

the rich resources of soil minerals and soil water plays an important role in plant metabolism.

The plant physiologists, agronomists and soil scientists need to understand the plant structure, its function, growth and development for knowing the plant and soil relationship. Further, special attention has been given to understand the balance nutrition, transport and leaching losses through soil. The nutrient uptake by plants is supposed to be one of the most important physiological processes which helps in plant growth and development owing to the combination and concentration of mineral nutrients available in the soil solution. Nutrient uptake is the process successfully implemented by young roots, especially by the root hairs. The absorption of water through roots is always in a continual state of flux and further, the uptake of water by the cells generates a pressure known as turgor, as has been stated in the book.

The authors deserve appreciation for stating the importance of abiotic stress in the book which mainly focuses on soil basics and management. Different abiotic stress factors like cold, drought, salt and heavy metals largely influence plant development and crop productivity. It has become a major threat for food and nutrition security due to the impact of climate change and deterioration of the pedo environment and atmosphere caused by anthropogenic activity. The water and salt stress related to soil has a direct influence on plant growth and development. In order to overcome the abiotic stress, plants initiate a number of molecular, cellular and physiological changes as mentioned in the book.

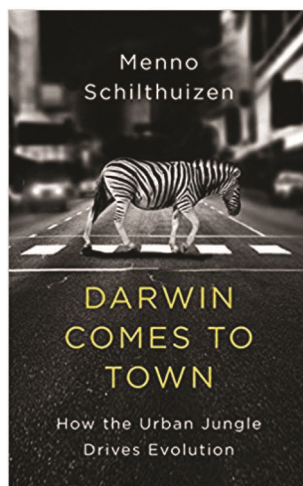
The major thrust of the book is on rhizosphere engineering for achieving sustainable agriculture. Rhizosphere is the most important zone of the soil around the roots being influenced by root activity through the release of organic materials. The rhizosphere engineering permits improvement of plant and soil health. The rhizosphere can be manipulated artificially to improve plant health and productivity. The modification of soil parameters, as well as microbial or plant engineering are strategies developed to engineer the rhizosphere. Thus rhizosphere engineering may ultimately reduce our reliance on agrochemicals by replacing their functions. This is of great significance for formulating future soil research.

This book should be in every library and will prove useful to soil scientists, agronomists, environmental scientists, biochemists and those involved in natural resource management. It can also be of immense importance to teachers, students, farmers and all those who are involved in agriculture and allied subjects. The basic concepts and mechanisms are explained with neat and self-explanatory figures, cycles, diagrams and appropriate photographs.

I appreciate the efforts of the authors and publishers for bringing out this valuable book which will have significance for designing and formulating educational, research and extension activities in soil science, agronomy, plant physiology, environmental science and other related subjects in the coming years.

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Darwin Comes to Town: How the Urban Jungle Drives Evolution. Menno Schilthuis. Quercus Editions Ltd, Great Britain. 2018. 344 pages. 1571 (Hardcover). ISBN 978-1-78648-110-8.

Planet earth is increasingly becoming an urbanized landscape occupying about 3% of the earth's land surface with over half of the human population inhabiting the cities. Cities around the globe are the same. They all produce similar kinds of

trash, have roads and high-rise buildings with higher temperatures (heat islands), are sources of light, air and noise pollution, increase habitat fragmentation, decrease native species diversity, etc.

Life forms on earth are now forced to live and adapt to these city conditions. It is important to understand that ecological processes operate within cities, and urban ecosystems are extremely different from their more natural counterparts. Nevertheless, most of the insights in ecology and evolutionary biology to date come from the natural forested landscape or undisturbed locales. Despite advances in tools answering questions in evolutionary biology, the scientific fraternity seems to have scanty understanding of urbanization affecting the evolution of life forms that inhabit the cities.

This book aptly addresses the aforementioned concerns in an elegant manner with close-to-home examples.

Present-day cities are often considered as adversaries of nature, unfruitful, sterile and post-industrial dump yards. However, the author is successful to a vast extent in driving the readers to change this notion of cities, with the following arguments:

- (a) The importance of evolutionary adaptations occurring at a rapid phase and how plants and animals within cities are coming up with novel ways of adapting to the human crafted environments.
- (b) How adaptation and evolution happening within a city are resulting in the myriad ways of biodiversity within these urbanized ecosystems.

The book has 20 well-connected chapters beginning with the author's haunting childhood beginnings as a naturalist working on beetles and ants. Then it succinctly explains the mechanisms of evolution such as gene flow (the bobcat making a comeback around suburbs and cities in California, USA), genetic drift (white-footed mouse at New York City, London underground Mosquito in the Subway metro stations), mutation (sensitivity of the mummichog fishes to PCB and PAH pollution, melanistic feathers of pigeons), natural selection (peppered moth adaptations, *Anolis* lizards at Puerto Rico) and sexual selection (song adaptation of the great tits to noisy surroundings, Australian jewel male beetles trying to mate with stubby beer bottles,

Indian gerbils shifting from smell to sight), all influencing the change in allele frequencies (evolution) within an urban setting. The book is scientifically accurate and very optimistic in identifying cities as a novel ecosystem for evolution to occur with splendid and interesting themes, if, one may connect the dots. First, one can identify the patterns in narrations such as remarkable similarities (what the author calls as homogenization) among cities of the world, where non-native species of plants and animals are increasingly successful in colonizing new habitats (Singapore estuary setting – *Pomacea* apple snails clinging, Javan mynahs feeding on cow grass and touch-me-not plants, massive peacock bass coming up for air), thus adapting to physical and chemical signatures. The author smartly points out that each urban species, wherever it finds itself in the world, is bound to encounter a similar set of urban cohabitants. Furthermore, the author explains how cities across the world are the same in the sense that they no longer consist of native varieties and are assemblages of immigrants from all over the globe.

Secondly, the author draws attention to the evolution happening at a human timescale. Gone are the days where evolution was thought to happen at a slow pace. Most of us are aware that the Darwin's finches provided much insight in our understanding of adaptations leading

to evolution (though at a snail's pace). This book shows that evolution can occur at a blitzkrieg speed with the example of the Eurasian blackbird (*Turdus merula*). These birds from the wild have started to transform themselves by colonizing the urban environments enjoying warmer temperature, feasting on abundant leftover food and low predator pressure, thereby constituting what could be a new species *Turdus urbanicus*? (emphasis by the author). The book is quite successful in showcasing evolution in action in the cities with notable examples from a flock of pigeons with dark feathers; insects looping inside a bright lighted vending machine or the city's answer to Galapagos finch – the blackbird, all of which could be materials for high school, college and citizen science projects.

Lastly, the author emphasizes on the need to re-engineer this novel ecosystem by humans who are playing a key role, which can benefit both humans, and adapting plant and animal species. The author also calls for new designs to be incorporated, boosting architectural guilds and urban environments by humans, whom he refers to as 'hyper keystone, ecosystem engineering super tramp species'. Escalation of humans to the level of hyper keystone species may not go well with some readers, but that seems to be only one of the miniscule pitfalls of this book which can be ignored.

There are many jaw-dropping examples of adaptations in this book which indicate that wildlife within cities is not just surviving but evolving at a break-neck speed, much quicker than Darwin had presumed. Readers of the book are quite likely to reflect on questions such as 'why did Darwin leave out the CITIES in his analysis?' or 'how could Darwin not sample species from cities?'. This book through its gripping narration backed by scientific evidences gives us a positive hope that humans and wildlife can co-exist in harmony. For those interested in concepts such as human-induced rapid evolutionary changes (HIREC) or 'telecoupling', this book can be a reliable source. The book would be an instant hit amongst college students, nature lovers, citizen scientists and science admirers, who would be fascinated to learn that new life is evolving amidst them in the 'CITIES' where they live and work now.

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