escaped, as the perplexed hunters watched the rupture of the 1983 Borah Peak earthquake develop before them.

Kerry Sieh must have developed a great attachment to the San Andreas fault, to which this book accords a celebrity status. He has spent nearly a quarter of a century, digging into it, reconstructing its history and attempting to forecast its future. Sieh began his studies of the infamous fault from Carrizo Plain that he later named as Wallace Creek (in honour of Robert Wallace who had encouraged Sieh's project). His efforts starting with trenching at Wallace Creek and Pallet Creek, looking for the predecessors of 1906 earthquake laid the foundations for palaeoseismology, which has later emerged as a powerful tool to reconstruct earthquake history of a fault. In these trenches we can learn how seismically-induced features are formed and how they are used, to explore the history of a fault. We can measure the slip produced by earthquakes in the past and use them to develop models of recurrence. The adventure of the Sieh's field exploration, combined with the excitement of unravelling the secrets of the earth can be very motivating to students of geology.

All through this book, there is an emphasis on how to interpret the histories of faults and volcanoes and how to use patterns of past behaviour to predict what lies ahead. That is one way of increasing our ability to face them and minimize their effects. The discussion on mitigation strategies is brief, the main point being strengthening unreinforced masonry buildings. There is a brief discussion on costs and benefits.

Perhaps, this book is not intended to be a textbook, but there are many things that students can learn and teachers can refer to in their lectures. It is most useful for to those who are keen to learn about the working of the earth and have the patience to go over a few basic ideas that are essential to understand the grand scheme of things. To the relief of the popular readers, the basics are done without much complication. Science journalists specializing on natural disasters would find it particularly useful.

There are several colour plates – among them are locations of California faults visited in this book, scarps formed during earthquakes, trench sections, sand-blows and aerial photographs. In the brief appendix, the authors explain earthquake magnitudes and techniques of Global Positioning System and radiocarbon dating. An enthusiastic reader may need to search standard textbooks to follow up on some concepts introduced in this book, but there is a glossary to give a quick grasp. In summary, this is a thoroughly enjoyable and exciting book, both for the general reader as well as for the students and practitioners of earth sciences.

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**Science of Field Crop Production.** Gururaj Hunsigi and K. R. Krishna. Oxford and IBH Publishing Co Pvt Ltd, 66, Janpath, New Delhi 110 001, India. ISBN 81-204-1287-7. 1998. 433 pp. Price: Rs. 190.

Global food production has shown significant improvement in the past few decades due to major breakthrough in agricultural science and helped in meeting the challenges of food and nutrition security. However, the world still faces an increasingly complex challenge of feeding its growing population while assuming the sustainable use of its natural resources. Hence maximizing the agricultural crop production and productivity is the major goal of the scientists across the world. Agricultural research in the national and international research organizations and universities has helped in evolving improved crop varieties, appropriate crop production practices and post-harvest technologies. The wealth of knowledge generated needs to be compiled and disseminated for the use of scientists and farmers.

*Science of Field Crop Production* by Gururaj Hunsigi and K. R. Krishna is a concise compilation of the current accumulated knowledge on the production of important crops, including cereals, legumes, oilseeds, fibre crops, sugar and starch crops and narcotics. There is information on 31 field crops with greater emphasis on aspects such as global distribution, climatological requirements, morphological and physiological features, land preparation and crop establishment practices, crop protection practices, availability of improved varieties and post-harvest technology. The information emanating from the international research institutes, leading agricultural universities and related organizations has been used extensively. Although the focus is on global crop production practices, the Indian agriculture perspective has also been highlighted.

In 'Principles of crop production' the authors have discussed the various agronomic practices which influence the process of yield formation. This includes seed viability, early seedling emergence and establishment, plant density, improved genotype with a desired architecture, balanced nutrition of both macro and micro plant elements, protection and post-harvest technologies. Since the yields of many important food crops have plateaued, it is imperative to understand the mechanism of yield formation so that the yield barriers can be broken. This raises a fundamental question as to what is the theoretical upper limit or the production potential of both biomass and grain yield of a crop in a particular environment? Can we define a plant type or an ideotype with a higher yield potential and direct the breeding efforts towards this goal. This is being done for major field crops, including rice, brassica, etc. Crop simulation models can be also used for defining a desired plant type, calculate potential productivity, understand the adaptation of field crops to adverse climatic conditions, including biotic and abiotic stresses, optimize complex cropping systems and understand crop nutrient dynamics in order to effectively manage soil fertility and fertilizer usage. Similarly biotechnological techniques can help us to break the yield barriers, improve the crop quality and develop disease-resistant transgenic plants. Transgenic cotton carrying the *Bt* gene for resistance to lepidopterous pests is already under cultivation. The importance of molecular marker methodology for identifying and tagging the genes for quantitative traits has also been highlighted and the need for integrated nutrient and pest management has been emphasized. The economics of crop production is discussed with reference to the costs of various inputs essential for optimizing crop yield while resulting in maximum benefit to the farmer.

On reading each chapter on crops it is apparent that the authors have placed emphasis on the various disciplines which contribute towards understanding the basis of yield and crop production. There is ample emphasis on physiological processes and components of growth and yield as viewed by an agronomist. The lack of basic information with respect to the above has been mentioned in certain crops such as safflower etc. This integration of information across disciplines such as genetics, physiology, and biotechnology along with pathology, origin, history and post-harvest technology is the strength of the book. This book will be of immense value to the graduate and postgraduate students of biology and agriculture. I strongly recommend this book for libraries and students.

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**PERSONAL NEWS**

# Zita Lobo – An obituary

Zita Lobo of the Department of Biological Sciences, Tata Institute of Fundamental Research, passed away on 6 October 2000, after a brief struggle against cancer. Zita Lobo and her close collaborator and husband Pabitra Maitra pioneered the genetics of sugar metabolism. Zita's scientific career began even before she graduated, and spanned over 30 years.

When Zita's mentor, Pabitra Maitra, joined the Tata Institute in the mid-1960s, cellular biochemistry had already deciphered most of the enzymes and pathways underlying the breakdown of carbon sources to generate ATP. Many important puzzles, however remained. Principal amongst these was the question of how metabolic flux was regulated. Metabolites generated upon breakdown and utilization of carbon sources are typically present at very high concentrations in the cell, as are the enzymes that synthesize and break them down. Yet, cellular growth profiles and metabolic fluxes maintain homeostasis when enzymes in the pathway are greatly reduced or increased. Maitra decided to take an approach to understand cell physiology that used both biochemistry and genetics as its tools. Soon after Maitra characterized glucokinase activity in yeast, he and Lobo began their collaboration which covers a major portion of our current understanding of the genetics of glycolysis in yeasts. They first examined the kinetics of glycolytic enzymes in *Saccharomyces cerevisiae* – resulting in Zita Lobo's first paper even before she had completed her B Sc degree. Meanwhile, along with Meher Irani, Maitra had begun the genetic dissection of glycolysis in *E. coli*. But this approach, selecting for inability to grow on defined sugars, effective in *E. coli* proved recalcitrant in yeast. The conventional view amongst purists – i.e. geneticists who had developed powerful methods in *E. coli* – was that yeasts were a polyploid zoo, best used for brewing and baking. Real geneticists should stay away from such ill-defined monsters. Maitra and Lobo's efforts yielded sparse results and the

future looked bleak. But very soon, in a *tour de force* that used selection pressure on different strains to isolate mutations in specific pathways, Maitra and Lobo not only pioneered yeast genetics but also dramatically explained why the first steps in getting glycolytic mutants were so difficult. Their 2-deoxyglucose selection method showed that there were three genes – encoding two hexokinases and one glucokinase – that affected the first steps of glycolysis. This genetic redundancy had confounded, temporarily, the genetic approach, but once the wall was breached, there was no stopping them.

Maitra and Lobo soon developed their collaborative efforts into one that genuinely shared talents and became mutually dependent. Their teamwork at the bench and in analysing their data was legendary. Maitra's ability to dissect tetrads and map mutants was invaluable as was Zita's ability to generate all combinations of strains and pick the mutant needle from the haystack. Genes in many of the steps in glucose or alcohol utilization were isolated and studied genetically and biochemically and, more important, analysed incisively. Recombinant DNA technology had not yet stripped genetics of its intellectual clothing and Lobo and Maitra's lab used genetics and biochemistry at their incisive best to make predictions on gene structure, function and regulation.

When the genes were cloned and analysed, many of them by Lobo, Maitra and collaborators, it was truly impressive just how many of their predictions proved correct. Exemplary in this regard was the study of regulatory mutations in phosphofructokinase and the demonstration that the regulatory subunit of one isozyme was the catalytic subunit of another isozyme. In addition, Lobo, Maitra and collaborators isolated and studied many regulatory genes in carbon metabolism.

Lobo, Maitra and their collaborators were soon to hit a new difficulty in their attempts to isolate the genes encoding enzymes in the pentose-phosphate (shunt)