



The Tuareg people of the Sahara are among the 2.6 billion people in the world who live in drylands.

## ENVIRONMENTAL SCIENCE

# Dryland epiphany

**Andrew Robinson** finds that a study of arid places and their peoples reveals untold riches.

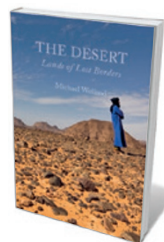
The earliest civilizations developed near great rivers in drylands such as the Fertile Crescent, in what is now Iraq, Syria and Palestine, and in the Nile valley. Yet the European world view has historically seen deserts as empty and inhospitable, perhaps because Europe has no absolute deserts. Charles Darwin, while circumnavigating the world in the 1830s, largely ignored deserts such as Chile's, treating them as evolutionary backwaters compared with rainforests and oceanic islands. In the twentieth century, drylands in places as far-flung as Nevada, Algeria, Kazakhstan and Australia have been deemed suitable for nuclear-weapons testing.

In *The Desert*, geologist Michael Welland aims to set the record straight. His *Sand* (Oxford University Press, 2009) explored drylands in granular detail. Now, in this impressively illustrated scientific and cultural history, he sets out the bigger picture, harnessing geology, climate science, botany, zoology, ecology and anthropology to reveal places of natural and cultural abundance, with rich histories. Sleep outside in the desert, he writes, and in the morning see the "myriad tracks and trails of nocturnal activity in the sand".

Almost one-third of our planet's land area, holding one-fifth of its population, is defined by the United Nations as hyper-arid like the Sahara, arid like central Australia or semi-arid like the American West. If we include dry sub-humid zones such as southeastern

India, 41.3% of land area consists of drylands, inhabited by 2.6 billion people. Even this takes no account of the influence of desert dust on non-arid regions. African dust blown across the oceans, notes Welland, determines the strength of the Indian monsoon and comprises most of the soils of the Bahamas and Florida Keys; dust from Africa, the Middle East and Asia stimulates winter rains and snowfall in California. The need to understand deserts' formation and ecology, societies and economies is urgent.

Central to the discussion is desertification. The UN Convention to Combat Desertification, which came into force in 1996, defines this as "land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors including climatic variations and human activities". However, when coined in the 1920s, desertification referred only to human misuse of drylands by overgrazing, deforestation and overcultivation, and it retains this emotional charge. Partly because of this, the concept is contested by some scientists. Welland feels that it "obscures the facts", for instance by implying wrongly that the desert represents



**The Desert: Lands of Lost Borders**  
MICHAEL WELLAND  
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the final stage of a process, rather than being simply a "member of our planet's range of environments and one that has evolved naturally under conditions of water scarcity".

Defining deserts is not straightforward. Welland notes that the UN Dryland Systems map, which classifies zones according to aridity indices, has "no real meaning whatsoever" on the ground: nature, he notes, "works with lost borders". By contrast, remote sensing by satellites such as the European Space Agency's Envisat has created maps with scope and nuance, revealing shifting patterns of vegetation that match on-the-ground realities.

Welland expounds on deserts' natural riches. 'Desert varnish', for instance, is a metallic finish on rocks that glints in the sun (T. E. Lawrence noted that it made his eyes ache). Typically less than 200 micrometres thick, the coating is high in iron oxides, manganese and clay minerals, as well as bacteria, pollen and "a smorgasbord of organic molecules". And it is becoming clear that desert plants thrive by making unique chemicals, some of which may have medical applications. For instance, the desert date tree (*Balanites aegyptiaca*) contains saponins, compounds that could lead to cancer treatments.

Much of the book concerns desert peoples such as the Tuareg of the Sahara and the Australian Aborigines. It also discusses explorers from medieval traveller Ibn Battuta to early-twentieth-century writer Gertrude Bell. Less familiar is the story of how Asian camels were introduced into the Australian outback from the 1870s. They served as beasts of burden during construction of the transcontinental railway; more than a million of their feral descendants now roam the Red Centre.

There are contemporary stories of heroic resistance to degradation of arid lands, too. Welland highlights Yacouba Sawadogo, a farmer in Burkina Faso who has re-greened a large area of desert, despite government resistance. He has adapted a technique based on digging holes (*zai*) and filling them with biodegradable waste; this attracts termites, whose tunnels break up the soil and encourage rain to infiltrate. In Mark Dodd's 2010 documentary *The Man Who Stopped the Desert*, Dutch agronomist Chris Reij says: "Yacouba single-handedly has had more impact on soil and water conservation in the Sahel than all the national and international researchers combined." In 2013, Sawadogo and Reij received UN Global Drylands Champions awards.

There is much more in this accomplished, if occasionally indigestible, book, ranging from geological complexities to over-exploited aquifers. In Welland's persuasive view, "the most important thing to learn from the desert is that it is not deserted". ■

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