CHAPTER 6

DARWIN’S WORLD—SPECIES, VARIETIES, AND THE AGE OF THE EARTH. EVIDENCES OF GLACIATION

When Louis Agassiz came to Harvard from Switzerland in 1846, he brought with him not only his considerable expertise in biology, but also a lifetime experience in the Swiss Alps. In the Alps, he had often observed the workings of glaciers and had speculated that the glaciers had once been much more massive. Glaciers form when more snow accumulates each winter than can melt in the spring. The snow continues to pile up until it compresses the snow below into a dense form of ice, so dense that it has a blue color. (The ice is blue for reasons very similar to the reasons why the sky is blue and why the ocean under sunlight is blue. It has to do with the way that water transmits and reflects light. But that is a different story.) As anyone who has ice-skated knows, at appropriate temperatures ice, when compressed, will melt. The ice skate puts the weight of your body on a very narrow surface, compressing the ice and causing it to melt. Thus the skate glides easily along the ice. It does not work if the ice is too cold or the weight is not enough. Try it!

Glaciers do the same thing. With all the weight of the glacier above, the ice at the bottom melts, allowing the glacier to slide down the mountain. Glaciers slip down mountainsides at rates from a few feet to hundreds of feet per year, as has been documented by objects such as abandoned climbers’ tents being moved down the mountain. At the upper end, the glacier is renewed by the continuous accumulation of snow. See Fig. 2.1. Underneath the glacier, the movement rolls or pushes rocks and often breaks them; and the glacier often breaks apart small structures such as uneven parts of the earth. The glacier expands in the winter and retreats in the summer, leaving piles of the rubble it produced. The glacier as a whole moves like a river: The glacier is always there, but the water in it changes constantly.

The movement of the glacier produces characteristic marks, very similar to those that would be produced if you scoured a dirty pot with cleanser or a soft stone such as a pumice stone. The uneven surface (the remnant food) would be ground away, and the pot, if it were soft metal, would be scratched by the cleanser. The remnant food would accumulate at the edge, where the scouring stopped. Glacial valleys look very much like those shown in Figs. 6.1 and 6.2, whether the glacier is still there or not. The walls are steep and give the appearance of having been gouged
Figure 6.1. Termination of a glacier in Alaska. The glacier extends much farther into the sea in the wintertime and previously was much larger. Note the characteristics of the land through which it has come: steep-walled carved and scored valleys (arrows) and piles of rubble, mostly stones, boulders, and pebbles, along the sides of the glacier. The rubble along the side is called lateral moraine. At the front of the farthest extension of the glacier is the terminal moraine.

Figure 6.2. Edge of a fjord, or valley carved by a glacier (Norway). Note that the physical characteristics are the same, allowing its identification long after the glacier has disappeared.