Fig. 2.2. McMurdo Dry Valleys. Location map showing major geographic features. Location of cross-valley profiles (Fig. 2.7) plotted as yellow lines; location of other figures in text shown as numbers and boxes. (Upper left inset) Black square shows location of dry valleys within Antarctica. (Lower right inset) Map showing general range for coastal thaw zone (CTZ; blue), inland mixed zone (IMZ; green), and stable upland zone (SUZ; yellow) (adapted from Marchant and Head, 2007).

Fig. 2.10. Perspective view of the distal portion of a gully on the north-facing wall of South Fork, upper Wright Valley (see Fig. 2.2 for location). Gully channels descend down the slope and out onto the valley floor, forming a distal fan (foreground). In the middle, white patches represent seasonal snowbanks topographically trapped in the channel from wind-blown snow and undergoing melting to produce water flow and erosion during daily peak solar insolation in the austral summer. The marginal and distal dark regions represent the hyporheic zone (Fig. 2.11). Polygon trough outlines can be seen in the distal hyporheic zone due to the more porous nature of the sand filling the troughs (Fig. 2.14d). The background displays polygonal ground not readily apparent in this perspective view but can be seen in detail in Fig. 2.14a, b. Vertical red/black line in center is person for scale.

Fig. 2.13. Landscapes, near-surface thermal profiles, and polygons as a function of microclimate zones in the MDV (from Marchant and Head, 2007). (Top row 1) Typical landscapes in each microclimate zone; left to right: stable upland zone (SUZ), inland mixed zone (IMZ), and coastal thaw zone (CTZ). (Second row 2) Schematic vertical thermal profiles for each zone. Dashed line represents 0 °C (273 K) baseline; blue and red lines show winter-mean and summer-mean soil temperatures as a function of depth. Numbered soil "horizons" are defined on the basis of temperature profiles. Horizon 1 experiences summer temperatures above 0 °C (273 K). In the case of the CTZ (right), soils are seasonally moist and thus oscillation about 0 °C (273 K) produces a classic active layer (see text for discussion). For the IMZ (center), soils are too dry to produce classic active-layer disturbance, even though summer soil temperatures rise above 0 °C (273 K); instead the IMZ shows a dry active layer. Horizon 1 is not present in the SUZ (left) because mean-summer soil temperatures fail to rise above 0 °C (273 K); this zone thus lacks a traditional active layer. Horizon 2 reflects the depth to which near-surface materials experience seasonal temperature change. Temperature oscillation results in material expansion/contraction and is responsible for the initiation of polygonal terrain; see text. Horizon 3 reflects a zone of uniform temperature increase with depth; the base of the permafrost occurs where temperatures exceed 0 °C. (Third row 3) Left, oblique-aerial view of sublimation-type polygons in SUZ; field of view (FOV) is ~100 m; center, oblique-aerial view of sand-wedge polygons in IMZ; FOV is ~50 m; right, oblique-aerial view of ice-wedge polygons in CTZ; FOV is ~75 m. (Bottom row 4) Block diagrams illustrating the development of sublimation-type polygons (left), sand-wedge polygons (center), and ice-wedge polygons (right). Blue color indicates ice; see text for explanation.

Fig. 5.7. This is an image of a 8643 ± 72-year-old microbial mat retrieved from the Dry Valleys after growth in liquid culture medium for 70 days. The confocal laser scanning microscope (CLSM) used was an Olympus Fluoview 500. A small piece of the mat was broken off the edge of a larger piece in liquid medium, so the entire depth of the sample is represented. The entire sample is approximately 100 µm thick. This image is a combination of approximately 12 images taken from the surface of the mat to a depth of 20 µm at 2 µm intervals. Beyond this depth, it was not possible to image the interior of the mat. The mat was stained with a live-dead kit (Invitrogen, Molecular Probes) using Propidium iodide and Syto 9. The dye was excited with a laser at 488 nm and fluorescence was collected separately in red and green channels. Dead cells (compromised membranes) appear red.

Fig. 7.6. Cryoconite hole in the surface of a Dry Valley glacier. The clear ice is refrozen meltwater, which strongly contrasts with the creamy opaque glacier ice. The prominent debris layer some 30 cm below is clearly visible, as is some recently deposited aeolian dust on the ice lid. The diameter of the hole is $\sim$20 cm.