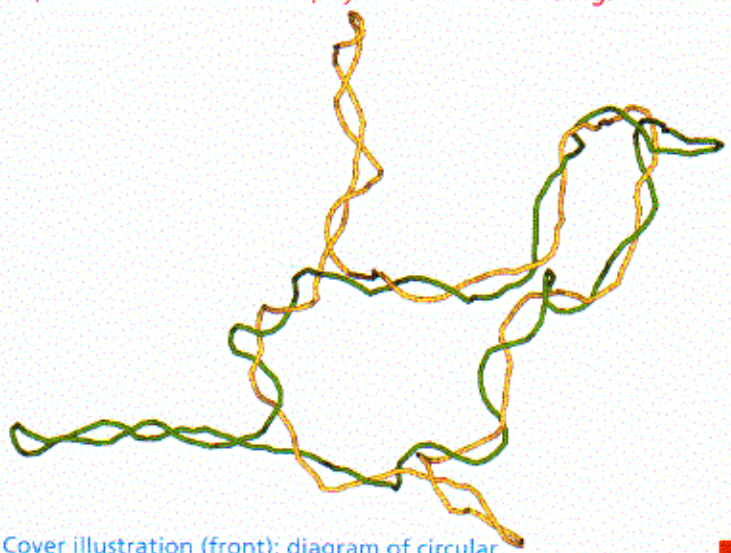
Surveying the last 60 years of research, this book describes the physical properties of DNA in the context of its biological functioning. It is designed to enable both students and researchers of molecular biology, biochemistry and physics to better understand the biophysics of DNA, addressing key questions and facilitating further research.

The chapters integrate theoretical and experimental approaches, emphasizing throughout the importance of a quantitative knowledge of physical properties in building and analyzing models of DNA functioning. For example, the book shows how the relationship between DNA mechanical properties and the sequence specificity of DNA–protein binding can be analyzed quantitatively by using our current knowledge of the physical and structural properties of DNA. Theoretical models and experimental methods in the field are critically considered to enable the reader to engage effectively with the current scientific literature on the physical properties of DNA.

Alexander Vologodskii began his research career as a theorist, pioneering theoretical studies of knots and links in circular DNA and designing statistical mechanical models and computational methods to predict the appearance of alternative structures in supercoiled DNA. He later ran a research laboratory at New York University, where he made important contributions to topics related to DNA topology and supercoiling, DNA topoisomerases and the physics of DNA bending.



Cover illustration (front): diagram of circular DNA; (back): a conformation of negatively supercoiled DNA catenanes. Such catenanes appear at the final phase of DNA replication. Images courtesy of the author.

Cover designed by Zoe Naylor

CAMBRIDGE
UNIVERSITY PRESS
www.cambridge.org

ISBN 978-1-107-03493-8