

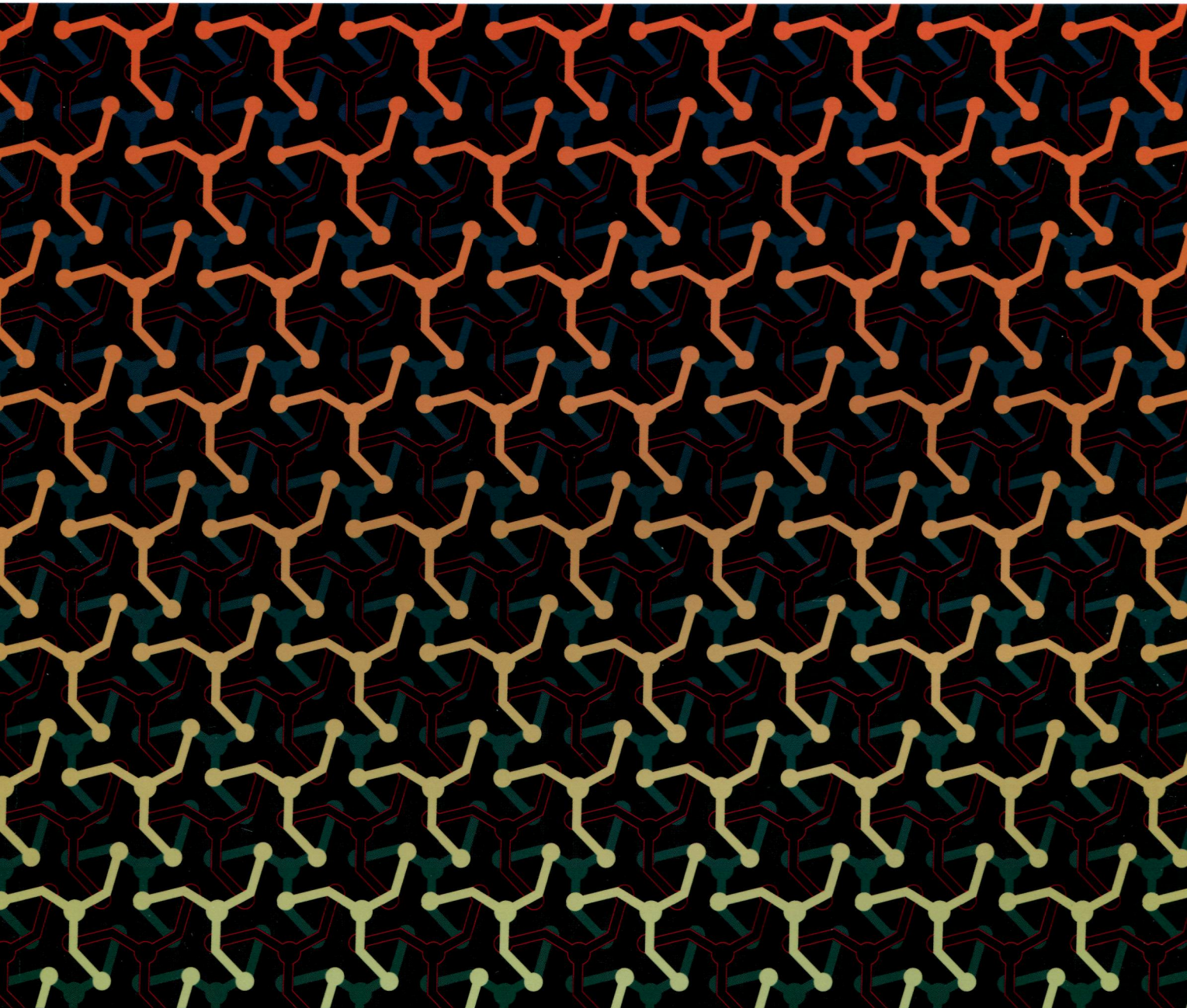
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# REVIEWS

august 2013 volume 11 no. 8  
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## MICROBIOLOGY



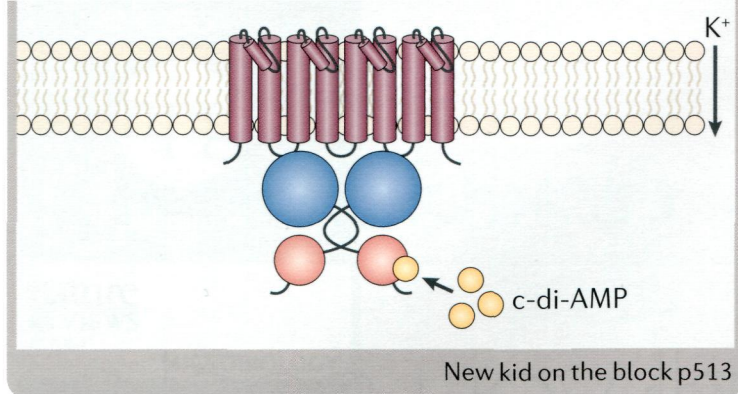
### BEYOND ENDOCYTOSIS

Clathrin lends pathogens a helping hand

### Getting to grips with bacterial persistence

Slow growth or no growth?





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### 513 Cyclic di-AMP: another second messenger enters the fray

*Rebecca M. Corrigan and Angelika Gründling*

Cyclic di-AMP is one of the latest cyclic nucleotide second messengers to be discovered in bacteria. Corrigan and Gründling provide an overview of the enzymes involved in its synthesis and degradation, the currently known receptor proteins and the cellular pathways it controls.

### 525 Breaking and joining single-stranded DNA: the HUH endonuclease superfamily

*Michael Chandler, Fernando de la Cruz, Fred Dyda, Alison B. Hickman, Gabriel Moncalian and Bao Ton-Hoang*

Many mobile genetic elements, such as transposons, plasmids and viruses, must cleave their own DNA to effect transposition, replication or conjugation. Here, Chandler and colleagues describe the HUH endonucleases, which use a unique mechanism to cleave and rejoin single-stranded DNA in order to mobilize and disseminate such elements.

### 539 Uncovering the mysteries of hantavirus infections

*Antti Vaheri, Tomas Strandin, Jussi Hepojoki, Tarja Sironen, Heikki Henttonen, Satu Mäkelä and Jukka Mustonen*

Vaheri and colleagues discuss the molecular and cell biology of hantavirus infection and provide an overview of the virus-induced and immune-mediated pathology caused by this virus family in humans.

### 551 The non-canonical roles of clathrin and actin in pathogen internalization, egress and spread

*Ashley C. Humphries and Michael Way*

Clathrin-mediated endocytosis is exploited by bacterial and viral pathogens during internalization. Humphries and Way review recent studies which highlight the fact that, in addition to a structural role, clathrin can function as a signalling platform during pathogen entry, and other studies revealing that, in conjunction with actin, clathrin is involved in pathogen cell-cell spread and release.

### 561 Molecular pathogenesis of the obligate intracellular bacterium *Coxiella burnetii*

*Erin J. van Schaik, Chen Chen, Katja Mertens, Mary M. Weber and James E. Samuel*

Samuel and colleagues discuss the recent technological advances that have facilitated a deeper understanding of the molecular mechanisms of *Coxiella burnetii* pathogenesis, including host cell invasion and modulation by virulence factors exported through the type IV Dot/Icm secretion system.

### 574 Modern clinical microbiology: new challenges and solutions

*Pierre-Edouard Fournier, Michel Drancourt, Philippe Colson, Jean-Marc Rolain, Bernard La Scola and Didier Raoult*

Raoult and colleagues review recent developments in clinical microbiology, including the development of mass spectrometry-based diagnostics and point-of-care tests, which might change clinical practice.

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*Enrico Cabib and Javier Arroyo*

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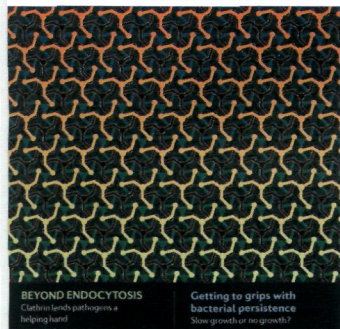
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REVIEWS

MICROBIOLOGY

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Clathrin lends pathogens a  
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Slow growth or no growth?► COVER: 'Triskelion carpet' by Philip Patenall,  
inspired by the Review on p551.

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*Andrew P. Waters*

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- 587 **A problem of persistence: still more questions than answers?**  
*Nathalie Q. Balaban, Kenn Gerdes, Kim Lewis and John D. McKinney*  
Bacterial persistence poses a major obstacle for current efforts to tackle the global rise of antibiotic resistance. Here, Balaban, Gerdes, Lewis and McKinney discuss the physiological features of persister cells and the factors leading to their emergence, as well as the implications of persistence for antibiotic treatment regimens and bacterial heterogeneity.



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