

and environmental changes. The authors write about human ecological footprints across the world, responsible for denudation of the natural resources. They write about population growth and the failure of scientific developments in conserving nature. The authors argue that speedy and unpredictable change in human behaviour is solely responsible for the ill-effects on our local and global environment. They examine in detail the present status of environmental education (EE) in the school system and its failure in creating environmentally conscious and pro-active citizens, citing examples from the Western countries.

Broadly speaking, EE represents four pillars – environmental knowledge, environmental skill, environmental attitude and environmental behaviour. This book provides a rigorous critique on the present state of EE – the various issues related to it; definition, barriers, wrongs leading to its failure, role of media and institutions in effective EE; environmentally active citizens for protection of the environment; widening gaps in awareness and actions, domineering political interests, importance of exhorted consumption, change-ideas, and evaluation methods, and finally offering tips for solving the problems concerning EE. It is an appreciable attempt by the authors to focus on the viable paths to achieve efficient EE in school system. They also talk about five issues: (i) creating an essential civic responsibility; (ii) considering EE as compulsory subject at various curricular levels; (iii) introducing better evaluation system; (iv) developing problem-fixing ability through reinforcement and (v) promoting the celebration of human diversity in the context of EE. This narrative also talks about world economics, politics, history, science and civics.

It is commendable that the authors handle diverse concepts related to the theme in an excellent manner, their expertise making it possible to do so. Their constructive perspective emerges from the synergy of their varied backgrounds: Blumstein, a scientist and educator, and Saylan, an entrepreneur leading an environmental non-profit organization. We are sure that their narrative would help improve the quality of EE.

Since the mid 21st century, there have been protests across the world against environmental degradation and pollution. Environmentalism, in effect, emerged with appalling experience from the

World Wars and the classical *Silent Spring* published in 1962. The sparks, such remonstrations, are touched upon in this book considering them as the need of the hour. One can appreciate the concerns of the authors where they state 'Environmentalism is not an option like choosing one's religion or political affiliation', and 'It is a responsibility and fundamental aspect of cohesive society, like respect for the nature'. These positions have arisen from their intensive analysis of historical and contemporary incidences, and studies.

EE has failed to bring about the impelling changes in attitude and behaviour of individuals or society necessary to save nature. It has remained only a subhead in science education and world over it is counted only as an optional subject in most curricula. This attitude needs to be changed by adopting multidisciplinary teaching approach (cultivating scientific civic literacy) in schools; institutional and attitudinal obstacles with direct impacts on pedagogy have to be subdued in an unflinching manner.

Misinformed political and economic agendas, rapid industrial and green revolution and oil exploration and usage are major agents for environmental degradation. We must realize that we all breathe the same air, drink the same water, need to eat, and need shelter from natural elements. We must accept that we are each individually responsible for making sure that we do no irrevocably harm the natural systems that support us. The authors strongly believe that effective EE is the only option for a nation to be environmentally prosperous.

Schools perhaps play the most critical role in imparting environmentally positive ideas among the students, but they need proper infrastructure, time management, financial resources, trained and qualified teachers, timely government guidance and appropriate programme evaluation methods. It is also important that working at the grassroots level to the top, and vice versa, is essential for such actions to be successful. Nevertheless, schools focus nowadays on coaching in job skills for economic success, manufacturing standard employable products. They in effect posit that life is fundamentally a rat race and a fierce competition with everybody else to accomplish the best, failing to inculcate requisite values for a sustainable society and flouting the values of cooperation for a sus-

tainable development sans mounting material consumption and ever-growing ecological footprint.

The authors appreciate the innovative and successful stories of the green advisory team (GAT), green belt movement (GBM) and 'Food from the Hood' based on the concept of 'greening up our schools'. They rightly conclude that for humanity to ensure its place on Earth, creativity, flexibility, compassion and understanding, along with technological and scientific acumen are needed, all of which must be introduced, developed and reinforced through our educational institutions. For this, developing individual and collective responsibilities, values and pro-active perspective among the students is unavoidable.

The book will be highly useful in the field of EE. It is worthy as a reading material for undergraduate students. We believe that EE in the new perspective should have a wider reach, so that it may help us to save other species and our environment for posterity.

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**Genetically Modified Planet: Environmental Impacts of Genetically Engineered Plants.** C. Neal Stewart Jr. Oxford University Press, New York, 2004. 256 pp.

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Neal Stewart's book is a balanced account on genetically modified (GM) technology, which he views, is not dangerous and can prove beneficial for the environment. GM crops have been slammed by environmental activists and others worldwide, generating a debate on safety issues. Central to the debate has been the tactic of altering the characteristics of an organism by manipulating the genetic material encoded in the DNA.

However, there is an optimistic view to GM plants and food as well. The technology can be used to reduce mass hunger and revolutionize sectors – medicine,

## BOOK REVIEWS

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animal husbandry and agriculture. Stewart notes and supports his views with succinct examples. He explains how farmers in western Tennessee, USA readily welcomed the Roundup Ready Soybeans, a product of GM technology which helped them cut down on the use of herbicide and save money. The GM soybean produced a good yield. Similarly, USDA National Agricultural Statistics Service, USA reported a decline in use of insecticide soon after insect-resistant *Bt* cotton was introduced.

On the other hand, several environmental issues and risks are associated with this technology. There are arguments that genetic engineering may spell the end of humanity. It is feared that the pests may develop resistance to a transgenic, plant-produced pesticide and become difficult to control. There is another school of thought that gene flow between GM crops and weeds may occur to produce super weeds. And there exists a possibility of viral transgenes in plants recombining with existing viruses to produce super viruses. Therefore, most of the Eastern countries, including Europe and Asia are hesitant to embrace this technology.

Stewart argues that no significant studies have been conducted that may hold

true for concerns related to GM technology. Some of the studies have been misleading. For example, a paper in *Nature* reported gene flow and contamination by corn. However, terminator technology (1998) highlighted how the toxin gene, if expressed, could kill the embryo in the seed prohibiting germination and thus preventing gene flow. Similarly, a study published in *Nature* (1999) allegedly reported the adverse effects of transgenic pollen grains on larvae of monarch butterfly. Later, in 2001, another study noted that the monarch larvae did not choose to feed on *Bt* corn pollen and that the impact of the technology was negligible.

In this book, a detailed chapter on the origin of genetic engineering during the years 1983–1985 explains how the plant molecular biologists used tobacco for the purpose and the technology involved. Concepts like the gene flow have been briefly discussed making the book a good read for both students and experts in the field.

In a separate chapter, Stewart goes on to discuss pest management proposed in late 1950s. Chapter seven introduces the use of chemical insecticides, which cannot differentiate between good and bad pests, thus killing both. The developed

resistance against the use of chemical insecticides is a challenge now faced by researchers worldwide. Three possible solutions have been proposed in the book, namely sledgehammer, interspersing *Bt* and non-*Bt* corn and pyramiding.

Another success story is that of the creation of GM virus-resistant crops. As viruses are fast evolving, there is a risk that a mutation will occur which may cause new viral strains, e.g. the papaya ring spot virus. Transgene stacking is seen as a promising way of dealing with plant diseases. The 'deathstar' gene developed using this technology claims to cure diseases through a compacted gene.

Stewart has been successful in presenting a well-supported argument fencing the *Bt* debate. His writing is engaging and conversational. Overall, the book may be of interest to readers of both science and non-science, students, or anyone willing to learn about GM technology.

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