

Nanotechnology Seminar Series

“FoSpectroscopy of Individual Viruses Reveals DNA Storage Strategies and Structural Properties of Capsids and Virions”

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BNC, 1001, 3:30-4:30pm

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Microscopy in buffer conditions we performed nanoindentation experiments on a variety of bacteriophages and eukaryotic viruses. In the spherical virus Minute Virus of Mice (MVM) we discovered that the DNA molecule exerts an architectural role by increasing the stiffness of the virus on the 3 and 2-fold symmetry axes (1). This mechanical reinforcement is a consequence of the interaction between crystallographically visible, short DNA patches and the inner capsid wall, and apparently does not build internal pressure inside the virus. We have further manipulated the virions stiffness by protein engineering the junctions between the DNA and the capsid-wall. (2) Preliminary experiments performed on ϕ 29 bacteriophage proheads reveals built-in stress of the viral shell which behaves counter-intuitively different from standard continuum elasticity predictions. In addition, the comparison of empty and full DNA viruses results in a different stiffness which can be attributed to the internal pressure provided by the DNA of about 70 atm. We have also isolated the effect of capillary forces on single viral particles during desiccation processes (3). [1] PNAS 103, 13706 (2006). [2] PNAS 105, 4150 (2008). [3] PNAS 106, 5475-5480 (2009).

Dr. Pedro José de Pablo Gómez is currently Associate Professor at the Universidad Autónoma de Madrid, Condensed Matter Department, Spain. Prior to joining the Universidad Autónoma de Madrid as a faculty member, he was a postdoctoral fellow at the Vrije Universiteit, Amsterdam, the Netherlands from 2001-2003. He earned his PhD at the Universidad Autónoma de Madrid in 2000, and also holds a B.S in Physics from the same University. During his doctoral studies, Dr. De Pablo spent 6 months as a research visitor at Purdue.

Dr. De Pablo's research focuses on novel Atomic Force Microscopy methods to study multi-disciplinary problems in (a) physical virology, especially structural and mechanical studies of viruses in air and in buffer conditions, including bacteriophages P29, T7, and eukaryotic viruses, minute virus of mice (MVM) and adenovirus, (b) Detection of kinesin transport on microtubules, mechanics of microtubules, and (c) Electronic transport in single molecules.

(Host: Arvind Raman, 45733, raman@purdue.edu)