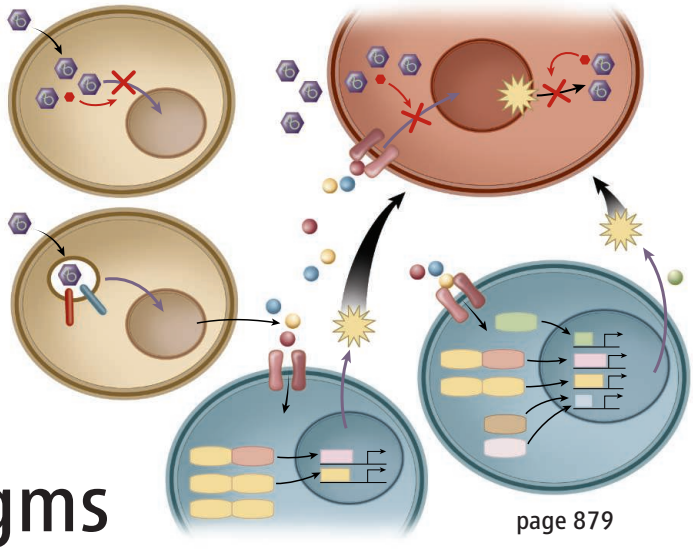

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INTRODUCTION

Paradigms in the Virosphere

VIRUSES HAVE BEEN DESCRIBED AS PERFECT PARASITES: MANY ARE SO MINIMALLY assembled that they cannot strictly be classified as living organisms. Except when they damage health, we concern ourselves little about them; nevertheless, the "virosphere" (a term coined by Curtis Suttle) is ubiquitously influential in our everyday lives. Viruses continue to be the vehicles for important genetic events, from the evolution of photosynthesis to the emergence of pathogens, and play an important role in regulating the microbially dominated cycling of carbon, nitrogen, and phosphorus in the world's oceans. By means of horizontal gene transfer, viruses endow bacteria, and probably many other phyla, with clusters of distinct genes and phenotypes. Viruses infecting bacteria (bacteriophages) have been instrumental in the development of modern molecular biological techniques, and the precision and assembly of the interlocking proteins of virus capsids have inspired architects and nanotechnologists alike. In this special issue, we explore some of the attributes of viruses that are distinct from their ability to cause human disease.

Douglas and Young (p. 873) have taken virology farthest from its roots and in a Perspective explore how the flexibility of capsid structure can be exploited for diverse uses, including drug delivery and as precise templates for nanostructure assemblies. There are many challenges to the biotechnological application of artificial viruses, not least toxicity and immune responses. Initial infection with a virus can trigger a cell into an autophagic response that is similar to the cell's normal response to protein aggregates, such as those that develop during Huntington's disease. Wileman (p. 875) reviews the possibilities for subversion of the degradative activity of autophagous structures, known as aggresomes, as scaffolds for viral replication and assembly. García-Sastre and Biron (p. 879) review the subsequent lines of host defense against virus establishment: type 1 interferons. Viruses are adept at eluding host responses, but interferons can trigger a flexible network of backup responses. These backups may not result in clearance of the virus but instead give rise to its persistence, and hence a standoff develops in which yet another round of host innate or adaptive response is signaled. A News story by Zimmer (p. 870) examines a theory that viruses coexisted with the earliest organisms and perhaps helped create DNA, as Forterre argues. Three further articles at *Science*'s Signal Transduction Knowledge Environment (STKE) offer examples of how viruses and other pathogens exploit cell signaling pathways to achieve their own ends. A Review by Hayward *et al.* describes how gamma herpesviruses mimic and manipulate Notch and Wnt signaling, a Perspective by Barry and Früh focuses on viral manipulation of cullin RING ubiquitin ligases, and a Review by Münter *et al.* concerns how pathogens manipulate tyrosine kinase– and Rho GTPase–mediated pathways.

With the ongoing focus on viruses in the public eye, some may dread what the future may bring; but for most viruses, excessive virulence is a dead-end strategy. The interactions between viruses and hosts are usually subtle and unexpected; the application of nanotechnology as host defense would surely have gratified Koch, Pasteur, and Iwanowski.

–CAROLINE ASH, STELLA HURTLEY, MARC LAVINE, STEPHEN SIMPSON

CREDIT: A. GARCIA-SASTRE AND C.A. BIRON

Virology

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Published by AAAS

Paradigms in the Virosphere

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Science **312** (5775), 869.
DOI: 10.1126/science.312.5775.869