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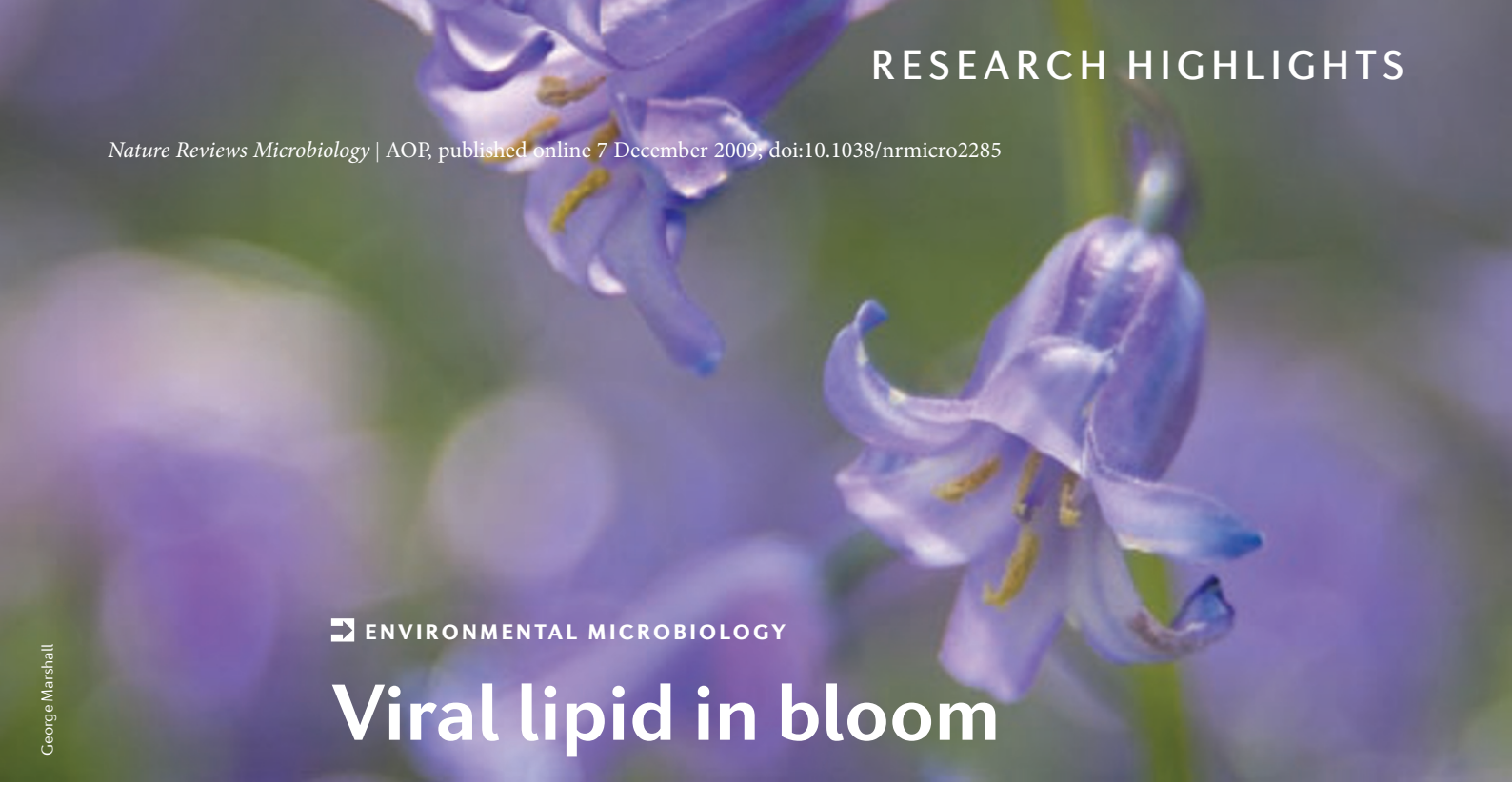

George Marshall

ENVIRONMENTAL MICROBIOLOGY

Viral lipid in bloom

> “Release of myristoyl GSL from infected cells following lysis could act as a bloom termination signal”

Every year, the unicellular coccolithophore *Emiliania huxleyi* forms massive blooms in the North Atlantic Ocean, making it a key player in global carbon cycling. *E. huxleyi* can become infected by lytic double-stranded DNA viruses known as coccolithoviruses, which are thought to be important for regulating bloom dynamics. However, the mechanisms underlying viral infection of such phytoplankton species are poorly understood. In an article published in *Science*, Vardi *et al.* now show that the *E. huxleyi* virus 86 (EhV86) produces a glycosphingolipid (GSL) that triggers programmed cell death (PCD) in *E. huxleyi*.

Previous analysis of the genome of EhV86 had revealed an unexpected cluster of sphingolipid biosynthesis genes, the first found in a viral genome. In general, sphingolipid biosynthesis is initiated by a serine palmitoyltransferase (SPT), but the SPT encoded by the EhV86 genome exhibits a unique substrate preference for myristoyl coenzyme A rather than palmitoyl coenzyme A. Vardi *et al.* detected a unique species of myristoyl GSL in infected *E. huxleyi* cells that was absent in uninfected cells. When the authors purified viral particles, they found that the membrane that was packaged with the virus contained virus-derived myristoyl GSLs but no host-derived palmitoyl GSLs. The accumulation of myristoyl GSLs in infected cells was found to correlate with a reduction in host cell abundance and a 30-fold increase in caspase activity, which is a marker for the induction of PCD. The authors suggest that myristoyl GSL production may be part of a timing mechanism for viral release, whereby PCD and host cell lysis occurs only after myristoyl GSL has accumulated to a critical concentration.

Interestingly, when *E. huxleyi* cells were treated with purified myristoyl GSLs, dose-dependent induction of PCD was observed, suggesting that myristoyl GSLs alone can trigger PCD. Accordingly, in natural plankton samples collected in the North Atlantic Ocean, a myristoyl GSL molecule consistent with that produced by EhV86 was found at local minima in coccolithophore population densities. These data suggest that the release of myristoyl GSL from infected cells following lysis could act as a bloom termination signal by eliciting PCD in the surrounding phytoplankton and may therefore serve as a novel biomarker for monitoring viral infection in the ocean.

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ORIGINAL RESEARCH PAPER Vardi, A. *et al.* Viral glycosphingolipids induce lytic infection and cell death in marine phytoplankton. *Science* **326**, 861–865 (2009)
FURTHER READING Suttle, C. A. Marine viruses — major players in the global ecosystem. *Nature Rev. Microbiol.* **5**, 801–812 (2007)