IN BRIEF

ARCHAEA

Thaumarchaeota go it alone

The proposal that the Thaumarchaeota should be considered as a separate phylum within the Archaea, rather than a branch of the Crenarchaeota, has gained further support from the first analysis of the thaumarchaeal cell cycle. Pelve *et al.* used flow cytometry to investigate the cell cycle of *Nitrosopumilus maritimus* and found that it differs substantially from that of crenarchaea, with a much longer pre-replication phase (G1) and a shorter post-replication phase (G2, mitosis and cell division). Remarkably, although the *N. maritimus* genome is only 1.64 Mb, replication takes 15–18 hours. The authors suggest that this reflects the oligotrophic niches in which thaumarchaea are found. Pelve *et al.* also demonstrated that in *N. maritimus* it is the Cdv proteins, and not FtsZ, that localize to division sites. What function FtsZ fulfils in thaumarchaea remains an open question.

ORIGINAL RESEARCH PAPER Pelve, E. A. *et al.* Cdv-based division and cell cycle organization in the thaumarchaeon *Nitrosopumilus maritimus*. *Mol. Microbiol.* **82**, 555–566 (2011)

BACTERIAL PHYSIOLOGY

Bacteria get old

A new study using data from earlier work that had generated conflicting results now reveals that bacteria do indeed age, but aging and rejuvenation occur simultaneously. Aging appears to be related to inheritance of the old pole. When a bacterium divides, each progeny receives an old (pre-existing) pole and a new pole, which is created during division. When the progeny divide, both daughter cells will receive a new pole from this division cycle, but one cell will have the old pole from the original ancestor, whereas the other will receive the former new pole. By using a modelling approach, the investigators now show that cells with the older poles grow more slowly than cells with the newer poles. As a result, the older poles would be gradually lost and the population would be dominated by newer poles. The authors speculate that the damage associated with the older poles slows bacterial growth, and that by receiving newer poles, the bacteria can rejuvenate.

ORIGINAL RESEARCH PAPER Rang, C. U., Peng, A. Y. and Chao, L. Temporal dynamics of bacterial aging and rejuvenation. *Curr. Biol.* 27 Oct 2011 (doi 10.1016/j.cub.2011.09.018)

IMMUNOLOGY

Effectors do not escape notice

Bacterial effectors that are secreted into the host cell cytosol can induce a protective immune response, according to a new study. The authors found that cytotoxic necrotizing factor 1 (Cnf1), a uropathogenic *Escherichia coli* (UPEC) toxin that activates RHO GTPases, induces the production of antimicrobial peptides when expressed in *Drosophila melanogaster* cells. Furthermore, flies challenged with wild-type UPEC mounted a vigorous immune response, whereas bacteria lacking Cnf1 did not induce such a response, and the Cnf1-induced immune response protected flies from the lethal effects of infection by *Pseudomonas aeruginosa* str. PA14. Further analysis revealed that the immune activation is a response to the changed activation of RAC2 and requires the immunedeficiency (IMD) pathway. A similar response to the toxin was detected in mammalian cells, in which it depended on the kinases RIP1 and RIP2 (also known as RIPK1 and RIPK2, respectively). Hence, the presence of a bacterial toxin is detected by its effects on the host and induces a protective immune response. The authors suggest that such a response is similar to the response of plants to pathogen effectors.

ORIGINAL RESEARCH PAPER Boyer, L. *et al.* Pathogen-derived effectors trigger protective immunity via activation of the Rac2 enzyme and the IMD or RIP kinase signaling pathway. *Immunity* **35**, 1–14 (2011)