Fig. 2. The measured $R(l)$ curves for (a) the Archimedean, (b) the logarithmic and (c) the Comu's (hyperbolic) spirals. The horizontal bars show the lengths of arcs used in the measurement.

curves in Figs. 2(a) and (b) are nearly a parabola and a straight line, while that in Fig. 2(c) rises suddenly at a certain value of l. The spiral type with this kind of $R(l)$ curve is called here a hyperbolic type.

3. Applications to Vortex in Water Flow and Spirals in Traditional Cultures

The present method to characterize spiral curves was applied first to visualized vortices obtained experimentally, because the vortex in the water flow is considered to be one of common types of spiral patterns observed in the nature. The experimental setup is shown in Fig. 3. It was composed of a water tank of acrylic resin, $260 \times 300 \times 1200$ mm, a motor with variable rotation speed (Zeromax, assembled by Miki Pulley Co.) and a small truck running above the tank pulled by the motor. The truck carried a circular cylinder and a video camera (DCR-HC88, Sony Co.). The main part of the cylinder was held vertically in the water and driven with the truck. The vortices produced behind the cylinder were visualized by injecting a dye from the cylinder surface. The dye pattern was recorded by the video camera.

Figure 4(a) is one of the visualized vortices (one member in the Karman vortex street)