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# Mechanistic Virology: Engineering virus-derived protein containers for applications

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Deciphering the geometric principles of virus architecture serves as a key to understanding viral infections. Most viruses have protein shells, called viral capsids, that surround, and thus protect, their genetic material. Mathematical techniques from group, graph, and tiling theory, combined with stochastic simulations, act like a mathematical microscope, revealing the mechanisms that are responsibe for efficent capsid formation and genome packaging. Examples of work with different experimentalist groups world-wide reveal how this approach provides unprecedented insights in the structure and function of both virus-derived and *de novo* designed protein nanocontainers for a host of applications in antiviral therapy and nanotechnology.