

Molecular biology of RNA phages

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RNA Phages. Edited by Norton D. Zinder. Pp. viii+428. (Cold Spring Harbor Laboratory: Cold Spring Harbor, 1975.) n.p.

RNA Phages is the latest of the Cold Spring Harbor Monograph series and provides 400 pages of endeavour devoted largely to our understanding of the structure, replication, and translation of the phage genome. The RNA phages are among the smallest known viruses and since the techniques for RNA sequence analysis preceded those for DNA, they formed the logical choice for the new art of the sequencer. This emphasis is apparent in many of the contributions and adds a comfortable sense of reality to the descriptions of the various interactions which regulate the replication and translation of the viral RNA.

The fourteen chapters of this book provide a reasonably well balanced selection of current work and interest in this field. Invariably there are some omissions, and some are serious, for example the work of Weissmann *et al.* on the *in vitro* synchronised synthesis of both plus and minus RNA strands; and the extension of such methods in site-directed mutagenesis gets negligible attention. Similarly the important research of Porter *et al.* on the rebinding of Q β initiator fragments to *Escherichia coli* ribosomes fails to get any mention whatever in spite of their particular relevance to the problem of ribosome recognition of initiator regions in phage RNA.

The first chapter provides an authoritative account of the physical properties of RNA phages and their RNAs, and the second contribution reviews the genetic studies which established the presence of three cistrons (complementation groups) in RNA phages.

One of the most informative features contributing to the study of RNA phages is the ability to compare primary RNA sequences with the amino acid sequences of the phage-specified proteins. The third chapter reviews our knowledge in this direction and clearly brings out the value of such work in pin-pointing the initiation triplets, the apparent non-random use of synonymous codons, the location and effects of amber mutations and the

explanation of the 'read through' phenomenon found in phage Q β .

The fourth chapter surveys the physiology of phage attachments and penetration, and makes the point that much remains to be done in understanding these phenomena. Nearly 100 pages in the succeeding four articles are devoted to the replication of phage RNA. This makes fascinating reading and the main impression one is left with is the exquisite adaptation of the replicase complex, which contains both virus- and host-specified proteins, to the selective and controlled replication of the viral RNA. No less interesting is the elaborate control exercised on the translation of the viral RNA and this topic is discussed in the next three chapters. Again it is the level of organisation and sophistication achieved in these, the simplest of phages, which excites the wonder of the reader. The *tour de force* of the book comes in chapter thirteen in which Fiers presents the entire RNA sequence of the A-protein gene of phage MS2 and shows the value of such detail in grappling with the problems of gene organisation.

To complete the picture the morphogenesis of RNA phages, and the fact that *E. coli* is not unique in acting as host to RNA phages, are discussed in two informative contributions.

The clear message of this book is that the molecular biology of RNA phages have much wider implications into the general problems of replication and translational control, and it can be recommended to the student and specialist alike. □

Paracelsian chemistry

M. P. Crosland

The Chemists and The Word: The Didactic Origins of Chemistry. By Owen Hannaway. Pp. xiii+165. (Johns Hopkins University: Baltimore, Maryland and London, November 1975.) £6.50.

WHEN did chemistry emerge as a distinct discipline? Hermes, Tresmegistos, Moses, Aristotle, Jabir, Paracelsus, Boyle, Lavoisier and Liebig have all been candidates with their respective supporters for the title of founder of chemistry. Even if we refuse to take the earlier names in this list seriously we cannot ignore a group of contemporary historians of science who have made great claims for Paracelsus and (more convincingly) for some of his followers. They have argued that the chemical philosophy of the Paracel-

sians in the sixteenth and seventeenth centuries was not only fundamental to the development of chemistry but to science generally. It sought to comprehend all natural phenomena and thus provided an alternative to both the traditional philosophy of Aristotle and the new mechanical philosophy of Descartes. Yet the obscurantism and secrecy of some Paracelsians have hardly helped to support this claim. Their apparently arbitrary use of language made any dialogue with outsiders extremely difficult. Dr Hannaway appreciates the relevance of the Paracelsians but admits that there was an essential difference between their aims and methods and that of a rational science. He therefore attempts a synthesis and tries to pin-point the beginning of the science of chemistry in a reaction to Paracelsianism. His hero is Andreas Libavius who first appears as the enemy of Paracelsian chemistry, seen as a "counter-culture". But it was the same Libavius who became the propagandist for a new chemistry, presented in a systematic and logical form.

A full discussion of the various strands of Paracelsianism would require a book of massive proportions and we can accept the author's decision to focus on one writer, Oswald Croll, as a representative of the Paracelsian school. This choice enables him to expose some of the deficiencies of the Paracelsians and to contrast their approach with that of Libavius. Hannaway suggests that chemistry emerged not so much from Paracelsian alchemy as from a more positivistic attitude of those who tried to present a new and rational science in textbook form. This is a plausible argument but the author goes further in claiming that the writing of one particular textbook, the *Alchemia* (1597) of Libavius constituted the "invention" of chemistry. It is easier to interpret the role of textbooks in science as providing a consolidation of a new approach rather than the main instrument of a "scientific revolution", and a detailed discussion of Ramism is included to help support this argument.

I would like to be able to recommend the book to any working chemist who felt that the didactic origins of his subject were worthy of some consideration. It would be fairer, however, to recommend the book rather as a contribution to the intellectual history of the sixteenth century. With its detailed textual analysis it is more a book for the specialist. Readers may not be convinced that the work of Libavius alone marked the beginning of 'real' chemistry but the discussion provides a persuasive reminder of the metaphysical and religious context of the emergence of early modern science. □