

Contents in brief

- I. Genes and chromosomes are accessory structures**
 1. The gene is not so important
 2. The chromosome is not such an important structure either
 3. A chromosome theory has not been available
- II. Molecular recognition leads to self-assembly**
 4. Protein-nucleic acid interaction and the importance of molecular recognition
 5. Symmetry in DNA, protein and RNA, and its functional implications
 6. Self-assembly is the basic determinant of molecular, chromosomal and organism organization
- III. Evading randomness and selection**
 7. How the chromosome evades randomness. The uniqueness of the chromosome molecules
 8. How the chromosome evades selection
- IV. From the carbon atom to the simplest chromosomes**
 9. Atomic and molecular history of DNA, RNA and protein
 10. The establishment of the first genes
 11. The simplest chromosomes. Chromosomes of viroids, plasmids, viruses and bacteria
- V. The formation of the eukaryotic cell and its chromosomes**
 12. Formation and evolution of the eukaryotic cell
 13. The evolution of DNA content
 14. Eukaryotic chromosomes: mitochondrial and chloroplast chromosomes
 15. The organization of the nuclear gene. The split gene
 16. The organization of the nuclear chromosome. The chromosome field

VI. Polarity and gene clustering

17. Polarity from the DNA molecule to the chromosome arm
18. Gene clustering in viruses, bacteria and fungi
19. Gene clustering from flowering plants to humans

VII. Processes of directing expression, mutation and rearrangements

20. One way of introducing order into mutations and rearrangements. Episomes and transposons
21. The introduction of order into expression and mutation. Controlling elements in eukaryotes
22. Position effects are key phenomena for understanding chromosome organization
23. Genetic changes directed by position effects in insects, plants and mammals
24. Position effects at the molecular level

VIII. Other processes of directing rearrangements

25. Diminution is a form of directed chromosome rearrangements
26. Confrontation between DNAs and between chromosomes. Recognition, marking and elimination

IX. Interactions between chromosomes and between specialized chromosome regions

27. Experimental demonstration of interactions between chromosomes. Interchromosomal effects
28. The organization of the centromere
29. Interactions between centromeres
30. Organization and function of telomeres
31. Interactions within and between chromosomes involving mainly the centromere and telomeres

X. The plasticity of the chromosome

32. Structural plasticity. The drastic changes in chromosome phenotype
33. Genetic plasticity. The equipotentiality of the chromosome
34. Genetic activity and plasticity of heterochromatin
35. Molecular plasticity. The multiplicity of DNA sequences
36. The relationship between chromomeres and operational units

XI. Molecular direction in development

37. Genes and molecular events responsible for the meiotic programme
38. How the organism evades selection. The molecular determination of development
39. The simplicity of the mechanisms involved in development
40. How to produce a human with three chromosomes and 1000 primary genes

XII. Physical determinism in evolution

41. The three abused concepts. Mechanics, randomness and selection
42. How the species evades selection
43. The evolution of poverty
44. Emerging principles of physical determinism in evolution

References

Subject index