

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Solutions to the public goods dilemma in bacterial biofilms KNUT DRESCHER, CAREY D. NADELL, HOWARD A. STONE, NED S. WINGREEN, BONNIE L. BASSLER, Princeton University — Bacteria frequently live in densely populated surface-bound communities, termed biofilms. Biofilm-dwelling cells rely on secretion of extracellular substances to construct their communities and to capture nutrients from the environment. Some secreted factors behave as cooperative public goods: they can be exploited by non-producing cells. The means by which public-good-producing bacteria avert exploitation in biofilm environments are largely unknown. Using experiments with *Vibrio cholerae*, which secretes extracellular enzymes to digest its primary food source, the solid polymer chitin, we show that the public goods dilemma may be solved by two very different mechanisms: cells can produce thick biofilms that confine the goods to producers, or fluid flow can remove soluble products of chitin digestion, denying access to non-producers. Both processes are unified by limiting the distance over which enzyme-secreting cells provide benefits to neighbors, resulting in preferential benefit to nearby clonemates and allowing kin selection to favor public good production. Our results demonstrate new mechanisms by which the physical conditions of natural habitats can interact with bacterial physiology to promote the evolution of cooperation.

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Date submitted: 07 Nov 2013

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