

89.354 - SEDIMENTATION & STRATIGRAPHY LABORATORY
ROUNDNESS AND SPHERICITY

I. Introduction

Roundness and sphericity have proven to be useful properties of particles (greater than sand size) when investigating the transport and deposition of sedimentary material. In this laboratory you will determine the roundness and sphericity of a number of sedimentary particles and will investigate the relationship between these two properties of particles.

Roundness refers to the sharpness of the corners and edges of a grain. Roundness was defined by Wadell (1932) as the ratio of the average radius of curvature of the corners to the radius of the largest inscribed circle. Since it is quite time consuming to measure roundness, the common method of estimating roundness is to visually compare grains of unknown roundness with standard images of grains of known roundness.

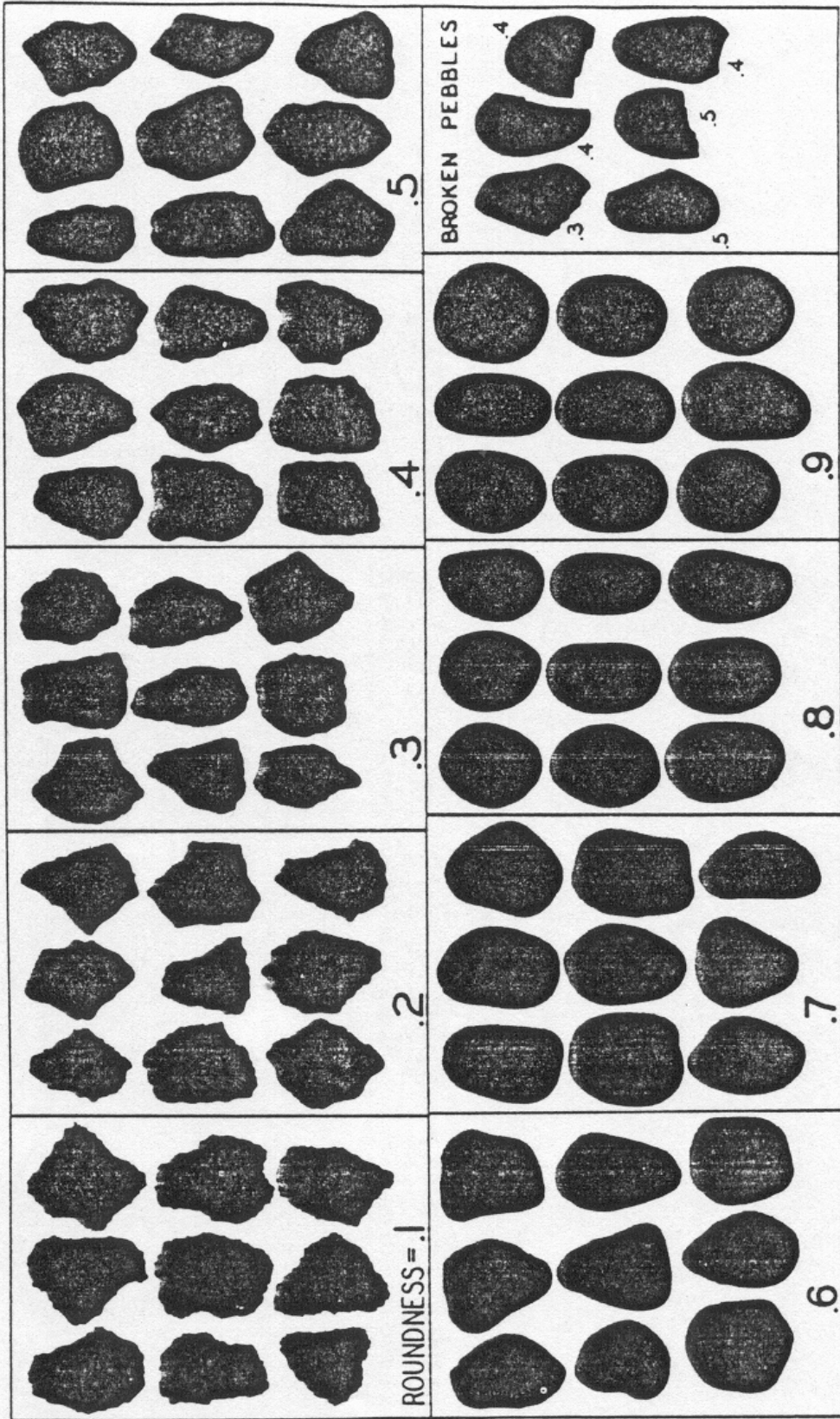
Sphericity measures the degree to which a particle approaches a spherical shape. It was defined by Wadell (1932) as the ratio between the diameter of a sphere with the same volume as the particle and the diameter of the circumscribed sphere. The sphericity of a particle is usually determined by measuring the three linear dimensions of the particle (longest (L), intermediate (I) and shortest (S) diameters).

II. Data Acquisition

Select 1 group of pebbles (Black, Red, Blue or Green numbers). **Record the color of the group at the top of the data sheet.** Determine the roundness of each pebble by visual comparison with the roundness chart. Determine the long (L), intermediate (I) and short (S) diameters of each of your pebbles using calipers. Enter this information on the data sheets. Calculate the ratios I/L and S/I and determine the sphericity (to the nearest 0.1 unit) using the attached Zingg diagram.

III. Data Analysis

Plot two histograms, one for roundness versus number of pebbles and one for sphericity versus number of pebbles. Number of pebbles is plotted on the y-axis and roundness or sphericity units are plotted on the x-axis. Each box of the histogram will be centered on the roundness or sphericity class number. Next, make a plot of roundness (x-axis) versus sphericity (y-axis). Is there any relationship between these properties? Discuss your answer.



PEBBLE IMAGES FOR VISUAL ROUNDNESS

Figure 3.7. Figure for estimating roundness of sedimentary grains. Note category for roundness estimates for broken grains. Based on method of Powers (1953).

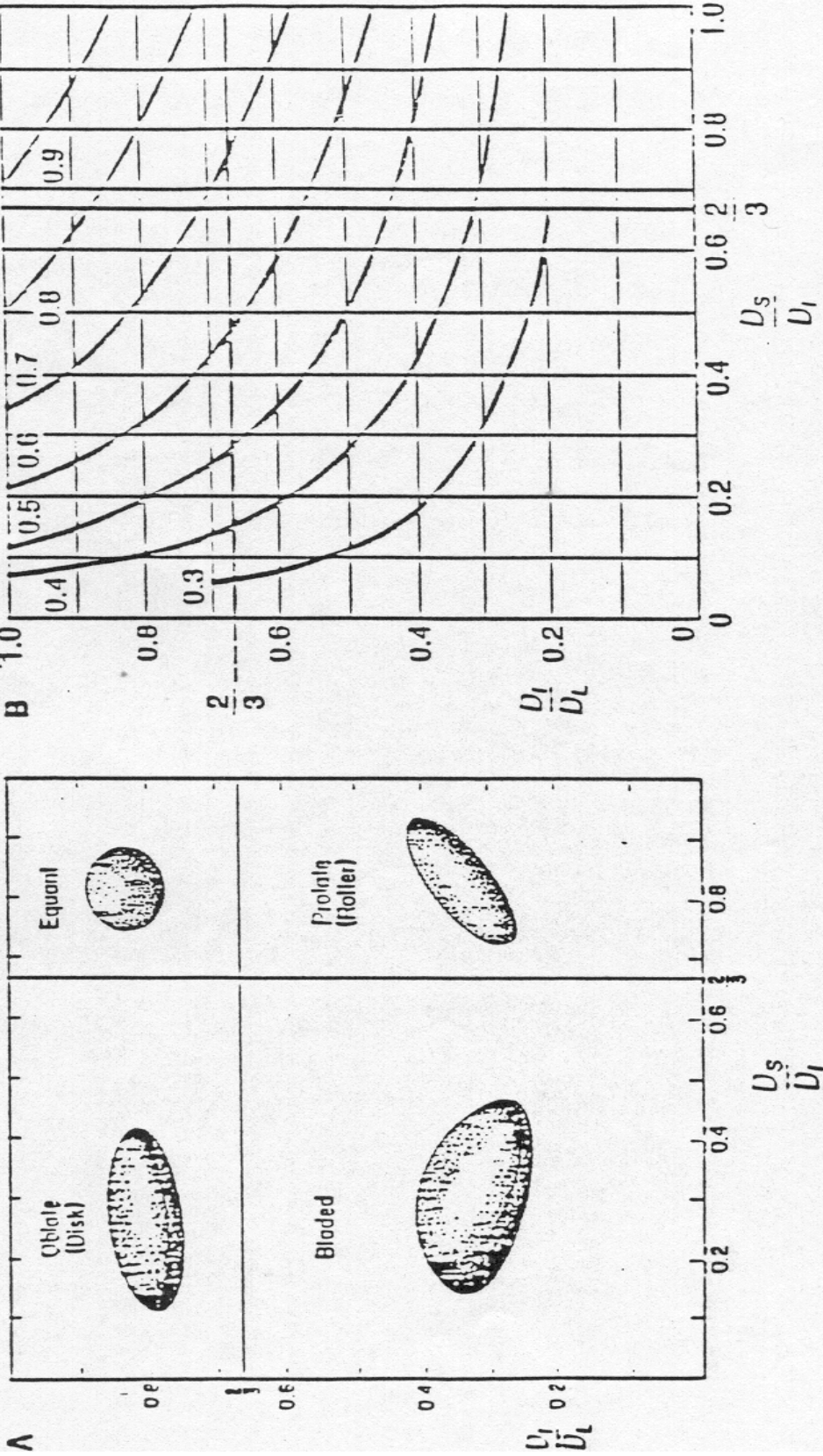


FIGURE 5.10 A. Classification of shapes of pebbles after Zingg (1935). B. Relationship between mathematical sphericity and Zingg shape fields. The curves represent lines of equal sphericity. (A, from Blatt, H., G. V. Middleton, and R. Murray, *Origin of sedimentary rocks*, 2nd ed. © 1980, Fig. 3.20, p. 80. Reprinted by permission of Prentice Hall, Englewood Cliffs, N.J.) B, after Pettijohn, F. J., *Sedimentary rocks* © 1975, Fig. 3.19, p. 54, reprinted by permission of Harper & Row, New York.)

