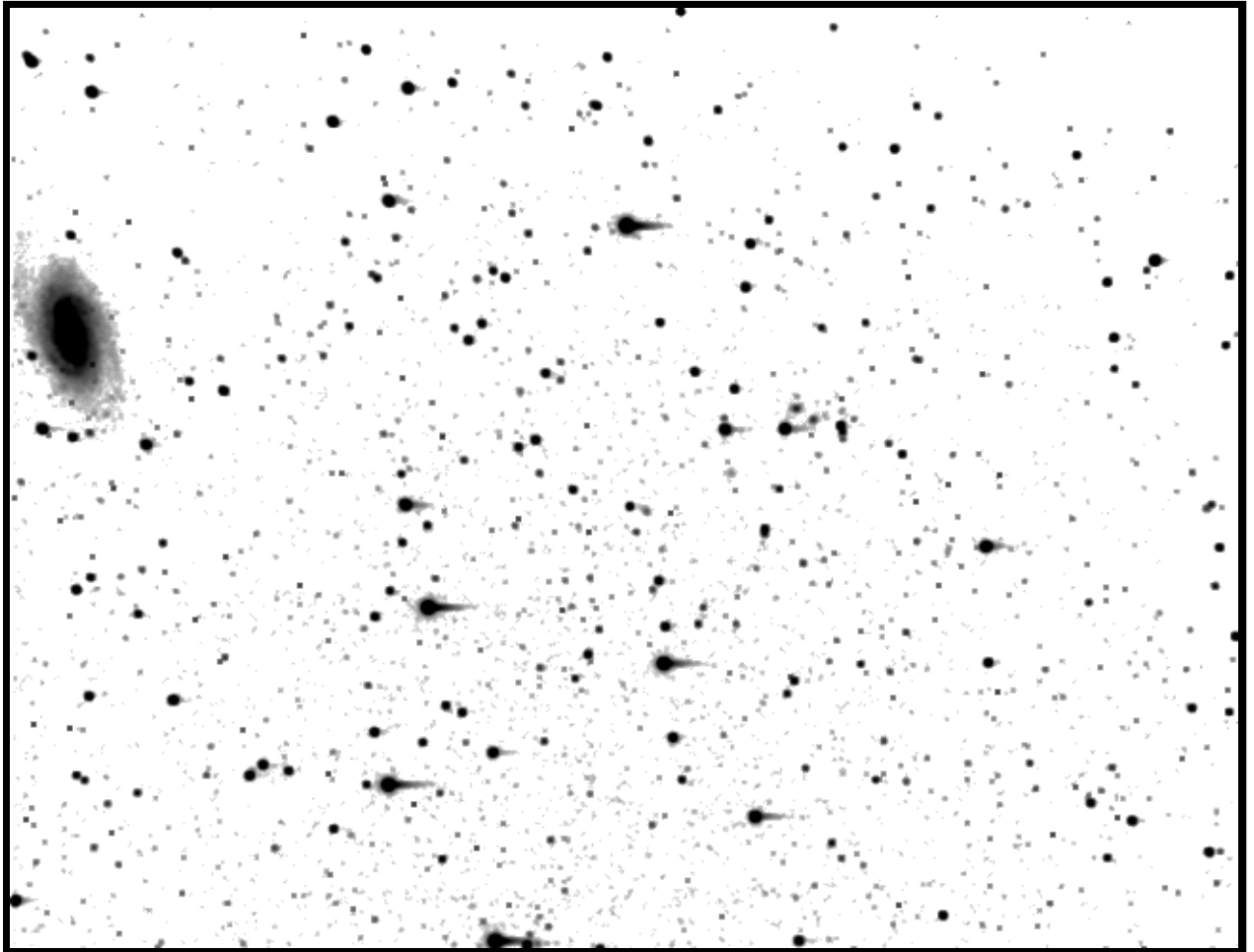




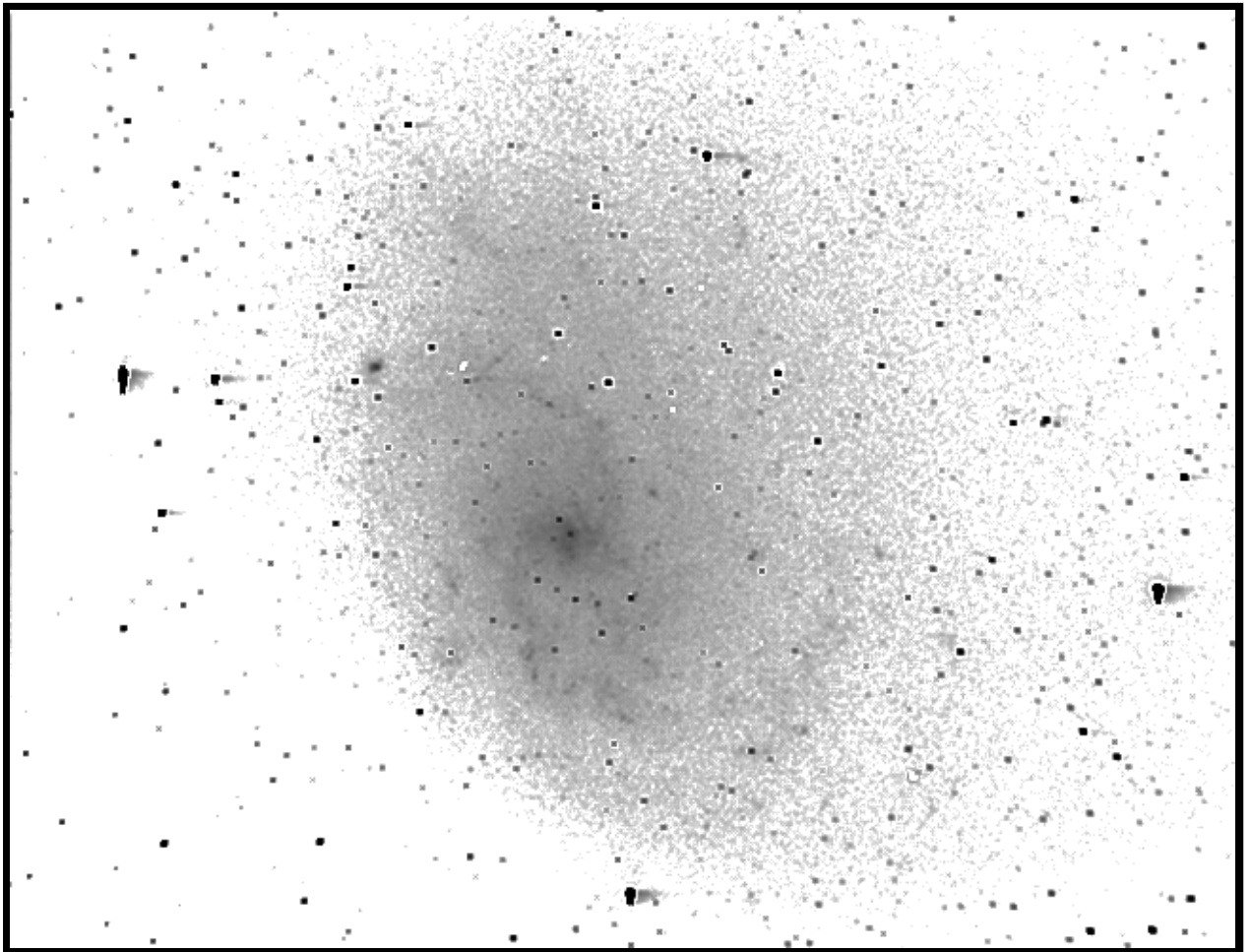
**NGC 2543**



## NGC 2903



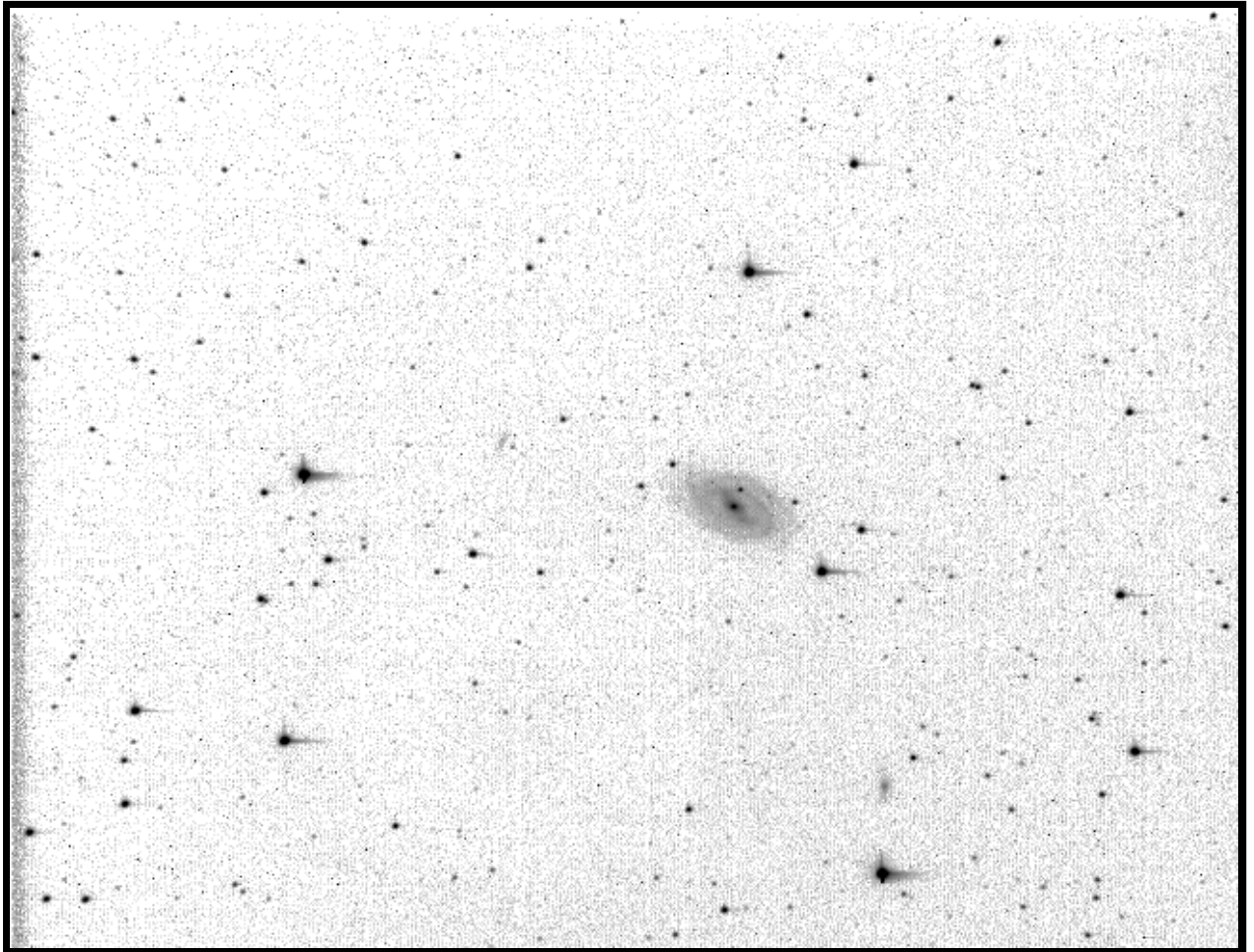
M 33



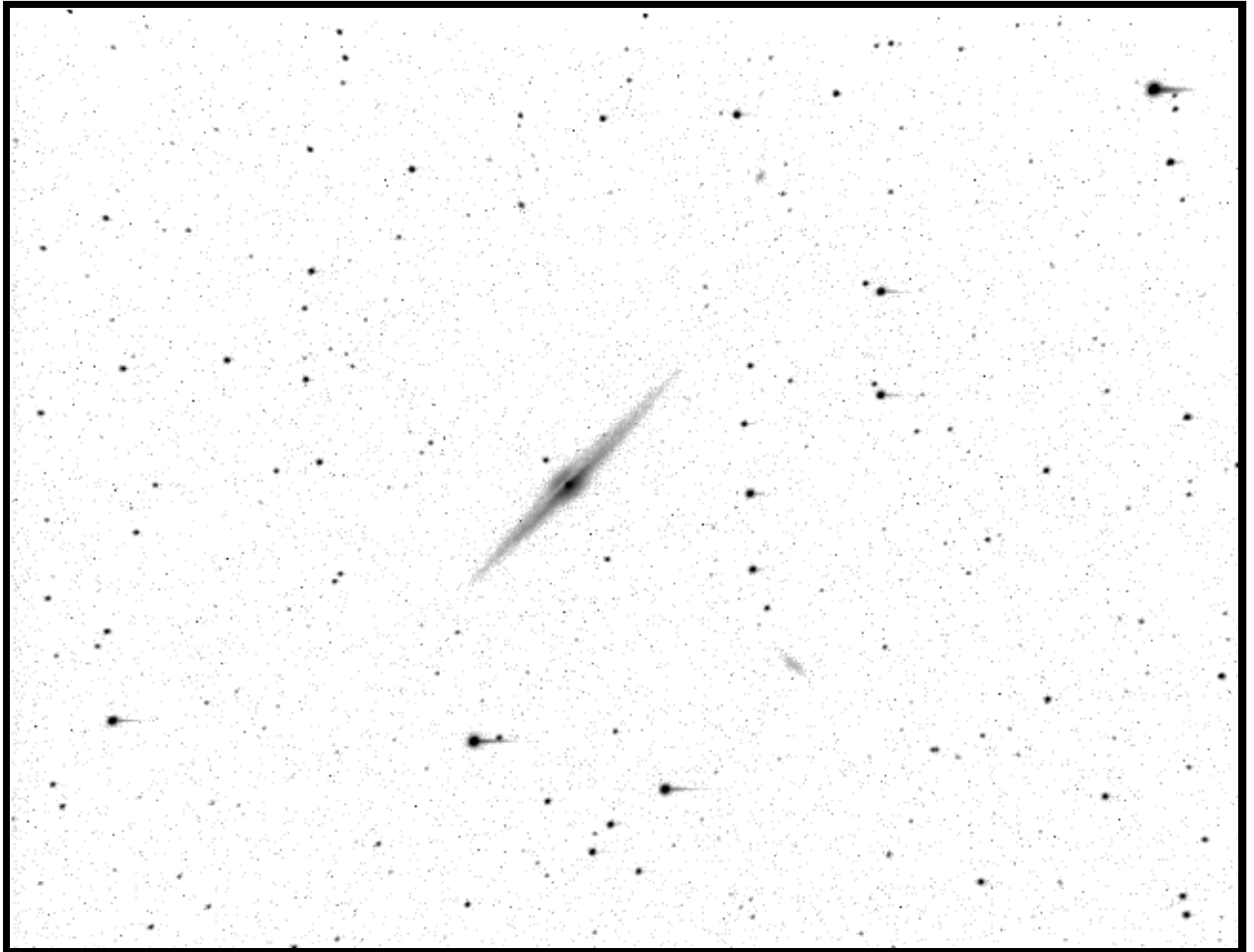
Cosmic Times 1929

Determining the nature, size, and age of the Universe  
Appendix B: Galaxy Images

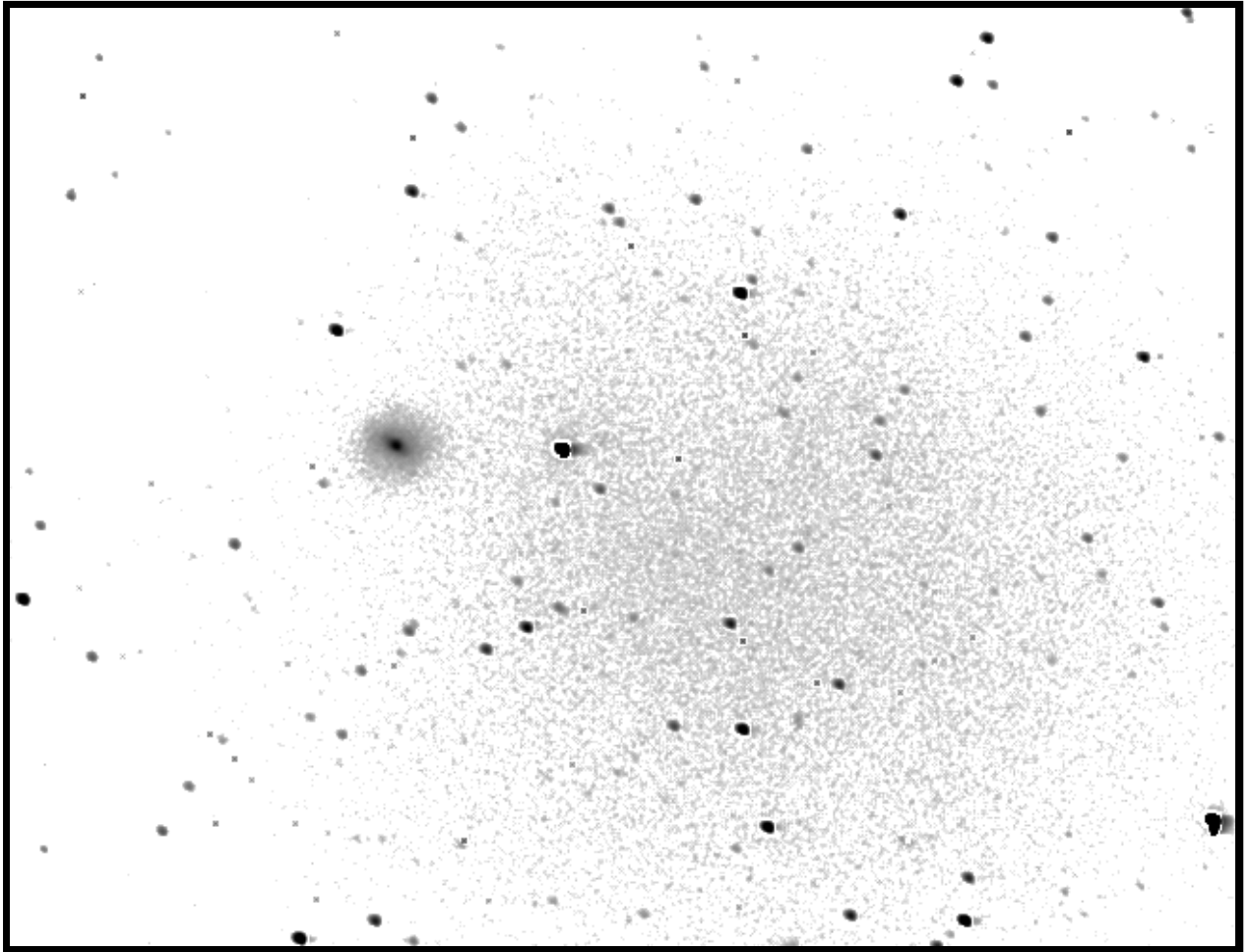
**M 109**



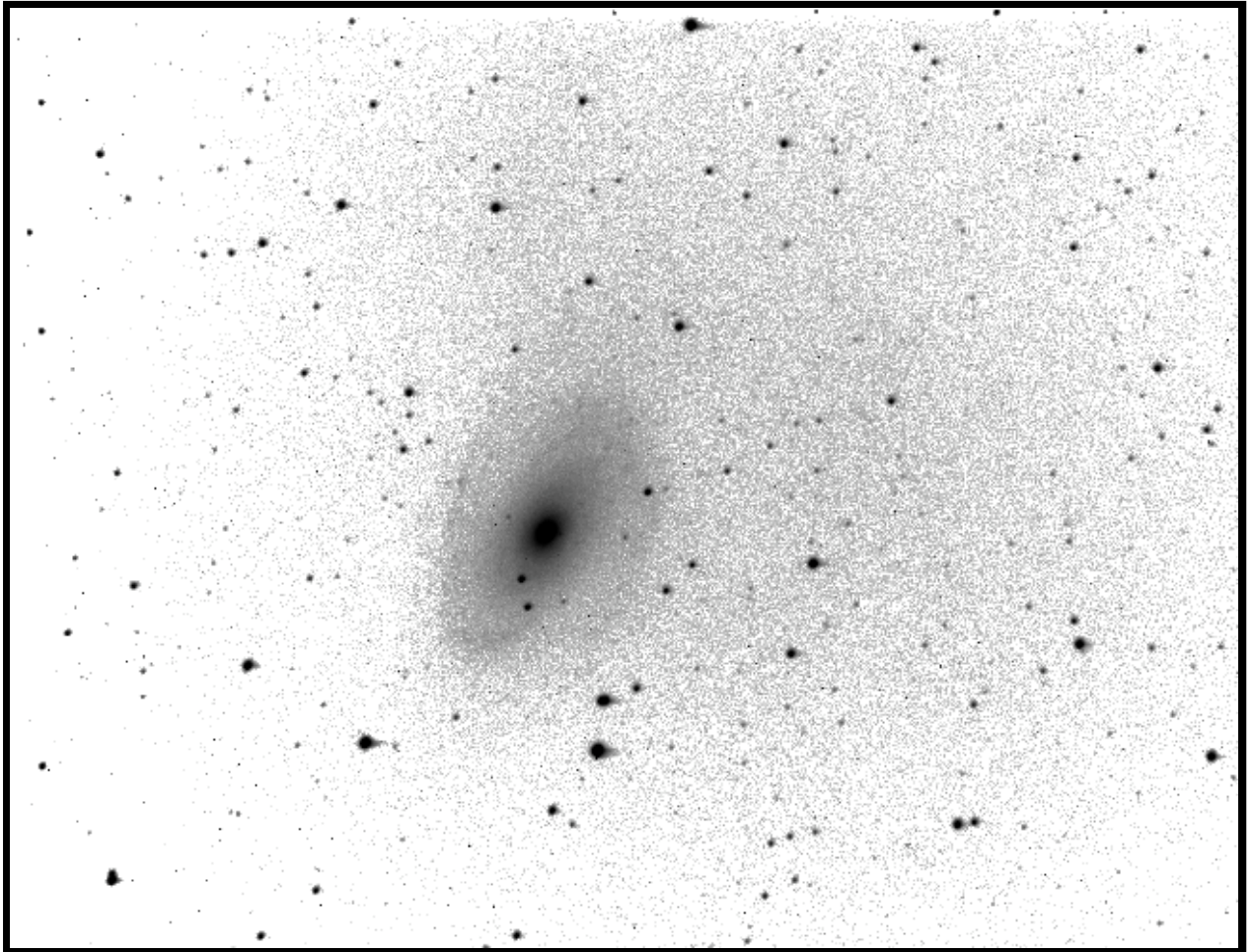
**NGC 4565**



**M 58**



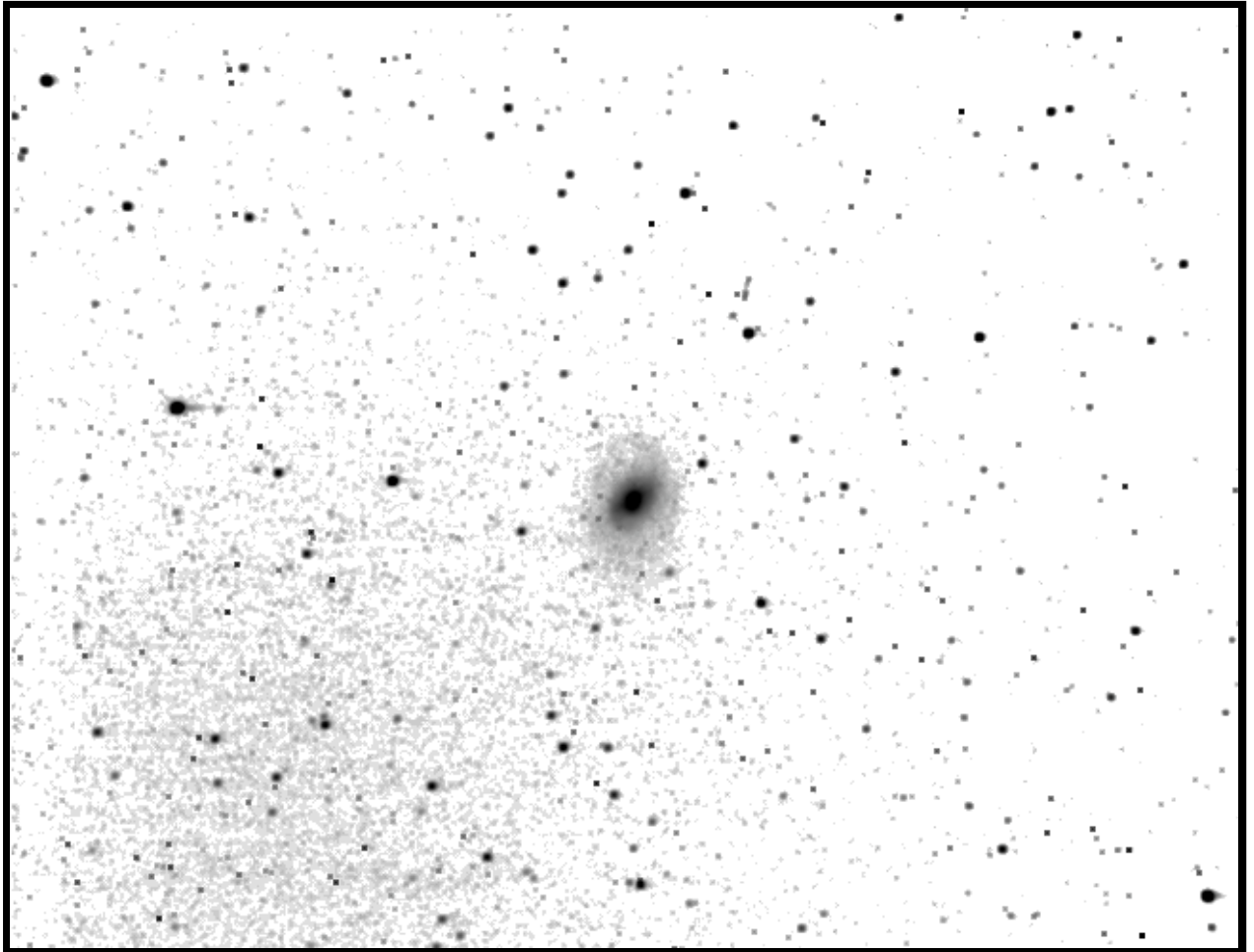
**M 81**



Cosmic Times 1929

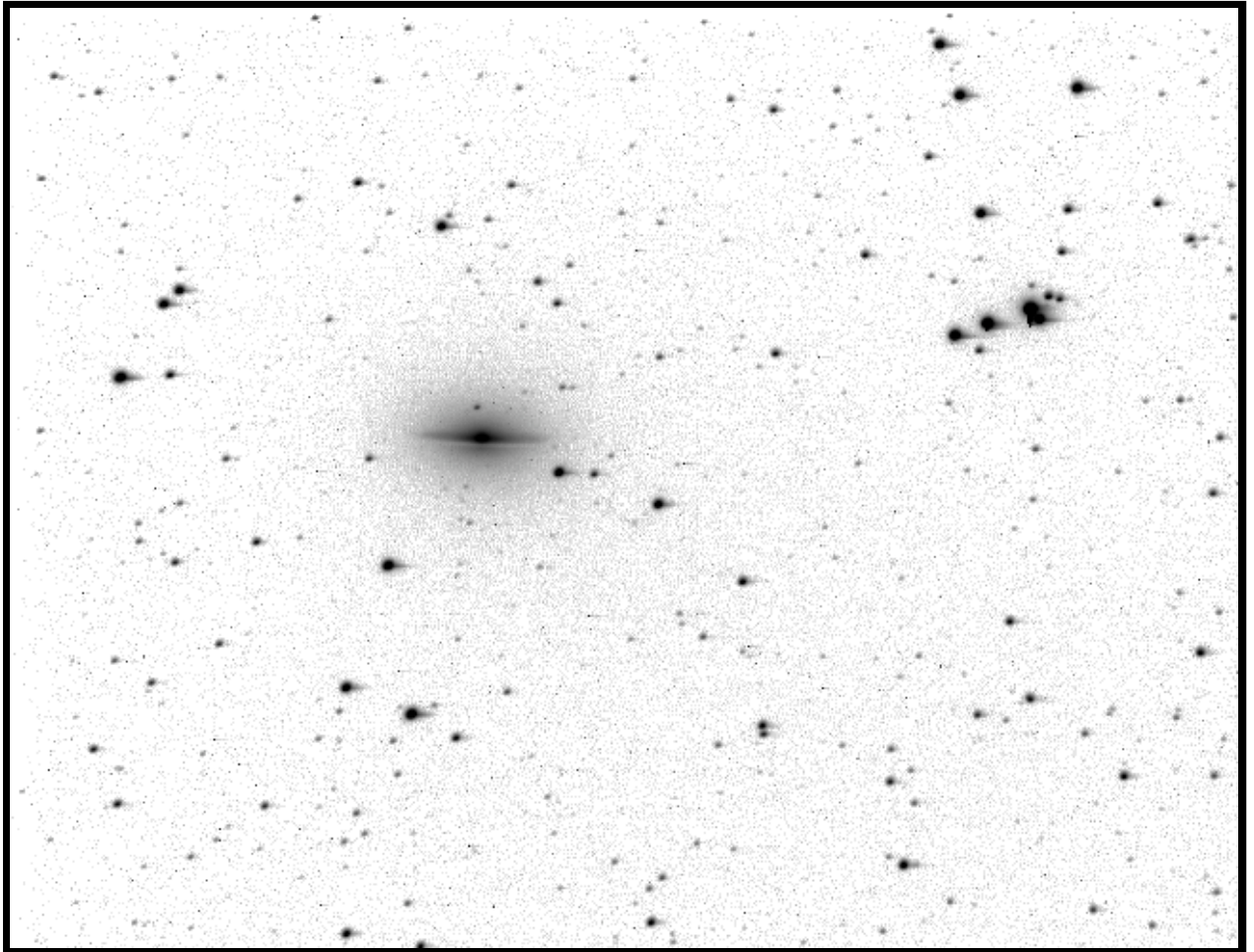
Determining the nature, size, and age of the Universe  
Appendix B: Galaxy Images

M 96

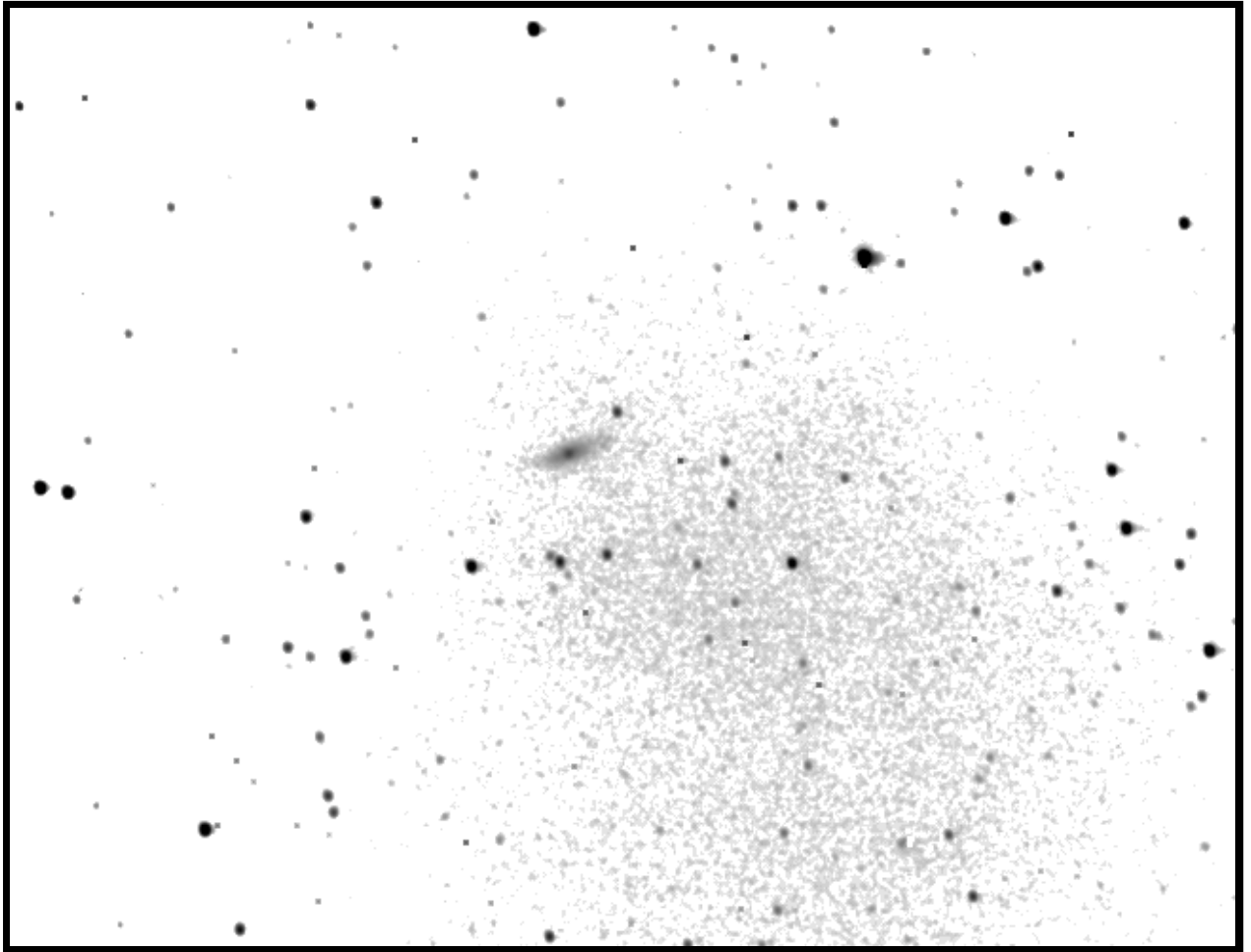




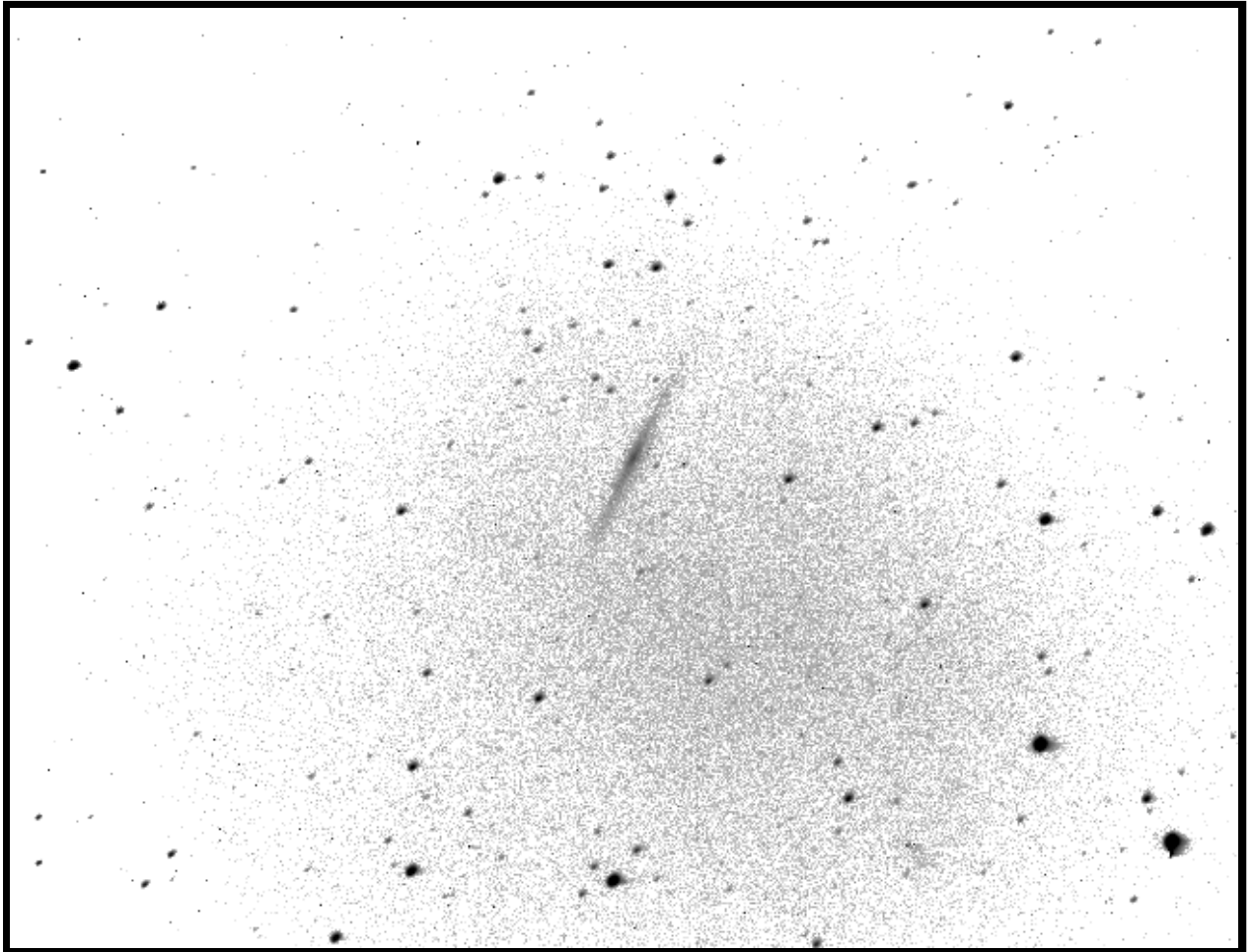
**M 104**



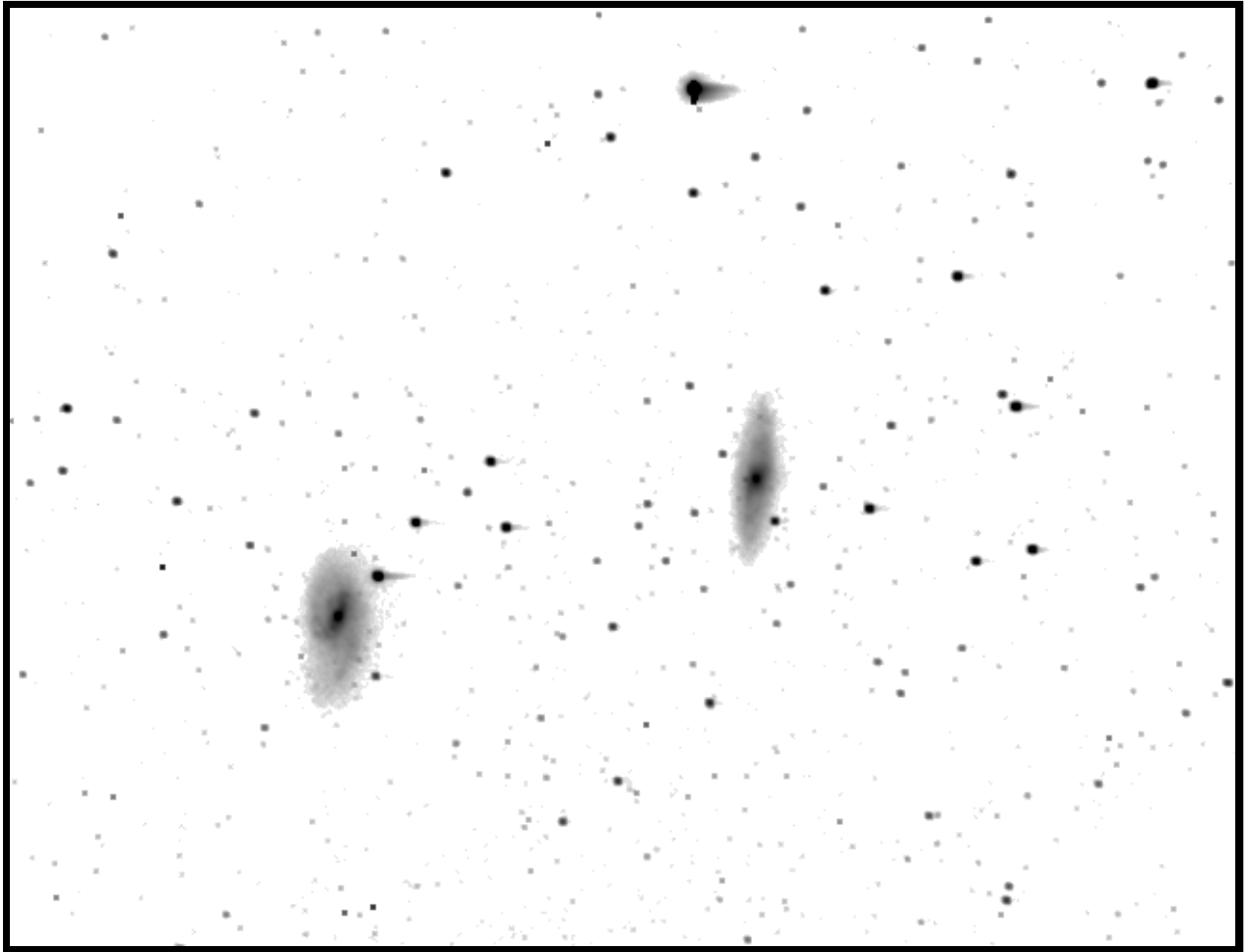
**NGC 4124**



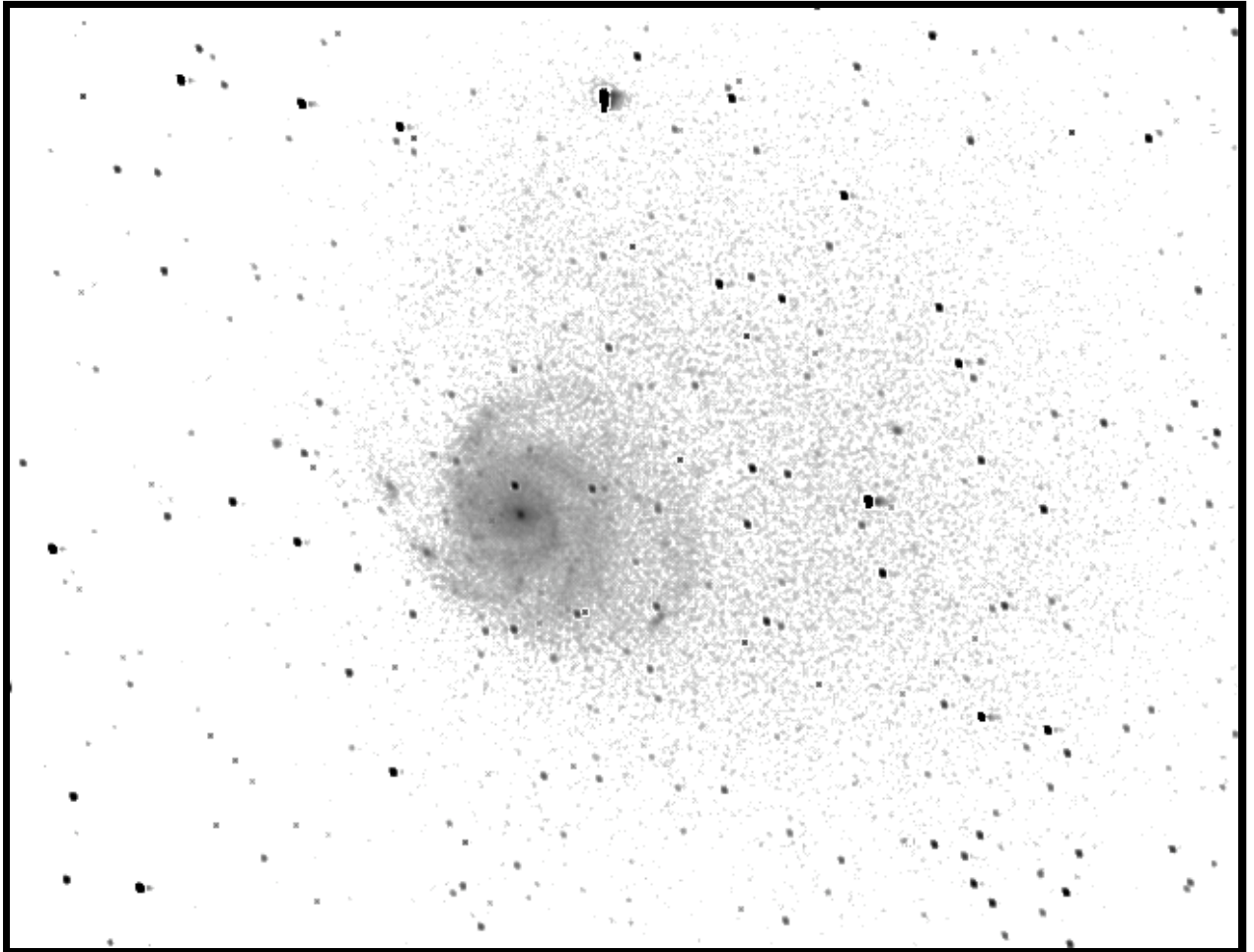
**NGC 5907**



**M 65**



**M 101**



**M 106**

