Tobacco Mosaic Virus

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Tobacco mosaic virus
TMV

- Genus *Tobamovirus*

  15 members

  naked, rigid rod,

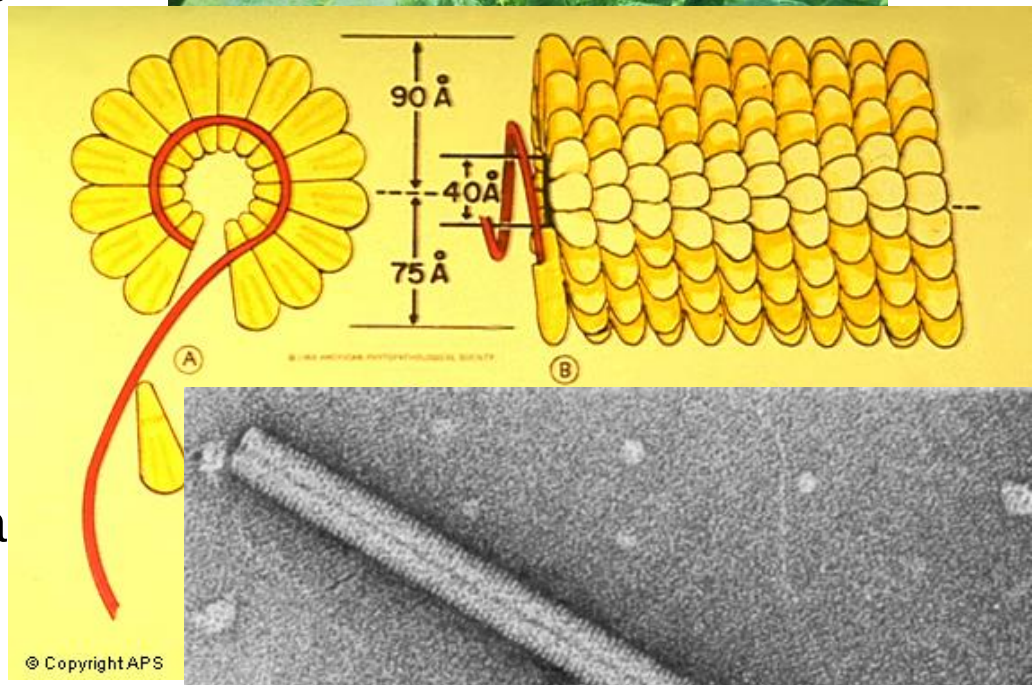
  + unsegmented ss RNA

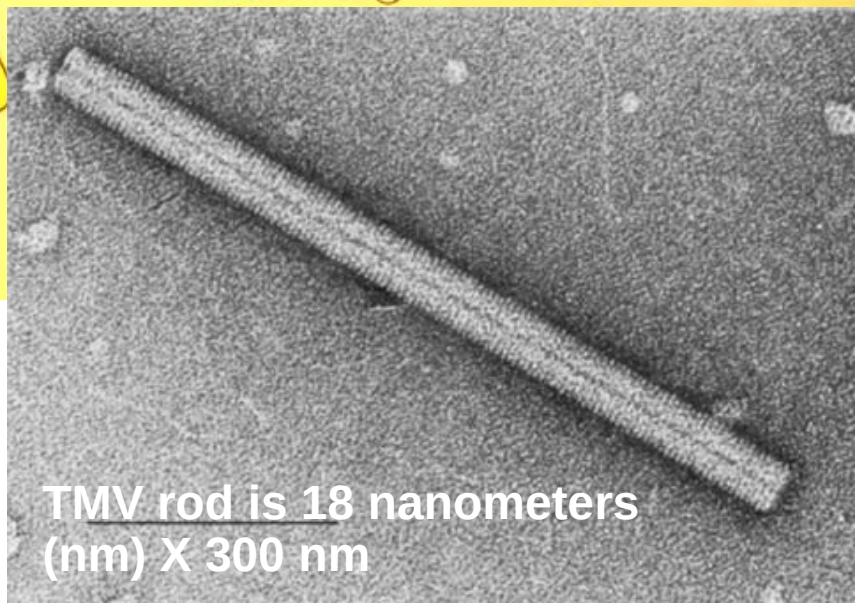
Classification

- Realm: Riboviria
- Family: Virgaviridae
- Genus: Tobamovirus
- Species:Tobacco mosaic virus

Helical symmetry

- ***Tobacco mosaic virus*** is typical, well-studied example
- Each particle contains only a single molecule of RNA (6395 nucleotide residues) and 2130 copies of the coat protein subunit (158 amino acid residues; 17.3 kilodaltons)
  - 3 nt/subunit
  - 16.33 subunits/turn
  - 49 subunits/3 turns
- TMV protein subunits + nucleic acid will self-assemble *in vitro* in a energy-independent fashion
- Self-assembly also occurs in the absence of RNA





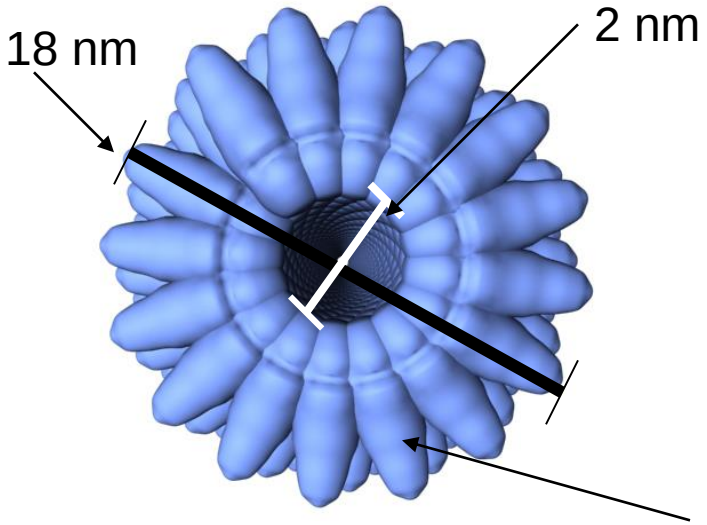
STRUCTURAL FEATURES OF TMV

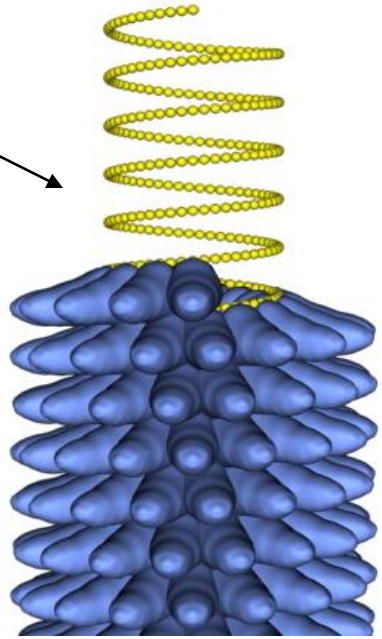
CAPSID

30 nm

Helical symmetry

RNA genome





Images:P. Sforza, 2001

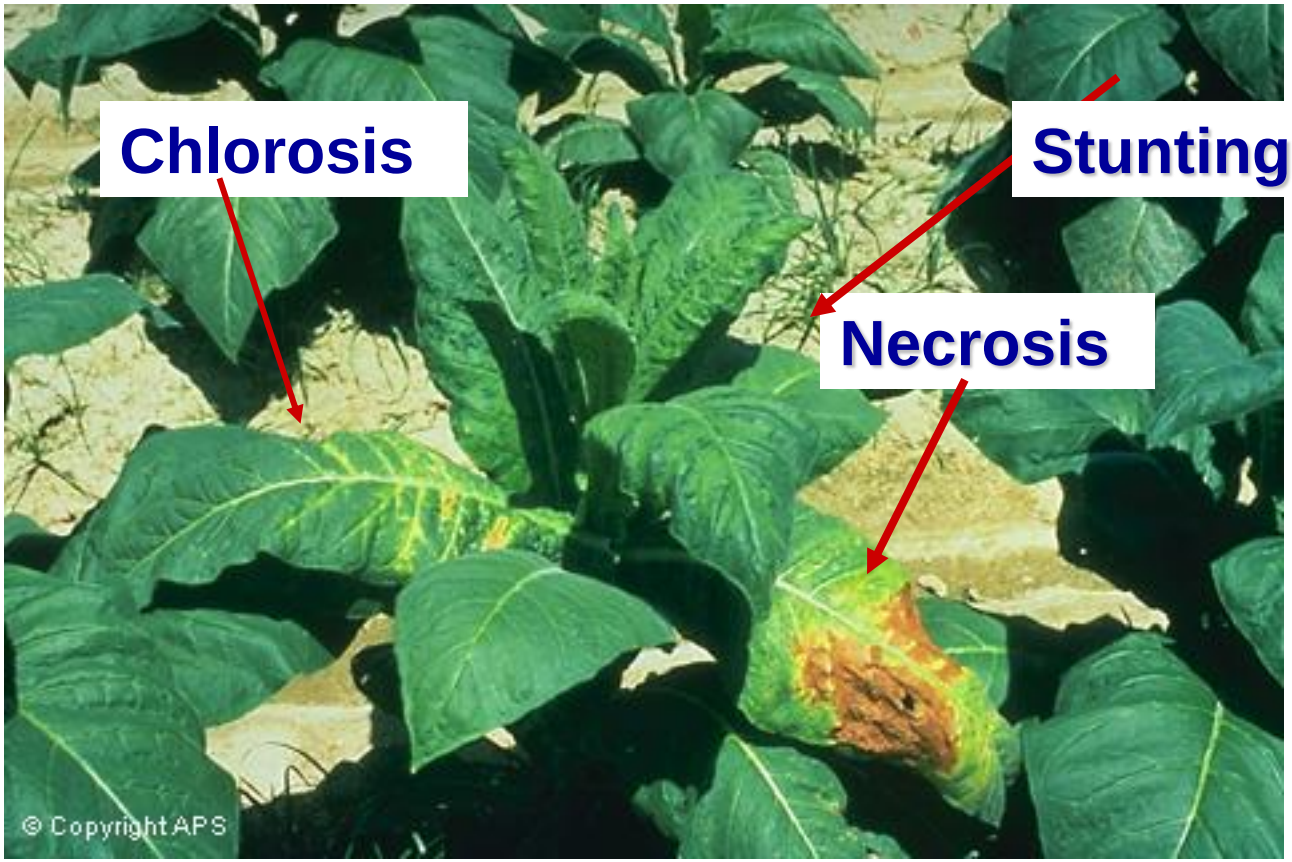
www.ppws.vt.edu/~sforza/tmv/tmv.html

Host: *Nicotiana tabaccum*

(*Solanaceous*) & other 9 plant families susceptible too

Disease:Mosaic (calico)

Mosaic disease on Tobacco leaf



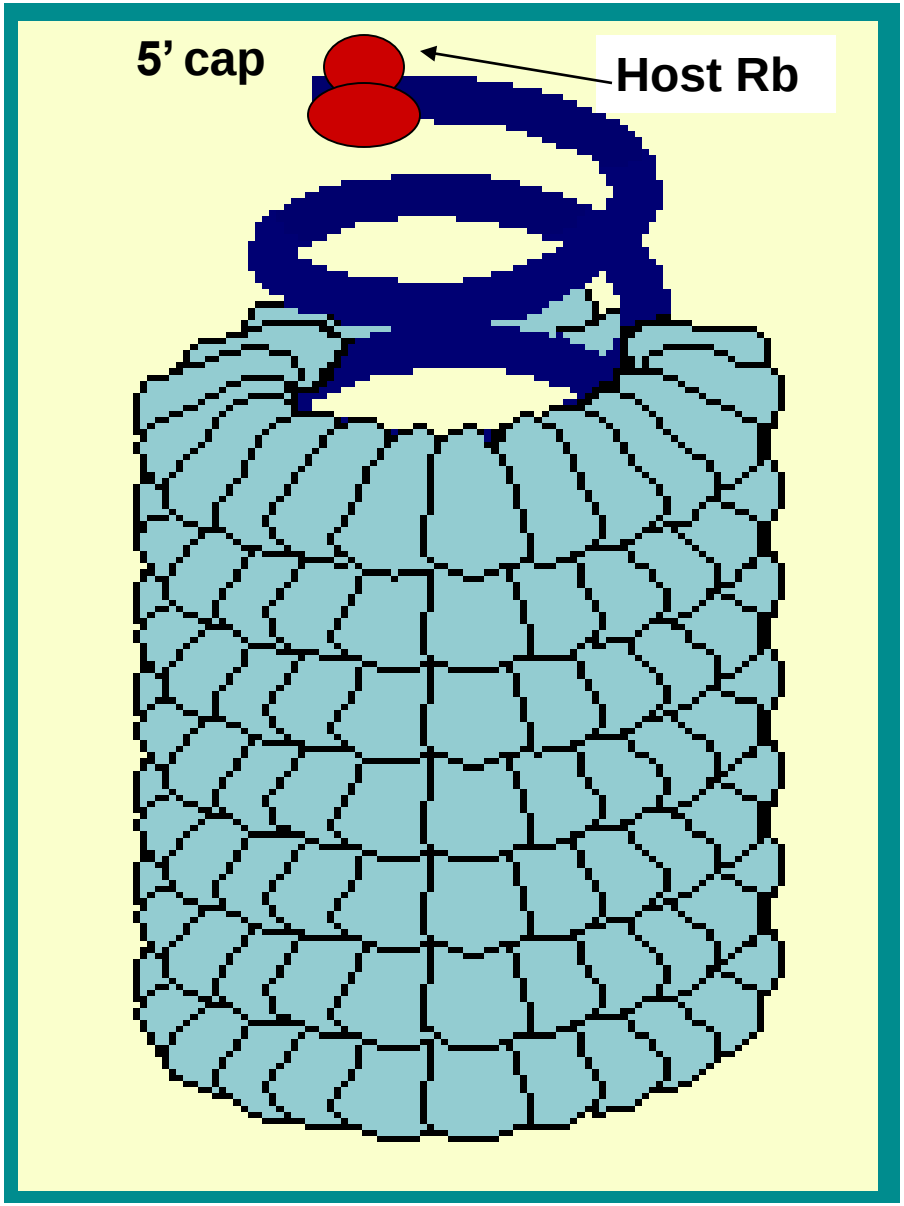
Mosaic disease: significant losses in yield & $ value

TMV Life cycle

a) Virus entry through abrasions on plant tissue. Inside cell associates with ER

b) spontaneous release of few capsid (CP) subunits 5' end of genome is uncovered

c) Host ribosome attaches to viral RNA, moves down displacing more CP units …/…



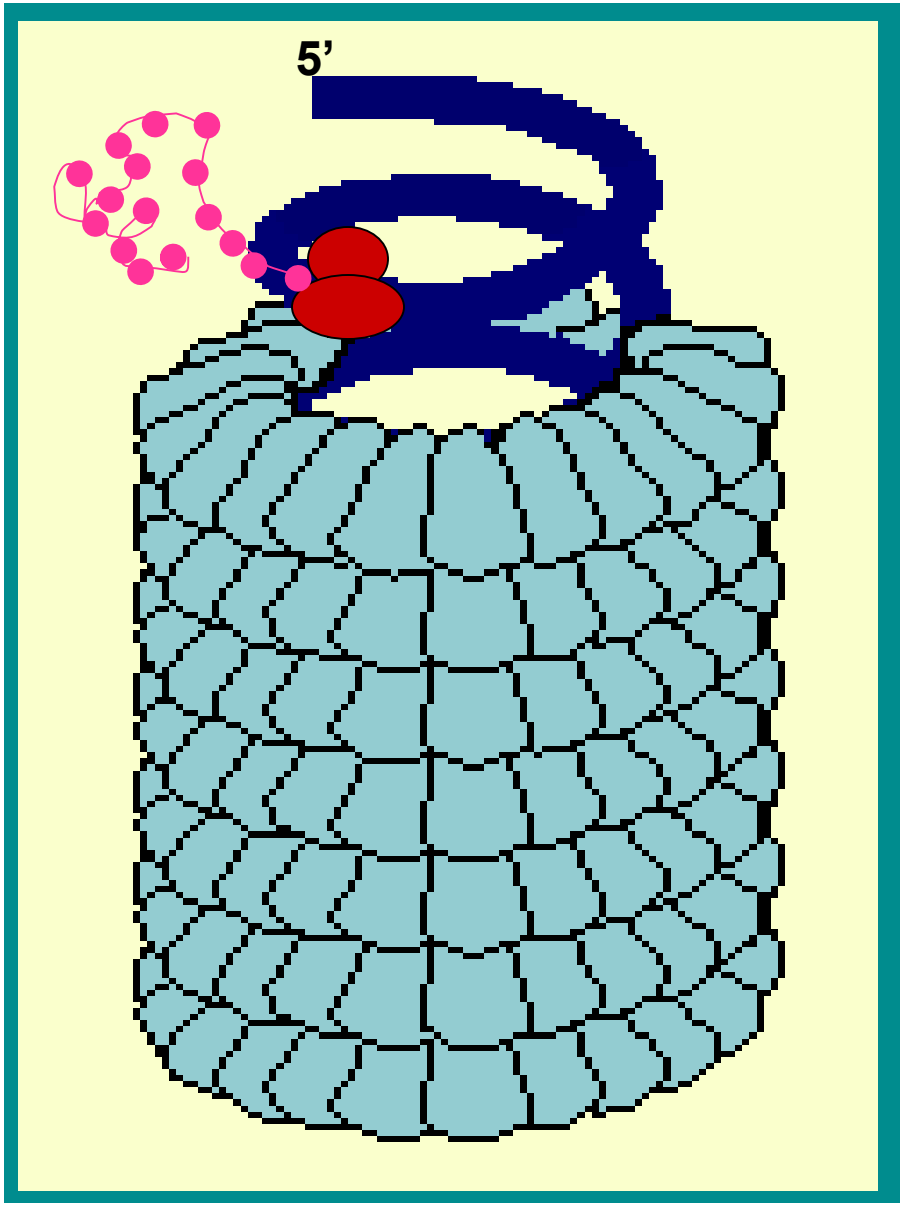
Modification of a diagram from: L. Stannard, Department of Medical Microbiology, U. of Cape Town

TMV Life cycle

(cont.)

d) Ribosome meets start codon, translates first two proteins (126K ,183 K) while uncoating continues "co-traslational disassembly"

e) 126 K (MET-Hel) & 183 K (RdRp) use viral RNA as template to make full length complementary neg. strand RNA …/…



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Current Research on *TMV*

- Improving diagnostic techniques
- Characterization of MP and viral movement through plant
- Characterization of the Helicase & RdRp