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► **COVER:** 'Entry and exit' by Philip Patenall, inspired by the Reviews on p369 and 382.

**T**he ability to adapt a particular trait in order to overcome a change in circumstances is important for all biological systems. Adapting to changes in the environment allows microorganisms to colonize a wide range of ecological niches and to survive sudden

alterations in conditions. For example, on page 330 Krulwich, Sachs and Padan describe how bacteria have evolved diverse mechanisms for pH sensing and homeostasis that have allowed them to tolerate and grow at external pH values outside the cytoplasmic pH that they must maintain for growth.

For pathogens, adapting to better exploit a host will provide a selective advantage over competing organisms and can allow the colonization of a new niche. Bacteria of the genus *Xanthomonas* can cause disease in hundreds of plant hosts, including many important crop species, as described by Dow and colleagues on page 344. They discuss the host specificity and pathogenicity factors that have allowed this group of bacteria to adapt in order to exploit an extraordinary diversity of plant hosts.

Adaptation even occurs at the molecular level. During transcription, a terminator at the end of the gene induces rapid and irreversible dissociation of the nascent transcript from RNA polymerase. However, premature termination within an operon can lead to potentially deleterious effects on the expression of downstream genes. On page 319, Santangelo and Artsimovitch describe the mechanisms of antitermination through which bacteria are able to adapt their gene expression to overcome termination signals when necessary.

Finally, on page 356 is the last article from our Focus on Mucosal Microbiology (<http://www.nature.com/nrmicro/focus/mucosalmicro>), in which Bevins and Salzman provide an overview of the intestinal microbiota, and of the importance of Paneth cells and their secretions to intestinal homeostasis.



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