Botanizing on the roof of Africa

On the roof of Africa: bogs in the distance and everlastings in the foreground. Photo: S. Siebert.

The Bale Mountains of Ethiopia

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Like mountains on top of mountains, the highlands of Ethiopia rise 1 500 m above a plateau that already lies at 2 500 m above sea level and comprises 80% of the landmass of Africa above 3 000 m; better known as the 'roof of Africa'. The Bale Mountains on the southern highlands are characterized by numerous spectacular volcanic peaks, beautiful alpine lakes and unspoiled mountain streams. A large proportion of these mountains are protected in the 2 500 km^2 Bale Mountains National Park some 400 km south of Addis Ababa.

The Harenna escarpment that runs from east to west divides the National Park. A high altitude plateau lies north of the escarpment, averaging around 4 000 m above sea level. South of the escarpment the topology drops abruptly, and then slopes gradually down to an altitude of 1 500 m at the park's boundary.

The Sanetti plateau in the north is the most extensive afroalpine (the distinctive flora of the uppermost parts of high mountains) area in Africa, its ancient volcanic rocks dissected by many rivers and streams that have cut deep gorges, and created spectacular waterfalls. Several massifs rise from the plateau. Of these, Tullu Deemtu (Red Mountain) is the highest at 4 377 m above sea level: the second highest point in Ethiopia.

The Bale Mountains lie within the tropics of the northern hemisphere and the climate, high rainfall and mainly damp, cloudy weather is typical of a high altitude mountainous region. The year has three seasons: dry from November to February, early wet from March to June, and wet from July to October. Summer days can reach maximum temperatures of 30 °C, with minimum winter night temperatures dropping well below freezing point. On cold, clear nights, heavy ground frosts are common.

The basalts of the Bale Mountains support a rich diversity of plant communities. High rainfall and variation in altitude and topography result in clear zonation of vegetation, similar to the patterns of zonation evident on most east African mountains. Some plant genera are shared and are common to many of these mountains (e.g. *Kniphofia*, *Afrocarpus* and *Erica*) although species may differ.

Lowlands

The Weyb River, which rises in the Bale Mountains, formed the extensive underground cavern systems at Sof Omar as it channelled through the limestone foothills. Numerous

Commiphora (corkwoods) and *Acacia* species, many of which are also found in southern Africa, dominate these limestone hills.

The vegetation is typical dry, thorny savanna with wooded grasslands and resembles the 'mixed bushveld' of South Africa. Conspicuous tree species include *Balanites aegyptiaca* (single green-thorn), *Combretum molle* (velvet bushwillow), *Grewia pubescens* (raisin), *Maerua angolensis* (bead-bean), *Pappea capensis* (jacket-plum), *Steganotaenia araliacea* (carrot-tree), *Terminalia brownii* (weiba) and *Ziziphus mucronata* (buffalo-thorn). *Dracaena ellenbeckiana* (dragon tree) is a common understorey shrub.

Forbs (dwarf shrubs or woody plants found in grasslands) are also common, especially succulents such as *Caralluma speciosa*, *Cissus quadrangularis*, *Plectranthus puberulentus* and *Pyrenacantha malvifolia*, and different species of *Aloe*, *Euphorbia* and *Kleinia*. A blue-flowered pioneer, *Blepharis edulis*, colonizes roadsides and, in contrast, the white-flowered *Kanahia laniflora* vegetates moist river banks. Exposed bedrock along the road is inhabited by the xerophyte, *Xerophyta humilis*.

Coffea arabica is found throughout the country at this altitude (1 500 m). Coffee originates from the horn of Africa and Ethiopia is the centre of its genetic diversity. The shrub grows as a semi-wild crop in moist montane forest, as a cultivated crop with artificial shade and watering, or as garden plant in backyards with other fruit trees. Another crop found at this altitude is

RIGHT: The white-flowered *Kanahia laniflora* grows along river banks.
BELOW LEFT: Like the euphorbia next to it, *Pyrenacantha malvifolia* has evolved a water storage organ to survive the dry conditions of the lowlands.
BELOW: A hedge of *Euphorbia abyssinica* with this year's cut-back lying on the ground. Photos: S. Siebert.

Eragrostis tef (teff), a cereal used in the preparation of Ethiopia's staple food 'ingera'. Ethiopia has over 100 species of cultivated crops and their wild relatives.

Plains

The Bale Mountains are surrounded by wide, fertile plains below 2 000 m above sea level that are extensively planted for wheat production. Towards the main towns vast areas are also planted with *Eucalyptus globulus* (Tasmanian blue gum) and *Cupressus lusitanica* (Mexican cypress), and closer to the escarpment with the indigenous *Juniperus procera* (African juniper). Conspicuous plants of the road verges next to the fields include the invasive grass *Pennisetum villosum* (white foxtail), the north African endemic *Solanum marginatum* (white-edged nightshade), and scattered specimens of the flat crowned *Acacia abyssinica* (highland umbrella-thorn).

Also visible are magnificent specimens of *Afrocarpus falcatus* (small-leaved or Outeniqua yellowwood), remnants of forests that once covered the hillsides. A very interesting feature of the roadsides is the planted hedges of *Euphorbia abyssinica* (Abyssinian candelabra) that are cut back 1.5 to 2 m high. At lower altitudes locals grow *Ensete ventricosum* (false banana), which they harvest for the starch stored in the stem and leaf bases.

Escarpment

Beyond the undulating hills of the wide plains, an afromontane forest belt stretches up the escarpment to about 3 200 m, which is the upper limit of the tree zone apart from isolated remnants in higher lying protected valleys. To the north of the Harenna escarpment the landscape is characterized by patches of formerly extensive forests, dominated by *Juniperus procera* and *Hagenia abyssinica* (East African rosewood). *Schefflera abyssinica* (Abyssinian false cabbage tree), *Maesa lanceolata* (false assegai) and *Rapanea simensis* (Simien beech) grow in these open forests and *Rosa abyssinica* (white Abyssinian rose) scrambles among the trees. The

Grasslands occasionally develop between forests due to impeded drainage, marshy conditions along streams or human activities.

ABOVE: The yellow flowers of *Bidens macroptera* brightens the extremely species-rich rocky grasslands.
LEFT: Human disturbance has caused beautiful 'gardens' of the torch lily, *Kniphofia foliosa*. Photos: S. Siebert.

LEFT: The dense vegetation of the *Erica-Alchemilla-Helichrysum* heathlands reminded us of the fynbos. Photo: S. Siebert.
BELOW: Ethiopia, and the Bale Mountains National Park. Map by Sally Adam, Technodraft.

In the Drakensberg, a similar *Erica-Helichrysum* alpine heath occurs between 2 900 - 3 500 m, a significantly lower altitude than the Bale Mountains.

large, endemic composite *Solanecio gigas* (nobe) is common in damp areas.

The southern tree zone beneath the Harenna escarpment is characterized by yellowwood forests interspersed with groves of *Arundinaria alpina* (mountain bamboo). These southern forests are much denser with a greater diversity of species.

Trees reach heights of 30 m and are covered in epiphytes, creepers and lianas. Dominant trees include *Buddleja polystachya* (anfar), *Ekebergia capensis* (Cape ash), *Maytenus addat* (silky bark), *Nuxia congesta* (brittlewood), *Pittosporum viridiflorum* (cheesewood), *Prunus africana* (African almond) and *Schefflera volkensii* (ansha). Dense thickets of rapidly growing edible mountain blackberry, *Rubus steudneri*, grow in the wet season. At the lower levels of the southern tree zone (2000 m and below), the species composition of trees changes. *Allophylus abyssinicus* (forest false-currant), *Celtis africana* (white stinkwood), *Croton macrostachyus* (bissana), *Erythrina brucei* (coral tree), *Ocotea kenyensis* (northern stinkwood), *Olea hochstetteria* (ironwood olive), *Syzygium guineense* subsp. *afromontanum* (pointed-leaf waterberry) and *Trema orientalis* (pigeonwood) become more abundant.

Grasslands occasionally develop between forests due to impeded drainage, marshy conditions along streams or human activities. They contain dense stands of the scrubby aromatic *Artemisia afra* (African wormwood) and grey-leaved *Helichrysum splendidum* (Cape gold) with bright yellow, papery flowers.

In higher altitude grasslands, endemic flowering plants such as *Acanthus sennii* and *Echinops ellenbeckii* can be seen on the margins of remnant forest patches. At lower altitudes human disturbance has resulted in beautiful 'botanical gardens', where fields with masses of *Kniphofia foliosa* (torch lily) make for a spectacular sight. This species parallels *Kniphofia caulescens* of the Drakensberg in beauty and localized abundance. *Bidens macroptera* is a yellow-flowered endemic of the rocky grasslands on lower mountain slopes.

In the vicinity of the spectacular Sebsebe Washe rock formation, the grassland is full of geophytes including *Gladiolus longispathaceus*. Other frequently encountered genera with indigenous representatives include *Geranium*, *Oxalis*, *Plectranthus*, *Scabiosa* and *Sedum*.

Subalpine

Above the tree line, reaching up to 3 500 m above sea level, is a subalpine belt of ericaceous heathland. Frequent mists support a dense growth of lichen, mosses, wildflowers and grasses beneath small trees. *Hypericum revolutum* (giant tree wort) with its golden yellow flowers occurs frequently with *Erica arborea* (tree heather) at lower altitudes in the forest/heathland transition. Pastoralists often burn the

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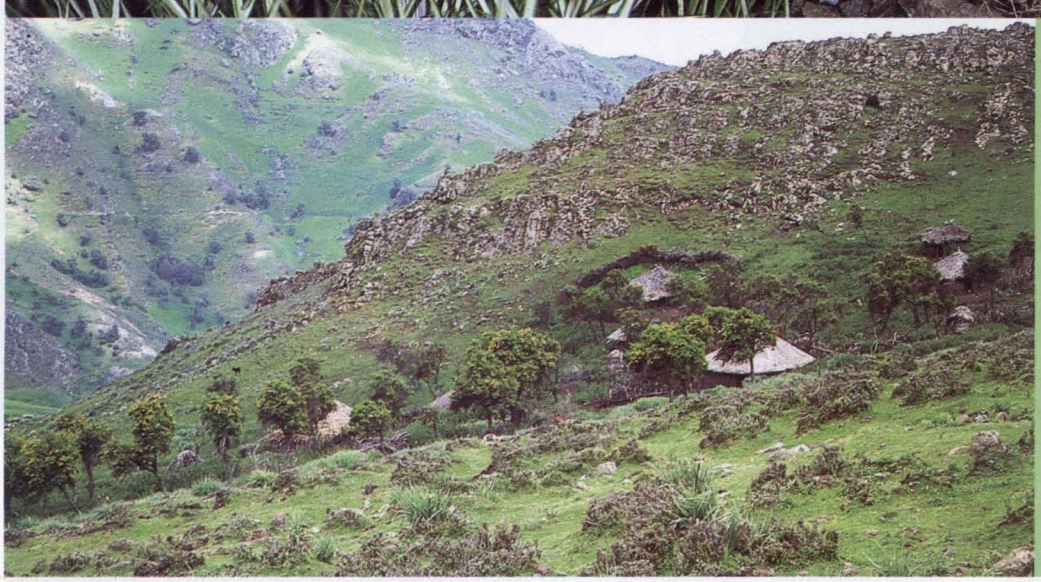

ABOVE RIGHT: Flowering specimens of *Carduus* in the afroalpine zone.
ABOVE LEFT: *Echinops ellenbeckii* with its characteristic ball-shaped flowers is unmistakable on the margins of forest patches.
LEFT: A homestead surrounded by *Hypericum revolutum.* (Note the re-sprouting *Erica arborea* in the foreground.) Photos: S. Siebert.

heather in an attempt to increase the grass layer, resulting in stunted, re-sprouting trees. Frequently-occurring herbaceous genera include *Festuca*, *Hebenstretia*, *Romulea*, *Swertia* and *Viola*. At higher altitudes *Alchemilla haumannii* (lady's mantle), *Erica trimera* (asta) and *Helichrysum citrispinum* (spiny everlasting) form dense, localized stands among the tree heather in the transition zone with the afroalpine belt.

Endemics associated with the ericaceous heathlands include *Echinops longisetus*, with its conspicuous large flower heads, and *Rubus erlangeri*, with its unusually elongated and pointed sepals.

Afroalpine

Afroalpine refers to the peculiar flora of the uppermost parts of high mountains. On the Bale Mountains this zone starts at about 4 000 m above sea level and is recognizable by its capping of more recent lava flows that created spectacular rock formations. High peaks are covered by bare rock or exposed soils, vegetated only by small but hardy herbs like *Dipsacus pinnatifidus* and *Helichrysum splendens*, and tussock grasses such as *Pentaschistis minor* and *Festuca abyssinica*. Plant community patterns in this zone are determined by slope, drainage and rodent activity. Pioneers are common, colonizing soil that is continuously moved by giant mole rats, and include *Arabidopsis thaliana*, *Erophila verna* and *Thlaspi alliaceum*. Rocks are covered by many species of mosses and lichens. Vegetation in flat areas below the peaks include many cushion-forming everlastings like *Helichrysum citrispinum*, *H. cymosum*, *H. formosissimum* and *H. splendidum*; and typical

cushion plants such as *Geranium kilimandscharicum* and *Polygonum afromontanum*. Plants frequently encountered along drainage lines and bogs include *Alchemilla haumannii* and the tufted sedge, *Carex monostachya*. A peculiar *Carduus* species and the blue flowered *Myosotis keniensis* occur on rock outcrops.

In the Drakensberg, which also has a basaltic geology but where altitude does not exceed 3 500 m above sea level, a similar *Erica-Helichrysum* alpine heath occurs between 2 900 - 3 500 m: a significantly lower altitude than in the Bale Mountains. Altitudinal effects have resulted in intermingling of montane forest and ericaceous belts and these are not as distinct in the Drakensberg as the East African mountains. Like the other high altitude areas of East Africa, some plants in Ethiopia have developed giant forms. *Lobelia rhynchopetalum* (giant lobelia) is the most noticeable in the Bale Mountains: their silhouettes against the horizon on the Sanetti Plateau, and their reflections in the numerous small lakes make them unmistakable. Another giant lobelia, *L. gibberoa* (jibra), is a smaller, spindly species that occurs in the southern forests below the Harenna escarpment.

Unfortunately these graceful forms are not present in southern Africa, probably because of our lower altitudes. The Ethiopian afroalpine mountain refuge is not only renowned for its unique plant life, but is also home to endemic mammals such as the Simien red wolf, mountain nyala, Menilek's bushbuck and giant molerat. It is also a birder's heaven, containing many species endemic to Ethiopia.

This major watershed of Ethiopia and Somalia is not without threats. In the Bale National Park pressure is placed on the natural vegetation by overgrazing, fire for controlling woody vegetation and deforestation. The park has not been legally gazetted and people are permitted to live with their livestock on the sensitive Sanetti plateau and along the Harenna Forest. Fortunately WWF has taken note of this situation and have initiated a project to address responsible conservation.

Acknowledgements
The authors thank Mr Jonathan Timberlake, Prof Ibb Friis, Dr Alan Paton, Dr David Goyder and Prof Peter Linder for field identifications. SABONET, NRF and IAPT is thanked for funding the authors' attendance of the AETFAT Congress and post-congress tour.

Further reading

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BELOW: A typical high altitude bog with giant lobelias in the background. Photo: S. Siebert.