

CONTENTS

Table of Contents	ix
General Entries: alphabetical listing of entries covering general topics	xxvii
Virus Entries: alphabetical listing by taxa of entries covering individual viruses	xxxiii
Virus and Taxa Name changes	xliii
Contributors	xlvi
Preface	lxxiii
Acknowledgments	lxxv
Forewords:	
100 Years of Contributions to Virology	lxxvii
100 Years of Foot and Mouth Disease	lxxxii

VOLUME 1

A

Adenoviruses (<i>Adenoviridae</i>)	
General features	Göran Wadell 1
Molecular biology	Jörg Schröer, Stefan Kochanek, Marianna Hösel and Walter Doerfler 7
Animal viruses	William C Russell and Mária Benko 14
Malignant transformation and oncology	Margaret P Quinlan 21
African swine fever virus (<i>Asfarviridae</i>)	Maria L Salas 30
Aleutian mink disease virus See Parvoviruses	
Alfamovirus and ilarviruses (<i>Bromoviridae</i>)	JF Bol 38
Algal viruses (<i>Phycodnaviridae</i>)	James L Van Etten 44
Alpha 3 bacteriophage See Coliphage ϕ X174 and related phages	
Amphibian herpesviruses (<i>Herpesviridae</i>)	Allan Granoff 51
Antivirals	A Kirk Field and Catherine A Laughlin 54
Apoptosis and virus infection	Margaret Quinlan 68

Archaeal phages	Hans Peter Arnold, Kenneth Stedman and Wolfram Zillig	76
Arteriviruses (<i>Arteriviridae</i>)	Margo Brinton	89
Ascoviruses (<i>Ascoviridae</i>)	Brian A Federici	97
Astroviruses (<i>Astroviridae</i>)	Stephan S Monroe	104
Autoimmunity	Robert S Fujinami	108
Avian type C retroviruses (<i>Retroviridae</i>)	John M Coffin	112
B		
Baboon herpesvirus See Herpesvirus – baboon and chimpanzee		
Bacillus phage ϕ 29 (<i>Podoviridae</i>)	Margarita Salas	119
<i>Bacillus subtilis</i> phages	H Ernest Hemphill	130
Bacterial identification – use of phages	Michael S DuBow	137
Baculoviruses (<i>Baculoviridae</i>)		
Granuloviruses	Doreen Winstanley and David O'Reilly	140
Nucleopolyhedrovirus	George F Rohrmann	146
Barnaviruses (<i>Barnaviridae</i>)	C Peter Romaine	152
Benyviruses	Tetsuo Tamada	154
BF23 phage See T5-like phage and related phages		
Birnaviruses – animal (<i>Birnaviridae</i>)	Hermann Becht	160
BK virus See JC and BK viruses		
Border disease virus See Bovine diarrhea virus and Border disease virus		
Borna disease virus (<i>Bornaviridae</i>)	Lothar Stitz and Rudolf Rott	167
Bovine diarrhea virus and border disease virus (<i>flaviviridae</i>)	Edward J Dubovi	173
Bovine herpesvirus (<i>Herpesviridae</i>)	Michael J Studdert	180
Bovine immunodeficiency virus (<i>Retroviridae</i>)	Matthew A Gonda	184
Bovine leukemia virus (<i>Retroviridae</i>)	Kathryn Radke	191
Bovine papilloma virus See Bovine Diarrhea Virus and Border Disease Virus		
Bovine parvovirus See Parvoviruses – rodents, pigs, cattle and waterfowl		
Bovine spongiform encephalopathy See Prions		
Bromoviruses (<i>Bromoviridae</i>)	Paul Ahlquist	198
Bunyaviruses (<i>Bunyaviridae</i>)		
General features	Neal Nathanson and Francisco González-Scarano	204
Replication	Richard M Elliott	212

C

Caliciviruses (<i>Caliciviridae</i>)	Michael J Studdert	217
Canine distemper virus See Rinderpest and canine distemper viruses		
Canine parvoviruses See Parvoviruses		
Capilloviruses	Luis Falipe Salazar	222
Caprine arthritis encephalitis virus	Gilles Quérat and Robert Vigne	223
Cardioviruses (<i>Picornaviridae</i>)	Douglas G Scraba and Ann C Palmenberg	229
Carlaviruses	Sergei K Zavriev	238
Carmoviruses (<i>Tombusviridae</i>)	Feng Qu and T Jack Morris	243
Cell structure and function in virus infections	Samuel Dales	247
Central European encephalitis virus See Encephalitis viruses		
Chandipura, Piry and Isfahan viruses (<i>Rhabdoviridae</i>)	P De Bishnu and Amiya K Banerjee	257
Channel catfish virus See Fish herpesviruses		
Chicken herpesvirus See Marek's disease virus		
Chickenpox virus See Varicella-zoster virus		
Chikungunya, O'nyong nyong and Mayaro viruses (<i>Togaviridae</i>)	Charles H Calisher	261
Chilo iridescent virus See Tipula iridescent virus		
Chimpanzee herpesvirus See Herpesvirus – baboon and chimpanzee		
Chlorella virus See Algal viruses		
Closteroviruses (<i>Closteroviridae</i>)	Sylvie German-Retana, Giovanni Martelli and Thierry Candresse	266
Coltivirus See Orbiviruses and coltivirus		
Coliphage ϕ X174 and related phages (<i>Microviridae</i>)	David T Denhardt	274
Coliphage lambda (<i>Siphoviridae</i>)	Allan M Campbell	281
Comoviruses (<i>Comoviridae</i>)	G George P Lomonosoff and Michael Shanks	285
Coronaviruses (<i>Coronaviridae</i>)	Kathryn V Holmes	291
Cowpox virus (<i>Poxviridae</i>)	Derrick Baxby and M Bennett	298
Coxsackieviruses (<i>Picornaviridae</i>)	Bruno Pozzetto and Odette G Gaudin	305
Creutzfeld-Jakob disease See Prions		

Cricket paralysis virus **See** Picornaviruses – insect
Cryptoviruses (*Partitiviridae*)

Robert G Milne and
Cristina Marzachi

Cucumoviruses (*Bromoviridae*)

General features

Molecular biology

Marilyn Roossinck

Marilyn Roossinck

Cyanophages

Eugene L Martin and

Tyler A Kokjohn

Cypoviruses (*Reoviridae*)

Serge Belloncik

Cytokines and chemokines

Diane E Griffin

Cytomegaloviruses (*Herpesviridae*)

General features (human)

Molecular biology (human)

Animal cytomegaloviruses

Edward S Mocarski, Jr

Wade Gibson

Donald J Alcendor and

Gary S Hayward

Murine cytomegaloviruses

John Staczek

D

Defective interfering viruses

Laurent Roux

Dengue viruses (*Flaviviridae*)

Duane J Gubler

Densonucleosis viruses (*Parvoviridae*)

Jacov Tal

Diagnostic techniques

Detection of viral antigens, nucleic acids and
specific antibodies

Aloys CM Kroes and

Linda FF Kox

Isolation and identification by culture and
microscopy

Marie L Landry and

GD Hsiung

Dianthoviruses (*Tombusviridae*)

Steven A Lommel

Drosophila C virus **See** Picornaviruses – insect

Drosophila Melanogaster Gypsy Virus **See**

Retroviruses of Drosophila: The Gypsy Paradigm

E

Eastern equine encephalitis virus **See** Equine
encephalitis viruses

Ebola virus **See** Marburg and Ebola viruses

Echoviruses (*Picornaviridae*)

Helena Kopecka

Ectromelia virus **See** Mousepox and rabbitpox

Emerging and re-emerging virus diseases

Frederick A Murphy

Encephalitis viruses (<i>Flaviviridae</i>)		
Encephalitis viruses and related viruses causing hemorrhagic disease	James S Porterfield	424
Tick-borne encephalitis and Wesselsbron viruses	EA Gould	430
Endogenous viruses	Bernard F Benkel	437
Enteric viruses	Ruth F Bishop	441
Enterobacteria phage N4 (<i>Podoviridae</i>)	Lucia B Rothman-Denes	450
Enterobacteria phage P1 (<i>Myoviridae</i>)	Hansjörg Lehnherr and Jürg Meyer	455
Enteroviruses (<i>Picornaviridae</i>)		
Animal and related viruses	Elizabeth M Hoey and Samuel J Martin	461
Human enteroviruses (serotypes 68-71)	Jeffrey W Almond and Margeruite Yin-Murphy	468
Entomopoxviruses (<i>Poxviridae</i>)	Richard W Moyer	474
Epidemiology of viral diseases	Frederick A Murphy	482
Epstein-Barr virus (<i>Herpesviridae</i>)		
General features	Lawrence S Young	487
Molecular biology	Jeffrey T Sample and Clare E Sample	494
Equine arteritis virus See Arteriviruses		
Equine encephalitis viruses (<i>Togaviridae</i>)	Diane E Griffin	501
Equine herpesviruses (<i>Herpesviridae</i>)	Dennis J O'Callaghan and Nikolaus Osterrieder	508
Equine infectious anemia virus (<i>Retroviridae</i>)	Ronald C Montelaro	515
Eye infections	James Chodosh	522

F

Fabaviruses (<i>Comoviridae</i>)	Jl Cooper	531
Feline calicivirus See Caliciviruses		
Feline immunodeficiency virus (<i>Retroviridae</i>)	Janet K Yamamoto	535
Feline leukemia and sarcoma viruses (<i>Retroviridae</i>)	James C Neil and David Onions	541
Feline panleukopenia virus See Parvoviruses		
Feline sarcoma virus See Feline leukemia and sarcoma viruses		
Filamentous phages (<i>Inoviridae</i>)	Robert E Webster	547
Fish herpesviruses (<i>Herpesviridae</i>)	Andrew J Davison	553
Fish viruses	Carol H Kim and Jo-Ann Leong	558
Foot and mouth disease viruses (<i>Picornaviridae</i>)	David J Rowlands	568
Fowlpox virus (<i>Poxviridae</i>)	Deoki N Tripathy and William M Schnitzlein	576

Frog virus 3 (<i>Iridoviridae</i>)	Rakesh M Goorha and Allan Granoff	582
Furoviruses	Yukio Shirako and T Michael A Wilson	587

G

G4 bacteriophage See Coliphage ϕ X174 and related phages		
Geminiviruses (<i>Geminiviridae</i>)	KW Buck	597
Genetics of animal viruses	Frank Fenner	606
Giardiaviruses (<i>Totiviridae</i>)	Alice L Wang and Ching C Wang	613
Gibbon ape leukemia virus (<i>Retroviridae</i>)	Marvin S Reitz, Jr	617
Goat pox virus See Poxviruses		
Gonometavirus See Picornaviruses – insect		
Goose parvovirus See Parvoviruses		
Granuloviruses See Baculoviruses		
Guanarito virus See Lassa, Junin, Machupo and Guanarito viruses		

H

Hantaviruses (<i>Bunyaviridae</i>)	Connie S Schmaljohn	621
Hare fibroma virus See Poxviruses		
Hepatitis A virus (<i>Picornaviridae</i>)	Michael R Beard and Stanley M Lemon	631
Hepadnaviruses (<i>Hepadnaviridae</i>) Human hepatitis B virus		
General features	William S Robinson	640
Molecular biology	Christopher Seeger	645
Avian hepatitis B virus	William Mason and Patricia Marion	650
Hepatitis C virus (<i>Flaviviridae</i>)	Robert H Purcell	657
Hepatitis delta virus	Michael MC Lai	664
Hepatitis E virus	Albert W Tam, Patrice O Yarbough and Daniel W Bradley	669

VOLUME 2

Herpes simplex viruses (<i>Herpesviridae</i>)		
General features	Laure Aurelian	677
Molecular biology	Edward K Wagner	686

Herpesviruses 6 and 7 – human (<i>Herpesviridae</i>)	Takuya Shimamoto and Koichi Yamanishi	697
Herpesvirus sylvilagus (<i>Herpesviridae</i>)	Peter G Medveczky	703
Herpesviruses – baboon and chimpanzee (<i>Herpesviridae</i>)	SS Kalter and RL Heberling	707
Herpesviruses saimiri and ateles (<i>Herpesviridae</i>)	Julia K Hilliard	714
History of virology		
General	Frank Fenner	718
Bacteriophages	Donna H Duckworth	725
Polio, coxsackie, echo and other enteroviruses	Joseph L Melnick	730
Hog cholera virus (<i>Flaviviridae</i>)	Jan T Van Oirschot	738
Honey bee viruses	Brenda V Ball and Leslie Bailey	743
Hordeiviruses (<i>Hordeivirus</i>)	Dianne M Lawrence and Andrew O Jackson	749
Host genetic resistance	David G Brownstein	753
Host-controlled modification and restriction	Deklev H Krüger and Monika Reuter	758
Human immunodeficiency viruses (<i>Retroviridae</i>)		
General features	Luc Montagnier	763
Molecular biology	Leon F García Martínez and L Victor García-Martínez	774
Antiretroviral agents	Ranga V Srinivas and Arnold Fridland	778
Human T-cell leukemia viruses (<i>Retroviridae</i>)		
HTLV-1	Mitsuaki Yoshida	788
HTLV-2	Bobbie J Rimel, Joseph D Rosenblatt and Vincente Planelles	794
Hypoviruses (<i>Hypoviridae</i>)	Donald L Nuss	804

I

Idaeoviruses	MA Mayo and AT Jones	809
Ilarviruses	See Alfamoviruses and ilarviruses	
Immune response		
General features	Gordon L Ada	812
Cell mediated immune response	Janice Riberdy and Peter Doherty	818
Infectious pancreatic necrosis virus	See Birnaviruses – animal	

Influenza viruses (<i>Orthomyxoviridae</i>)		
General features	Robert G Webster	824
Molecular biology	Peter Palese and	
	Adolfo Garcia-Sastre	830
Structure of antigens	Jonathan W Yewdell,	
	Jack R Bennink and	
	W Graeme Laver	836
Insect pest control by viruses	Davin Miller,	
	David R O'Reilly and	
	David Dall	842
Interference	Julius S Youngner and	
	Patricia Whitaker-Dowling	850
Interferons – General features	Philip I Marcus	854
Iridoviruses – invertebrate	Richard Webby and	
	James Kalkmakoff	862
Isfahan virus See Chandipura, Piry and Isfahan viruses		
J		
Japanese encephalitis virus (<i>Flaviviridae</i>)	Akira Igarashi	871
JC and BK viruses (<i>Polyomaviridae</i>)	Richard J Frisque	876
Junin virus See Lassa, Junin, Machupo and Guanarito viruses		
K		
Killer virus system See Totiviruses and yeast RNA viruses		
Kyasanur forest disease See Encephalitis viruses		
L		
Lassa, Junin, Machupo and Guanarito viruses (<i>Arenaviridae</i>)	Joseph B McCormick	887
Latency	Jack G Stevens	897
Lelystad virus See Arteriviruses		
Lumpy skin disease See Poxviruses		
Luteoviruses	W Allen Miller	903
Lymphocystis disease virus (<i>Iridoviridae</i>)	Christian A Tidona and	
	Gholamreza Darai	908
Lymphoproliferative disease virus of turkeys (<i>Retroviridae</i>)	Arona Gazit and	
	Abraham Yaniv	913

Lymphocytic choriomeningitis virus (<i>Arenaviridae</i>)		
General features	Raymond M Welsh	915
Molecular biology	Peter J Southern and Barbara J Meyer	920
Lysogeny and prophage	Max E Gottesman and Arnos Oppenheim	925

M

Machlomoviruses (<i>Tombusviridae</i>)	Steven A Lommel	935
Machupo virus See Lassa, Junin, Machupo and Guanarito viruses		
Mammalian hepadnaviruses See Hepatitis B viruses		
Marburg and Ebola viruses (<i>Filoviridae</i>)	Hans-Dieter Klenk, Werner Slenczka and Heinz Feldmann	939
Marek's disease virus (<i>Herpesviridae</i>)	LN Payne	945
Mayaro virus See Chikungunya, O'nyong nyong and Mayaro viruses		
Measles virus (<i>Paramyxoviridae</i>)	Sibylle Schneider-Schaulies and Volker ter Meulen	952
Mink enteritis virus See Parvoviruses		
Molluscum contagiosum virus (<i>Poxviridae</i>)	LC Archard, BA Soteriou and CD Porter	960
Monkeypox virus See Smallpox and monkeypox viruses		
Morbilliviruses See Rinderpest and distemper viruses		
Mouse mammary tumor virus (<i>Retroviridae</i>)	Jackie P Dudley	965
Mousepox and rabbitpox viruses (<i>Poxviridae</i>)	Frank Fenner	973
Mu-like phages (<i>Myoviridae</i>)	Michael S DuBow	981
Mumps virus (<i>Paramyxoviridae</i>)	Bertus K Rima	988
Murine leukemia viruses (<i>Retroviridae</i>)	Hung Fan	995
Murine parvoviruses See Parvoviruses		
Murray Valley encephalitis See Encephalitis viruses		
Myxoma virus See Poxviruses		

N

Necroviruses (<i>Tombusviridae</i>)	Frank Meulewaeter	1003
Nepoviruses (<i>Comoviridae</i>)	Mike A Mayo and AT Jones	1007
Nervous system viruses	Richard T Johnson	1013
Newcastle disease virus (<i>Paramyxoviridae</i>)	Peter T Emmerson	1020
Nodaviruses (<i>Nodaviridae</i>)	A. Southern Hall	

Nonoccluded baculoviruses	John P Burand	1031
Norwalk and related viruses (<i>Caliciviridae</i>)	Mary K Estes and Isabelle Leparc-Goffart	1033
Nucleopolyhedrosis viruses See Baculoviruses		
O		
Omsk hemorrhagic fever virus See Encephalitis viruses		
O'nyong-nyong virus See Chikungunya, O'nyong-nyong and Mayaro viruses (<i>Togaviridae</i>)		
Orbiviruses and coltivirus (<i>Reoviridae</i>)		
General features	PPC Mertens	104
Molecular biology	Polly Roy and Peter PC Mertens	106
Organ system infections	Jangu E Banatvala and Felicity Nicholson	107
P		
P2, 186 and related phages (<i>Myoviridae</i>)	Ian B Dodd and J Barry Egan	108
P4 phage (Satellites)	Gianni Deho and Daniela Ghisotti	109
Papillomaviruses – human (<i>Papillomaviridae</i>)		
General features	Gérard Orth	110
Molecular biology	Paul Lambert, Elsa Flores, Pirkko Heino and Shiyu Song	111
Papillomaviruses – animal	William C Phelps, Gary L Bream and Alison A McBride	112
Parainfluenza viruses (<i>Paramyxoviridae</i>)		
Human	Allen Portner	113
Animal	Kailash C Gupta	113
Parapoxviruses (<i>Poxviridae</i>)	Andrew Mercer and David Haig	114
Partitiviruses – fungal (<i>Partitiviridae</i>)	Said A Ghabrial and Bradley I Hillman	114

Parvoviruses (<i>Parvoviridae</i>)		
General features	Caroline R Astell	1151
Molecular biology	Caroline R Astell	1155
Cats, dogs and mink	Colin R Parrish	1159
Rodents, pigs, cattle and waterfowl	Peter Tijssen, Mohamed Laakel, Zoltán Zádori and Benoît Hébert	1167
Pathogenesis		
Animal viruses	Kenneth L Tyler	1175
Plant viruses	James Culver	1184
Pea enation mosaic virus (<i>Luteoviridae</i>)	Jihad S Skaf, Steven A Denler and Gustaaf A de Zoeten	1191
Pecluviruses	DVR Reddy, P Delfosse and Mike A Mayo	1196
Persistent viral infection	Maryann T Puglielli and Rafi Ahmed	1200
Peste des petits ruminants virus See Rinderpest and distemper viruses		
Phage ϕ6 (<i>Cystoviridae</i>)	Dennis H Bamford	1205
Phage ecology, evolution and speciation	Allan M Campbell	1208
Phage PRD1 (<i>Tectiviridae</i>)	Dennis H Bamford	1210
Phage homologous recombination	Kenneth N Kreuzer	1213
Phage taxonomy and classification	Jack Maniloff, Hans-Wolfgang Ackermann and Audrey Jarvis	1221
Phage toxins and disease	Randall K Holmes, Michael G Jobling and Michael P Schmitt	1228
Phage transduction	Werner Arber	1234
Phages as cloning vehicles	Noreen E Murray	1240
Phages in industrial fermentations	Mary Ellen Sanders	1244
Phages in soil	Stanley T Williams, Martin A Mortimer and Jackie Parry	1248
Phages of <i>Streptococcus thermophilus</i>	Harold Brüssow	1253
Phocid distemper virus See Rinderpest and distemper viruses		
Phytoreoviruses (<i>Reoviridae</i>)	Bradley I Hillman and Donald L Nuss	1262
Picornaviruses – insect (<i>Picornaviridae</i>)	Paul D Scotti and Peter D Christian	1267
Piry virus See Chandipura, Piry and Isfahan viruses		

Plant pararetroviruses (<i>Caulimoviridae</i>)		
Caulimoviruses: general features	James E Schoelz and June E Bourque	127
Caulimoviruses: molecular biology	Thomas Hohn	128
Cassava vein mosaic virus	Alexandre de Kochko	128
Legume caulimoviruses	DVR Reddy and Richard D Richins	128
Plant pararetroviruses		
Rice tungro bacilliform virus	Roger Hull	129
Badnaviruses	Benham E Lockhart and Neil E Olszewski	129
Plant resistance to viruses		
Natural resistance	RSS Fraser	130
Engineered resistance	C Michael Deom	130
Plant retroelements	Roger Hull	131
Plant virus disease – economic aspects	OW Barnett and Charles E Main	131
Polioviruses (<i>Picornaviridae</i>)		
General features	Philip D Minor	132
Molecular biology	Thomas Pfister, Caroline Mirzayan and Eckard Wimmer	133
Polydnnaviruses (<i>Polydnnaviridae</i>)	Don Stoltz	134
Polyomaviruses – murine (<i>Polyomaviridae</i>)		
General features	James M Pipas	135
Molecular biology	Walter Eckhart	135
VOLUME 3		
Pomoviruses	L Torrance	136
Potexviruses	Mounir AbouHaidar and Duncan Gellatly	136
Potyviruses	Juan José López-Moya and Juan-Antonio Garcia	136
Poxviruses (<i>Poxviridae</i>)		
Capripoxviruses	R Paul Kitching	137
Leporipoxviruses and suipoxviruses	Grant McFadden	138
Prions		
Human and Animal	Stanley B Prusiner	138
Kuru	Carlo Masullo	139
Yeast and Fungi	Marie-Lise Maddelein, Herman Edskes, Kim Taylor and Reed B Wickner	140

Propagation of viruses		
Animal	Steffen Faisst	1408
Bacteria	Gail E Christie	1413
Plant	William M Wintermantel	1418
Pseudorabies virus (<i>Herpesviridae</i>)	Saul Kit	1421
Q		
Quasispecies	Esteban Domingo	1431
R		
Rabbit fibroma virus	See Poxviruses	
Rabbit hemorrhagic disease virus	See Caliciviruses	
Rabbitpox virus	See Mousepox and rabbitpox viruses and poxviruses	
Rabies virus (<i>Rhabdoviridae</i>)	George M Baer and Noël Tordo	1437
Rabies-like viruses (<i>Rhabdoviridae</i>)	Robert E Shope	1442
Recombination of viruses	Jozef J Bujarski	1446
Reoviruses (<i>Reoviridae</i>)		
General features	Kenneth L Tyler	1454
Molecular biology	WK Joklik	1464
Replication of viruses	V Gregory Chinchar	1471
Respiratory syncytial virus – human (<i>Paramyxoviridae</i>)	Peter L Collins	1479
Respiratory viruses	David O White and Lorena E Brown	1488
Reticuloendotheliosis viruses (<i>Retroviridae</i>)	Radmila Hrdlickova, Jiri Nehyba and Henry R Bose	1496
Retrotransposons of fungi	Jef D Boeke	1503
Retroviral oncogenes	Paula J Enrietto, Gabriela Maldonado-Codina and Michael Hayman	1507
Retroviruses – type D (<i>Retroviridae</i>)	Maja A Sommerfelt and Eric Hunter	1518
Retroviruses of <i>Drosophila</i> : The gypsy paradigm	Alain Bucheton, Alain Pélisson and Christophe Terzian	1526

Rhabdoviruses (*Rhabdoviridae*)

Plant rhabdoviruses

Andrew O Jackson,
Michael Goodin, Ignacio
Moreno, Jennifer Johnson
and Diane M Lawrence 153

Ungrouped mammalian, bird and fish
rhabdoviruses

P De Bishnu and
Amiya K Banerjee 154

Rhinoviruses (*Picornaviridae*)

Glyn Stanway 154

Ribozymes

Robert H Symons 155

Rinderpest and distemper viruses

(*Paramyxoviridae*)

Tom Barrett 155

Ross River virus and Barmah Forest virus

(*Togaviridae*)

Lyn Dalgarno and
Ian D Marshall 157

Rotaviruses (*Reoviridae*)

General features

Robert D Shaw and
Harry B Greenberg 157

Molecular biology

Mary K Estes 158

Rubella virus (*Togaviridae*)

Terly K Frey and
Jerry S Wolinsky 159

Russian spring summer encephalitis virus See
Encephalitis viruses

S

Salmonella phage P22 (*Podoviridae*)

Anthony R Poteete 160

Satellite RNAs and satellite viruses

ME Talianky and
PF Palukaitis 160

S13m bacteriophage See Coliphage ϕ X174 and
related phages (*Microviridae*)

San Miguel sea lion virus See Caliciviruses

Scrapie See Prions

Semliki Forest virus See Sindbis and Semliki Forest
virusesSendai virus (*Paramyxoviridae*)

Mario Homma and
Masato Tashiro 161

Sequiviruses (*Sequiviridae*)

Mike A Mayo and
AF Murrant 162

Sheep poxvirus See Poxviruses

Shrimp viruses

Philip C Loh 162

Shope fibroma virus See Poxviruses

Shope papilloma and bovine viruses See

Papillomaviruses - animal

Sigma rhabdoviruses (<i>Rhabdoviridae</i>)	Danielle Teninges	1635
Simian hemorrhagic fever virus See Encephalitis viruses and arteriviruses		
Simian herpesvirus See Herpesvirus saimiri and ateles		
Simian immunodeficiency viruses (<i>Retroviridae</i>)	Vito G Sasseville, Ronald C Desrosiers and Hillary G Morrison	1640
Simian virus 40	Janet S Butel	1647
Sindbis and Semliki Forest viruses (<i>Togaviridae</i>)	Miton J Schlesinger	1656
Single-stranded RNA phages (<i>Leviviridae</i>)	J van Duin	1663
Smallpox and monkeypox viruses (<i>Poxviridae</i>)	Keith Dumbell and Geoffrey L Smith	1668
Sobemoviruses	OP Sehgal	1674
SPO1 phage (<i>Myoviridae</i>)	Charles R Stewart	1681
Spongiform encephalopathies See Prions		
Spumaviruses (<i>Retroviridae</i>)	Mel Campbell, Ayalew Mergia, Philip C Loh and Paul A Luciw	1685
Squirrel fibroma virus See Poxviruses		
St. Louis encephalitis virus See Encephalitis viruses		
Swine herpesvirus 1 See Pseudorabies virus		
Swine vesicular exanthema virus See Caliciviruses		
Swinepox virus See Poxvirus		
Synergism - Plant viruses	Vicki Bowman Vance	1694
T		
T1-like phages (<i>Siphoviridae</i>)	JR Christensen	1701
T4-like phages (<i>Myoviridae</i>)	Gisela Mosig	1706
T5-like phages (<i>Siphoviridae</i>)	D James McCorquodale	1716
T7-like phages (<i>Podoviridae</i>)	Ian J Molineux	1722
Tanapox virus See Yabapox viruses		
Taxonomy, classification and nomenclature of viruses	Claude M Fauquet	1730
Tenuiviruses	Bryce W Falk	1756
Tetraviruses (<i>Tetraviridae</i>)	Terry N Hanzlik and Karl HJ Gordon	1764
Theiler's viruses (<i>Picornaviridae</i>)	Howard L Lipton	1773
Tick-borne encephalitis virus See Encephalitis viruses		

Tobamoviruses	Dennis J Lewandowski and William O Dawson	17
Tobraviruses	Peter B Vissler, Alexander Mathis and Hubb JM Linthorst	17
Tombusviruses	D'Ann Rochon	17
Toroviruses (<i>Coronaviridae</i>)	Marian C Horzinek	17
Tospoviruses (<i>Bunyaviridae</i>)	James W Moyer	18
Totiviruses (<i>Totiviridae</i>)		
General features	Said A Ghabrial and Jean L Patterson	18
<i>Ustilago maydis</i> viruses	Jeremy Bruenn	18
Transformation – Animal viruses	Ron Wisdom and Inder M Verma	18
Transplantation and virus infections	Robert A Krance, Helen E Heslop and Malcolm Brenner	1
Transportable bacteriophages See Mu-like phages		
Tree shrew herpesviruses (<i>Herpesviridae</i>)	Christian A Tidona and Gholamreza Darai	1
Trichoviruses	Sylvie German-Retana and Thierry Candresse	1
Tumor viruses – human	Herbert Pfister and Bernard Fleckenstein	1
Turkey herpesvirus See Marek's disease virus		
Tymoviruses	Adrian Gibbs	1
Ty elements See Retrotransposons of fungi		
U		
Umbraviruses	DJ Robinson and AF Murant	
<i>Ustilago maydis</i> viruses See Totiviruses		
V		
Vaccines and immune response	Gordon L Ada Riccardo Wittek	
Vaccinia virus (<i>Poxviridae</i>)		
Varicella-zoster virus (<i>Herpesviridae</i>)	Jeffrey I Cohen and Stephen E Straus	
General features	William T Ruyechan and John Hay	
Molecular biology		
Variola virus See Smallpox and monkeypox viruses		

Vectors		
Animal viruses	Geoffrey Kitchingman and J Victor Garcia	1885
Plant viruses	Thomas Hohn and Rob Goldbach	1892
Vector transmission of plant viruses	Stewart M Gray and D'Ann Rochon	1899
Venezuelan equine encephalitis virus	See Equine encephalitis viruses	
Vesicular exanthema virus	See Caliciviruses	
Vesicular stomatitis viruses (<i>Rhabdoviridae</i>)	Luis L Rodriguez and Stuart T Nichol	1910
Viral membranes	John Lenard	1920
Viral receptors	Horacio U Saragovi, Gordon J Sauvé and Mark I Greene	1926
Viroids	Robert A Owens	1928
Virus species	Marc HV Van Regenmortel	1937
Virus structure		
Atomic structure	Ming Luo	1943
Principles of virus structure	John E Johnson and Jeffrey A Speir	1946
Virus-host cell interactions	Patricia Whitaker-Dowling and Julius S Youngner	1957
Visna-Maedi viruses (<i>Retroviridae</i>)	Opendra Narayan	1961
W		
Waikaviruses (<i>Sequiviridae</i>)	Donald T Gordon	1965
Wesselbron virus	See Encephalitis viruses	
West Nile encephalitis virus	See Encephalitis viruses	
Western equine encephalitis virus	See Equine encephalitis viruses	
Y		
Yabapox and Tanapox viruses (<i>Poxviridae</i>)	HA Rouhandeh	1971
Yeast RNA viruses (<i>Totiviridae</i>)	Lionel Bernard, Herman Edskes, Juan Carlos Ribas and Reed B Wickner	1974
Yellow fever virus (<i>Flaviviridae</i>)	Thomas P Monath	1979

Z

Zoonoses

Thomas M Yuill

Color Plate Sections

in Volume 1

between pages 3

in Volume 2

between pages 104

in Volume 3

between pages 169

Appendix

Index