new and superior traits and in other areas of plant biotechnology.

The last article of this volume describes fluorescence imaging technique, extensively used by plant biologists in recent years. Fluorescent proteins are well known as reporters of gene expression and protein localization. Okumoto and associates, however, have analysed the limitation of the previously used probes and have cited the literature on the technique of quantitative imaging with fluorescent biosensors to study protein and membrane dynamics, enzyme activity and other molecular dynamics directly. They have summarized the design principles of several types of fluorescent biosensors emphasizing genetically encoded fluorescent sensors and their use to study complex plant cell dynamics.

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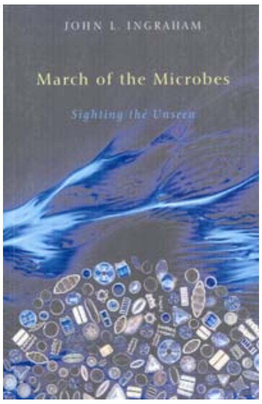

March of the Microbes: Sighting the Unseen. John L. Ingraham. The Belknap Press of Harvard University Press, Cambridge, Massachusetts, USA. 2012. x + 326 pp. Price: US$ 16.95.

Theodosius Dobzhansky's (1900–1975) essay 'Nothing in biology makes sense except in the light of evolution' (*Am. Biol. Teach*., 1973, **35**, 125–129) presents one of the best arguments I have read in support of evolution. But its celebrated title seemed a bit discomfiting when I learned that the bacterium *Deinococcus radiodurans* can withstand radiation intensities (5 million rads) that possibly were never before experienced by life on earth. I am relieved to read that my discomfiture is shared by no less distinguished a microbiologist than John L. Ingraham, former President of the American Society of Microbiology, Professor Emeritus of Microbiology at the University of California, Davis, and in whose honour *Psychromonas ingrahamii* is named, a bacterium that can grow even at –12°C. The last page (p. 306) of the book under review notes that the extraordinary radiation resistance of *D. radiodurans* presents an evolutionary conundrum. Shared discomfiture is only one of many reasons why I like the book, and unreservedly recommend it to all curious minds – expert, student and layperson.

The 14 chapters present a broad palette of ways in which microbes make their effects felt by us, thus enabling us to 'sight' them without microscopes. The sightings provide answers to a vast range of questions. Here is a sampling – Why are fungal diseases so difficult to treat? Why do fish from the sea begin to smell 'fishy' sooner than fish from freshwater? Why is the Black Sea black? Why do boiled eggs spoil faster than raw eggs? How do cows thrive on a diet of merely grass or hay? What is their major source of protein? How do our intestinal microbes contribute to obesity? What role do microbes play in helping an angler fish attract its prey? What triggers aphids to switch between parthenogenesis and the sexual cycle? What is the historical link between manure piles and gunpowder? What is the half-life of atmospheric nitrogen? How does one distinguish elemental sulphur of microbial provenance from that spewed by volcanoes? How do fairy rings form? Why are salt ponds so vividly coloured? Why does photosynthesis by chloroflexi not produce oxygen? How do yeast cells survive as dry yeast powder? What is the longest duration for which a bacterium is known to have withstood freezing? Why is rabies called hydrophobia (fear of water)? How was the anthrax bacillus attenuated to produce the anthrax vaccine? Why do pediatricians recommend against feeding honey to infants? Why are radiation-killed cells of *Pseudomonas syringae* added to the water and compressed air in snowmaking machines? How do dinoflagellates regulate the sunlight that reaches the oceans? How might phytoplankton be employed to transfer atmospheric carbon dioxide to the ocean floor? What role did microbes play in carving out the Carlsbad Caverns? Why do coral reefs bleach? Why were people in the Northern Hemisphere advised never to eat seafood in months lacking an 'r' in their name? How does diatomaceous earth control cockroach infestation (Lakshman rekha)? Why are more remains of carnivores than herbivores found in the Rancho La Brea Tar Pits near Los Angeles? What motivated Frederick Griffiths to do the experiment that led to his discovering DNA as the genetic material? Why do rats and rabbits eat their own faeces? Which element is found in RNA but not DNA? How does photosynthesis contribute to the hydrothermal vent ecosystem? How do *Caulobacter* thrive in tap water? Why is the unnecessary use of antibiotics for any purpose a threat to the utility of the antibiotic for all purposes?

We enologists naturally stand up for each other. Ingraham was at the Department of Viticulture and Enology before moving to the Department of Microbiology in 1964. And I had served as a Teaching Assistant for several semesters in the 'Introduction to Enology' course offered at Stony Brook University in the early 1980s (it helped that the course was taught by Eugene R. Katz, my Ph D advisor). So it was heartening to read all the standard 'chestnuts' of introductory enology courses – Why are European wine grapes grafted onto the stock of American grape vines? Why are champagne bottles heavy and closed with wired corks? Why is champagne sparkling, but vinho verde only semi-sparkling? Why do sommeliers offer you the cork pulled from a wine bottle for examination? What 'rot' do the world's most admired dessert wines, namely, French Sauternes, Hungarian Tokaj and German Trokenbeerenauslese, share? Knowing the answers to these questions is thought by some to lubricate the passage into 'society'.

For many questions we do not currently have any good answer, and Ingraham does not shirk from asking them and provoking thought. No archaea are known to cause diseases of humans, animals, and plants. Why? Viruses have DNA or RNA, but not both. Why? And, of course, *Deinococcus* is damned radiation-resistant. Why?

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