

# Sensory Mechanisms in Bacteria

## Molecular Aspects of Signal Recognition

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**Published:** September 2010. **Pages:** x + 268

**Hardback:** ISBN 978-1-904455-69-1 £159, \$319

**Published by:** Caister Academic Press [www.caister.com](http://www.caister.com)



Bacteria have evolved extraordinary abilities to regulate aspects of their behaviour (such as gene expression) in response to signals in the intracellular and extracellular environment. Key to this are the diverse macromolecules (proteins or RNA) that sense change through direct interactions with chemical or physical stimuli. In recent years there have been tremendous advances in our understanding of the structure and function of these signal receptors, and of how interaction with the signal triggers changes in their activity and downstream events. For some systems this understanding extends to the atomic level.

In this unique book, an international team of experts reviews a selection of important model systems, providing a timely snapshot of the current state of research in the field. The book opens with an introductory chapter that reviews the diversity of signal recognition mechanisms, illustrating the breadth of the field. Subsequent chapters include descriptions of the sensing of ligands ( $\alpha$ -ketoglutarate, adenylate energy charge, glutamine and xenobiotic compounds), chemoreceptors, iron-sulfur cluster-based sensors, metal-dependent and metal-responsive sensors, thiol-based sensors, and PDZ domains as sensors of other proteins. This book provides essential reading for everyone with an interest in sensory mechanisms, regulatory networks and responses to environmental stress in bacteria.

**Chapter 1.** Natural history of sensor domains in bacterial signaling systems. *L. Aravind, Lakshminarayan M. Iyer and Vivek Anantharaman*

**Chapter 2.** Sensing ligands by periplasmic sensing histidine kinases with sensory PAS domains. *H. Kneuper, P. Scheu, M. Etzkorn, M. Sevrana, P. Dünwald, S. Becker, M. Baldus, C. Griesinger, and G. Uuden*

**Chapter 3.** Sensation of  $\alpha$ -ketoglutarate, adenylate energy charge, and glutamine, and signal integration by the nitrogen assimilation control system of *Escherichia coli*. *Alexander J. Ninfa and Peng Jiang*

**Chapter 4.** Sensing xenobiotic compounds: Lessons from bacteria that face pollutants in the environment. *Víctor de Lorenzo, Rafael Silva-Rocha, Guillermo Carbajosa, Teca C. Galvão and Ildefonso Cases*

**Chapter 5.** Bacterial chemoreceptors as membrane-spanning allosteric enzymes. *Michael D. Manson*

**Chapter 6.** Iron-sulfur cluster-based sensors. *Jeffrey Green, Jason C. Crack, Adrian J. Jervis, David P. Diben, Laura J. Smith, Andrew J. Thomson and Nick E. Le Brun*

**Chapter 7.** Metal-dependent and metal-responsive regulatory systems. *John D. Helmann*

**Chapter 8.** Thiol-based sensory factors. *Haike Antelmann and Peter Zuber*

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