Classification and nomenclature of viruses
History of virus classification

- Type of host
- Type of disease
- Transmission by an arthropod vector
- Nucleic acid type
- SS or DS
- Segmented
- Size of the virion
- Capsid symmetry
- Envelope
Nomenclature

- Small, icosahedral, single-stranded DNA viruses of animals were called parvoviruses (Latin parvus = small)
- Nematode-transmitted polyhedral (icosahedral) viruses of plants were called nepoviruses
- Phages T2, T4 and T6 were called T even phages
- Serological relationships between viruses were investigated
- Distinct strains (serotypes) could be distinguished in serological tests
- Antisera against purified virions
- Serotypes reflect differences in virus proteins
International Committee on Taxonomy of Viruses

• Order had to be brought
• ICTV was formed in 1966
• Many working groups and is advised by virologists around the world
• Rules for the nomenclature and classification of viruses
• Considers proposals for new taxonomic groups and virus names
• Approved are published in book form and on the web
Modern virus classification and nomenclature

- Each order, family, subfamily and genus is defined by viral characteristics that are necessary for membership of that group.

<table>
<thead>
<tr>
<th>Taxonomic group</th>
<th>Suffix</th>
<th>Example 1</th>
<th>Example 2</th>
<th>Example 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>-virales</td>
<td>Caudovirales</td>
<td>Mononegavirales</td>
<td>Nidovirales</td>
</tr>
<tr>
<td>Family</td>
<td>-viridae</td>
<td>Myoviridae</td>
<td>Paramyxoviridae</td>
<td>Coronavirus</td>
</tr>
<tr>
<td>Subfamily</td>
<td>-virinae</td>
<td>–</td>
<td>Paramyxovirinae</td>
<td>–</td>
</tr>
<tr>
<td>Genus</td>
<td>-virus</td>
<td>T4-like viruses</td>
<td>Morbillivirus</td>
<td>Coronavirus</td>
</tr>
<tr>
<td>Species</td>
<td>–</td>
<td>Enterobacteria phage T4</td>
<td>Measles virus</td>
<td>Severe acute respiratory syndrome virus</td>
</tr>
</tbody>
</table>
Classification based on genome sequences

- Similarity is represented in diagrams known as phylogenetic trees.
- Rooted - the tree begins at a root which is assumed to be the ancestor of the viruses in the tree.
- Unrooted - no assumption is made about the ancestor of the viruses in the tree.
10.2.2
Nomenclature of viruses and taxonomic groups
- Bacterial viruses such as T1, T2 and φX174.
- Viruses of humans and other vertebrates diseases that they cause
  Examples: measles virus, smallpox virus, foot and mouth disease virus
- Some viruses city, town or river
  Examples: Newcastle disease virus, Norwalk virus, Ebola virus
<table>
<thead>
<tr>
<th>Place name</th>
<th>Family/genus name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bunyamwera (Uganda)</td>
<td>Family <em>Bunyaviridae</em></td>
</tr>
<tr>
<td>Ebola (river in Zaire)</td>
<td>Genus <em>Ebolavirus</em></td>
</tr>
<tr>
<td>Hantaan (river in South Korea)</td>
<td>Genus <em>Hantavirus</em></td>
</tr>
<tr>
<td>Hendra (Australia) and Nipah (Malaysia)</td>
<td>Genus <em>Henipavirus</em></td>
</tr>
<tr>
<td>Norwalk (United States)</td>
<td>Genus <em>Norovirus</em></td>
</tr>
</tbody>
</table>
Insect viruses

- Many insect viruses were named after the insect, with an indication of the effect of infection on the host.
- A virus was isolated from *Tipula paludosa* larvae that were iridescent as a result of the large quantities of virions in their tissues. *Tipula iridescent virus*.
- A virus was isolated from *Autographa californica* larvae that had large polyhedral structures in the nuclei of infected cells. *Autographa californica nuclear polyhedrosis virus*. 
## Plant viruses

<table>
<thead>
<tr>
<th>Host and disease signs</th>
<th>Family/genus name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brome mosaic</td>
<td>Family <em>Bromoviridae</em></td>
</tr>
<tr>
<td>Cauliflower mosaic</td>
<td>Family <em>Caulimoviridae</em></td>
</tr>
<tr>
<td>Cowpea mosaic</td>
<td>Family <em>Comoviridae</em></td>
</tr>
<tr>
<td>Tobacco mosaic</td>
<td>Genus <em>Tobamovirus</em></td>
</tr>
<tr>
<td>Tobacco rattle</td>
<td>Genus <em>Tobravirus</em></td>
</tr>
<tr>
<td>Tomato bushy stunt</td>
<td>Family <em>Tombusviridae</em></td>
</tr>
</tbody>
</table>
Many names of virus taxonomic groups are based on Latin words, while some have Greek origins.

<table>
<thead>
<tr>
<th>Latin</th>
<th>Greek</th>
<th>Translation</th>
<th>Reason for name</th>
<th>Family/genus name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arena</td>
<td>Kloster</td>
<td>Sand</td>
<td>Ribosomes in virions resemble sand grains in thin section</td>
<td>Family Arenaviridae</td>
</tr>
<tr>
<td>Baculum</td>
<td>Kystis</td>
<td>Stick</td>
<td>Capsid shape</td>
<td>Family Baculoviridae</td>
</tr>
<tr>
<td>Filum</td>
<td>Mikros</td>
<td>Thread</td>
<td>Virion shape</td>
<td>Family Filoviridae</td>
</tr>
<tr>
<td>Flavus</td>
<td>Pous</td>
<td>Yellow</td>
<td>Yellow fever virus</td>
<td>Family Flaviviridae</td>
</tr>
<tr>
<td>Luteus</td>
<td>Kystis</td>
<td>Yellow</td>
<td>Barley yellow dwarf virus</td>
<td>Family Luteoviridae</td>
</tr>
<tr>
<td>Parvus</td>
<td>Mikros</td>
<td>Small</td>
<td>Virion size</td>
<td>Family Paroviridae</td>
</tr>
<tr>
<td>Tenuis</td>
<td>Kystis</td>
<td>Thin, fine</td>
<td>Virion shape</td>
<td>Genus Tenuiviruses</td>
</tr>
<tr>
<td>Toga</td>
<td></td>
<td>Cloak</td>
<td>Virion is enveloped</td>
<td>Family Togaviridae</td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>Kloster</td>
<td>Greek</td>
<td>Thread</td>
<td>Virion shape</td>
<td>Family Closteroviridae</td>
</tr>
<tr>
<td>Kystis</td>
<td>Greek</td>
<td>Bladder, sack</td>
<td>Virion is enveloped</td>
<td>Family Cystoviridae</td>
</tr>
<tr>
<td>Mikros</td>
<td>Greek</td>
<td>Small</td>
<td>Virion size</td>
<td>Family Microviridae</td>
</tr>
<tr>
<td>Pous</td>
<td>Greek</td>
<td>Foot</td>
<td>Phages with short tails</td>
<td>Family Podoviridae</td>
</tr>
</tbody>
</table>
Baltimore classification of viruses

- Classification system that places viruses into one of seven groups depending on a combination of their:
  - Nucleic acids (DNA/RNA)
  - Strandedness (single/double-stranded)
  - Method of replication
- It was first suggested by David Baltimore, after whom the scheme is named.
- **Advantage**: Differentiation between plus-strand RNA viruses that do and do not carry out reverse transcription AND between dsDNA viruses that do and do not carry out reverse transcription.

* A reverse transcriptase (RT) is an enzyme used to generate complementary DNA (cDNA) from an RNA template, a process termed reverse transcription. ... In retroviruses and retrotransposons, this cDNA can then integrate into the host genome, from which new RNA copies can be made via host-cell transcription