

# Classification and Nomenclature of Viruses

First Report of the International Committee on Nomenclature of Viruses

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## Preface

The contents of this volume constitute a report of the activities of the International Committee on Nomenclature of Viruses, subsequently called the ICNV. The report covers the period 1966 to 1970. The work is, of course, incomplete and we should expect much of it to need revision. It is the first stage of an effort towards a universal nomenclature and we should expect the volume to be followed in course of time by others, each more comprehensive and precise than the last.

I wish to acknowledge the help of the many members of the ICNV who, between 1966 and 1970, generously gave much of their time and energy to the classification and nomenclature of viruses.

The smooth running of the organization was due to the Secretaries, Drs J. MAURIN, J. BRANDES and V. VALENTA. I should like especially to thank Dr MAURIN who has given devoted and efficient service over the four years. His patient and loyal support was invaluable, especially during the various perturbations we underwent. Until his tragic death in 1968, Dr BRANDES handled a tremendous amount of business and established liaisons with many other bodies interested in virus nomenclature; we all experienced a keen sense of loss when he died and I wish to pay tribute to him and to his contribution.

The main bulwarks on the taxonomic side were the Chairmen of the Subcommittees, Sir CHRISTOPHER ANDREWES, Dr H. G. PEREIRA, Dr B. D. HARRISON, Professor C. VAGO, Dr A. J. GIBBS and Dr D. E. BRADLEY. Without these people we should have achieved nothing. Their tireless and cheerful efforts have contributed most of the contents of this monograph.

I wish to thank the Vice-President, Professor H. S. GINSBERG, and the Executive Committee for their tireless patience during many hours of tedious committee work.

I wish to thank Miss P. THORNTON-BASSETT for her forbearance, her excellent staff-work and her high quality typewriting. I am grateful to Mr J. D. TROTTER for his help in editing this monograph, to Professor J. L. MELNICK who has helped in its publication and to Mrs E. E. THOMAS for work on the index.

I wish to thank all the virologists, known and unknown to me, who have contributed by giving us their opinions and advice during the past four years. All of it has been helpful and all has influenced what we have done.

For financial support I wish to thank CIOMS, IUBS, WHO and Flow Laboratories (U.K.) Ltd. Without their contributions we should have been helpless. I also wish to thank the Society for General Microbiology and the Ciba Foundation who helped to entertain the Executive Committee in London in 1968.

Finally, there are two men to whom we all owe a great debt. The first, Sir CHRISTOPHER ANDREWES, has, for very many years, persisted with virus taxonomy. As we have entered each succeeding phase in virology, he has deftly turned new knowledge to taxonomic advantage in the field of vertebrate virology. I have no doubt that it is largely owing to his efforts that the taxonomy of the vertebrate viruses is so far in advance. It is with great pleasure that I acknowledge the foundations he has laid in the past, his strong efforts over the past four years and the wise counsel he has given me. The second is Professor A. LWOFF, who has stimulated us all afresh during the past eight years. Sometimes it has seemed that this stimulant was excessively strong but it has been a healthy stimulant. He has done more than any other in the foundation of the ICNV and (as I know better than anyone) in finding support for it.

Birmingham, 1971

P. WILDY

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# List of Officers and Members of the International Committee on Nomenclature of Viruses

<b>Life Members</b>		Sir Christopher Andrewes F. O. Holmes A. Lwoff V. L. Ryzhkov V. M. Zhdanov
<b>Executive Committee</b>	<b>President</b>	P. Wildy
	<b>Vice-President</b>	H. S. Ginsberg
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	Venezuela	A. L. Briceño Rossi
Bacteriophage Subcommittee	Chairman Attending Secretary Members	D. E. Bradley J. Maurin T. F. Anderson E. Asheshov D. Goldfarb (1966 to 1968) A. D. Kaiser
Cryptogram Subcommittee	Chairman Members	A. J. Gibbs H. S. Ginsberg A. Klug J. L. Melnick (from 1968) S. B. Primrose (from 1968) P. Tournier C. Vago D. H. Watson (from 1968)

<b>Invertebrate Virus Subcommittee</b>	<b>Chairman</b>	C. Vago
	<b>Attending Secretaries</b>	J. Brandes (1966 to 1968) V. Valenta (1969 to 1970)
	<b>Members</b>	K. Aizawa F. Bird (1966 to 1968) C. Ignoffo (from 1968) M. Martignoni L. Tarasevich T. W. Tinsley
<b>Plant Virus Subcommittee</b>	<b>Chairman</b>	B. D. Harrison
	<b>Attending Secretaries</b>	J. Brandes (1966 to 1968) V. Valenta (1969 to 1970)
	<b>Members</b>	J. T. Finch A. J. Gibbs L. Hirth M. Hollings K. Maramorosch R. J. Shepherd V. Valenta (1966 to 1969) C. Wetter (from 1969)
<b>Vertebrate Virus Subcommittee</b>	<b>Chairman</b>	Sir Christopher Andrewes
	<b>Vice-Chairman</b>	H. G. Pereira
	<b>Attending Secretary</b>	J. Maurin
	<b>Members</b>	D. Blaškovič
		J. B. Brooksby
		J. Casals
		H. S. Ginsberg
		M. M. Kaplan
		J. L. Melnick
		R. Rott
		P. Tournier
		V. Zhdanov
		C. J. York
<b>Study Groups</b>	<b>Arboviruses</b>	J. Casals
		M. P. Chumakov
		C. Hannoun
		M. Mussgay
		J. S. Porterfield (Chairman)

Myxoviruses	R. M. Chanock Z. Dinter C. Morgan H. G. Pereira (Chairman) W. P. Rowe L. Syrucek P. K. Vogt A. P. Waterson C. J. York
Parvoviruses	I. Archetti L. Crawford (Chairman) M. D. Hoggan L. Kilham J. L. Melnick C. Vago
Rhabdoviruses	P. Atanasiu A. Berkaloff F. Brown B. D. Harrison A. F. Howatson (Chairman) M. M. Kaplan R. MacLeod N. Plus L. O. Zwillenberg
<b>Study groups  are in the process of being  formed for the following:</b>	
Adenoviruses Arenaviruses Coronaviruses Herpesviruses Iridoviruses Leukoviruses Papovaviruses Picornaviruses Poxviruses Reoviruses	

# Reports

## President's Report

### *Genesis*

The International Committee on Nomenclature of Viruses was set up at the International Congress for Microbiology held in Moscow in 1966. Its object was to find a universal taxonomic system for all viruses. The Committee was born in the midst of a fulminating controversy over how viruses should be classified and named and was nurtured in the grumbling aftermath of this controversy. It seems extraordinary to me, with the extreme difference on how the matter should be approached, that we managed even to make a beginning. However, a common policy was developed and a programme of work was agreed. The pattern of the organization has been outlined elsewhere [WILDY *et al.*: Progress in Medical Virology, vol. 9, p. 476, 1968].

The essential parts of the policy laid down in 1966 were (1) that groups (or genera) of viruses must be defined and listed, (2) that type members (species) of these groups would be provided, (3) that names for the groups (genera) would be proposed and (4) that the use of the cryptogram as a taxonomic device would be explored. Four problems faced us: (1) the apparently irreconcilable attitudes towards virus taxonomy, (2) the obvious differences between the extent of taxonomic development in vertebrate virology and in the rest of virology, (3) the need to apply simultaneously specialized knowledge and a universal approach, and (4) the need to find names that working virologists actually wanted to use. We therefore set up four specialist subcommittees (vertebrate virus, plant virus, invertebrate virus and bacteriophage). All proposals had to be approved by the relevant subcommittee, the Executive Committee and the ICNV and a sizeable number of virologists working in the relevant field were to be consulted. A fifth subcommittee especially devoted to exploring the use of the cryptogram was formed.

*Modus operandi*

The various subcommittees inevitably approached their tasks differently. For example, the Vertebrate Virus Subcommittee was faced with defining well-known groups of viruses, with bringing their descriptions up to date and with adding new groups as they appeared. On the other hand, the Plant Virus Subcommittee needed to define many groups for the first time and to find names for them. This has led to mutual vexation since the vertebrate virologists felt a need to set up a series of study groups to consider relatively fine distinctions between the viruses they dealt with, while the plant virologists were concerned to devise descriptions which would cover the groups as they were forged. The meetings of chairmen of subcommittees that we have held, have done something to unify approaches, and I believe that this will be clear in this monograph.

*A rose by any other name*

For many years, the dead hand of LINNAEUS has hovered uncertainly over the virus kingdom. The latinized binomial scheme of nomenclature is, however, not strictly Linnaean and though controversy still rages, the rules of orthography and the etymological exactitude prescribed in 1966 have generated further problems. The ICNV has, so far, resisted all attempts to alter these rules, I believe unwisely. This has led to a serious rift between the plant virologists and the rest. It would be foolish to underestimate the damage this has done to the unity of the ICNV and to its work.

*Positive and negative*

Despite what I have written above, the ICNV has achieved something. There have been two principal philosophies in virus nomenclature. First, the positive approach has been to classify viruses on the basis of a few 'important' criteria and construct a nomenclature on a hierarchic basis (cf. PCNV). This results in an ordered series of labelled boxes into which the different viruses are shoved, as seems most appropriate. Secondly, the negative approach is to group strains on the basis of many criteria and to arrange the groups in higher taxa only after exhaustive comparisons have been made [cf. GIBBS *et al.*, 1966]. It will be obvious that the latter process should lead to a definitive classification by doomsday and offers no guarantee of anything at all beforehand. On

the other hand, the positive method is certain to produce gross enormities but at least provides an immediately useful classification and nomenclature system (even if it is wrong). The ICNV has adopted a middle course. It has compared many individual viruses using manifold criteria and has then grouped them. On this basis it has selected names for the groups. There has lately been a shift from the negative to the positive approach, and although this will be immediately useful in some areas, we must expect to pay a price in the future because many of the taxa will prove to be weighted wrongly (i.e., genera will turn out to be families, etc.). Of one thing we shall be certain: whatever the approach, positive or negative, truth will become truer as time goes on and by doomsday precisely the same conclusions will have been reached.

### *The first step*

The classification and nomenclature of viruses has had a prolonged gestation period. There have been some abortive efforts and some that were more productive. What we present here is founded on the ruins of previous systems and we make no pretence that it will endure any longer than they did. This first step we hope will begin a regular series of monographs, each a little better than the last.

In this monograph, we list 43 groups of viruses and the members of the groups. Each group has a short description of the main discriminating characteristics. Under the heading 'Possible members' or 'Probable members' we list viruses about which, for one reason or another, we are uncertain. In some instances this is due to lack of data and in others to a belief that such viruses might eventually be grouped separately.

Each group has a type member which has been selected, usually because of some considerable knowledge of its properties.

As far as possible, we have given cryptograms of the individual viruses listed and group cryptograms. The value of these should be apparent to the virologist looking up a virus with which he is unfamiliar. Plainly, the cryptogram gives limited information, but the profusion of asterisks on these pages illustrates how little we know about most viruses and how much we rely on taxonomic analogy. Clearly, the analogy has to be true.

About half the groups have been given the taxonomic rank of genus and the members of these are properly called species. I believe that we have moved too quickly here, for although it is not essential to a classification that genera should be biologically equivalent categories, equivalence is logical and

helpful to the novice. For example, it is difficult to sustain the heterogeneous genera, *Poxvirus* and *Herpesvirus* if we recognize *Papillomavirus* and *Polyomavirus* as separate genera. Since we have now allowed two families we must expect a number of genera to be promoted to that status in the near future.

A great many names have been devised and nearly as many discarded. There are strict rules (see p.26) governing their formation. To be officially approved, these names have to be agreed by the relevant subcommittee(s), the ECICNV and the ICNV. Where this has been done, the names are shown at the top of each page. Where we have, so far, failed to reach agreement, the proposed names are given in a note at the bottom of the page.

The ECICNV and the ICNV have approved names for type species, which are given as a letter and a numeral. So far, none of these names have been accepted by the relevant subcommittees.

Obviously, many viruses and groups of viruses are missing from these pages. This is not because we have forgotten them and bears no relation to their importance. It is simply that they have not yet emerged from the cumbersome machinery of the ICNV.

Birmingham, 1971

P. WILDY

### Secretary's Report

The International Committee on Nomenclature of Viruses was established as a world wide organization in 1966 and its activities are very much governed by its structure.

The members of the Committee are nominated by the respective national societies of microbiology and are therefore scattered across the globe. They can rarely, if ever, meet in plenary sessions except at the time of other international meetings, such as during the International Microbiology Congresses. The Executive Committee, which undertakes most of the work of the ICNV, suffers from a similar geographical problem, although at a lower level. This latter committee consists of the President and the Vice-President of the ICNV as ex-officio members together with two Permanent Secretaries and eight elected members. The Executive Committee met once (London, 1968) be-



tween the 1966 and 1970 International Congresses, and for the rest the members have worked by correspondence.

The Executive Committee has, in turn, nominated a number of subcommittees or working parties. These groups organize themselves in the best way possible but, usually, are also forced to work by mail. One of the Permanent Secretaries is attached to each of the subcommittees. He has the particular responsibility of ensuring that any recommendations put forward are in accord with the rules of the ICNV.

The work of a subcommittee consists in the preparation of schemes which will permit the grouping and naming of viruses for which it is responsible; these schemes are first submitted to a number of virologists specialized in the respective field and the recommendations are subsequently forwarded to the Executive Committee, which may adopt, modify or reject them. Final approval of any recommendation normally requires ratification by the ICNV in plenary session, but as these are only held every 3 to 4 years, approval may be sought by means of a postal vote. This may be used in the case of motions proposing matters of general interest such as in the case of rules or of advisory notices, or in the case of motions proposing matters of nomenclature, although in the latter situation the system is much more delicate. A further attempt to increase speed was tried in Mexico City in August 1970 during the plenary session: this was to alter the normal order of proceedings by allowing the Executive Committee to discuss new recommendations before the relevant subcommittee had yet had occasion to consider the matter. It was, of course, agreed that any decisions arising from this arrangement would be referred back to the appropriate subcommittee, and would only become acceptable after its explicit approval.

Apart from their contributions to the work of the Executive Committee, the President, the Vice-President and the secretaries ensure liaison between the membership and with the different national and international organizations such as the national microbiological societies (who nominate the members of the ICNV), the International Association of Microbiological Societies (IAMS – who represent the corporate microbiological societies), the International Union of Biological Sciences (IUBS), the Council for International Organizations of Medical Sciences (CIOMS) and, of course, the World Health Organization (WHO). These different bodies have frequently, and often very generously, provided funds for the running expenses of the ICNV. We take this opportunity of thanking them most warmly and sincerely.

Paris, 1971

J. MAURIN