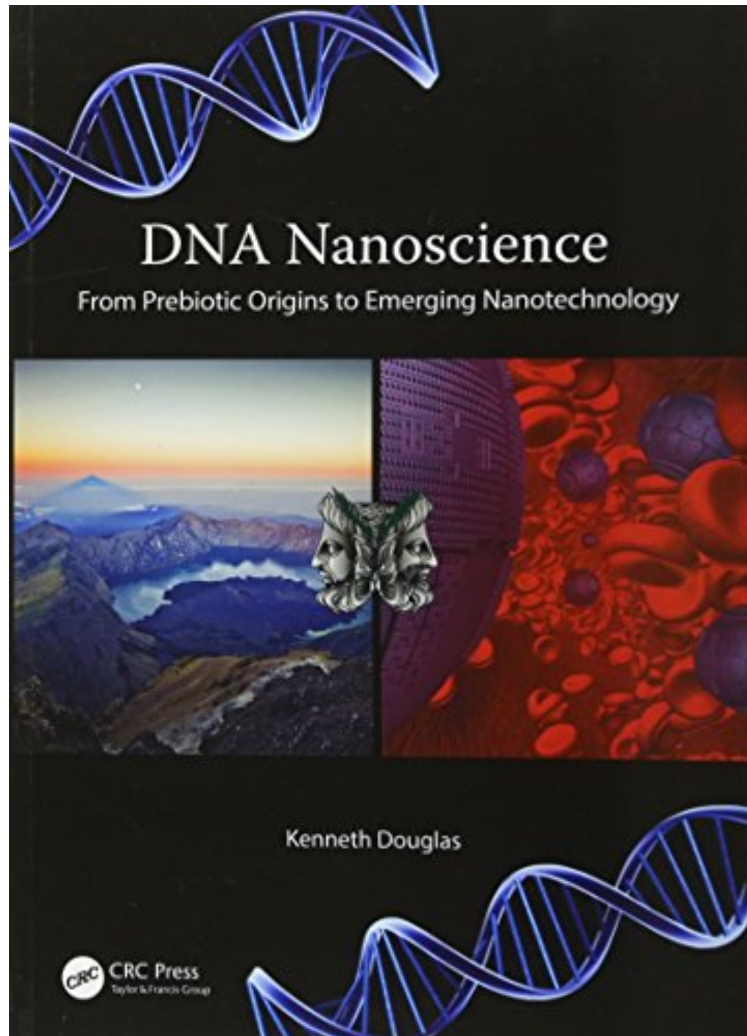


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DNA Nanoscience: From Prebiotic Origins to Emerging Nanotechnology

Kenneth Douglas

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Kenneth Douglas : DNA Nanoscience: From Prebiotic Origins to Emerging Nanotechnology before purchasing it in order to gauge whether or not it would be worth my time, and all praised DNA Nanoscience: From Prebiotic Origins to Emerging Nanotechnology:

4 of 4 people found the following review helpful. Science, cracks in the glass ceiling, and human drama - a MUST read!By WRJBooksWhen I bought this book on I wasn't quite sure what I would find most interesting. I knew from looking at the material online that it covered a lot of ground. The author makes the two main topics, DNA origins and DNA nanotechnology, clear right from the first chapter. He also states in the introduction that the human stories of the scientists will be told. As I read I became more and more intrigued by the human stories. And also the stories within

the stories. There are many of these and I thought they had just the right amount of detail to be appropriate. In the introductory liquid crystals chapter the story of Agnes Pockels was amazing. I learned about an unsung scientific heroine and was also reminded about the inequality of opportunity that existed almost 150 years ago. And the Pockels story was really a story within a story within a story. Her contribution came out in the discussion of the experiments of Gorter and Grendel where there were offsetting experimental errors and then their results were ignored for decades. And both the Pockels and the Gorter and Grendel segments were contained in the explanation of how every single cell is enclosed by a type of liquid crystal. I had no idea that liquid crystals were everywhere and I learned two fascinating human stories into the bargain. There were lots of these types of pieces and I didn't find them a distraction at all. They added color for me. Sometimes they really surprised me and caught me unawares. I won't spoil the read for others but this happens dramatically at the end of the first chapter of the last part of the book. All of a sudden, after reading about the science for section after section you're brought up short by the fact that real people are doing the science and sometimes "real life" trumps the science. It was a shock. In the case of this scientist, she was featured at the very beginning of the chapter so you got to know her a little, and then wham. 3 of 3 people found the following review helpful. DNAs ancient past and its future as a construction tool may rest on the same basic principle. By Paul J. Kiell

When I was in medical school (ironically Chicago Medical School, which is now part of Rosalind Franklin University) the age of molecular biology was just taking shape. The nucleic acids DNA and RNA were mentioned in my biochemistry class, but they were almost a side issue! When I saw this book on and the editorial reviews that praised its down-to-earth style, I hoped this would be a chance for a self-taught class in Continuing Education with a broad sweep. I was right. In Part I of the book I relearned the rudiments of DNA. I learned how DNA is sequenced and synthesized and I became familiar with the technique of gel electrophoresis where charged molecules of different sizes are separated when they travel through a porous material driven by an electric field. I also learned about spherical nucleic acids (SNAs) nanoparticles with an inert core covered with DNA (or RNA) strands. SNAs are powerful nucleic acid detectors that can rapidly find deadly viruses and bacteria in blood samples without the need for time-consuming culturing of the microorganisms. And they've shown the potential to silence cancer genes and even eliminate tumors in some cases. In Part II I was immersed in a field that wasn't even born when I was in medical school: DNA nanotechnology. The fact that the founder of the field, Nadrian Seeman, is a very quotable character added to the fun of learning how interdisciplinary scientists with a strong knowledge of computer programming as well as biochemistry are using DNA to make objects and gadgets on the scale of proteins. And it's fascinating to learn of the molecular motors and other biomolecules in our body that serve as the inspiration for many of these synthesized bio-machines. Part III drew me into a new and unusual proposal for how nucleic acids originated. While I found some of the details of this work challenging to follow, the gist is that the origin of nucleic acids is written in their structure. So as the phenomenon of the base pairing of A with T and C with G (somehow) developed, this enabled the formation of longer and longer strings of base pairs and hence more complex biomolecules, including the nucleic acids capable of storing information and reproducing themselves. The point is repeatedly made throughout the book that the phenomenon of selective base pairing is at the heart of both this novel origins proposal and also the practice of DNA nanotechnology. I don't know if this origins proposal is the correct explanation for how life got started, but if it is I find it very satisfying that both DNAs ancient past and the future of DNA as a construction tool rest on the same basic (excuse the word play) principle. Respectfully submitted, Paul J. Kiell, M.D. 3 of 3 people found the following review helpful. Douglass book is very comprehensive and he went to great length to provide visual explanation to concepts that are ...

By Customer I am very interested in natural sciences and the book was brought to my attention through a friend. Nano science in particular holds tremendous promise, from the medical field to other technologies. This book deals with the basics of life the DNA that all living organisms share and which unfolds on the smallest of scales. I was intrigued by the cover with the head of Janus, the two faced god, looking both into the past and into the future. Life as we know it started on a nano scale and that same scale may hold tremendous promise to cure all kinds of diseases. We are awed by the vastness of space, but we should equally be awed when we go the opposite directions into the world of nano particles. It's a universe all by itself. Dr. Douglass book is very comprehensive and he went to great length to provide visual explanation to concepts that are sometimes difficult to understand when we just read text. Many of the pictures are stunningly beautiful and I could tell that the author went to great length to select them. At times, the book is like a crime novel, unearthing evidence which leads to other evidence which finally leads to the culprit. It is helpful to have at least a rudimentary science background, but with enough curiosity, even a non science reader can find his or her way around and understand the most basic building blocks of life. At the end of the book is an extremely useful dictionary of the scientific terms used in the book, all explained in easy to understand English. This book is an excellent read, for both laymen and those with a scientific background. It's the most comprehensive book on that topic that I am aware of.

DNA Nanoscience: From Prebiotic Origins to Emerging Nanotechnology melds two tales of DNA. One is a look at the first 35 years of DNA nanotechnology to better appreciate what lies ahead in this emerging field. The other story looks back 4 billion years to the possible origins of DNA which are shrouded in mystery. The book is divided into three

parts comprised of 15 chapters and two Brief Interludes. Part I includes subjects underpinning the book such as a primer on DNA, the broader discipline of nanoscience, and experimental tools used by the principals in the narrative. Part II examines the field of structural DNA nanotechnology, founded by biochemist/crystallographer Nadrian Seeman, that uses DNA as a construction material for nanoscale structures and devices, rather than as a genetic material. Part III looks at the work of physicists Noel Clark and Tommaso Bellini who found that short DNA (nanoDNA) forms liquid crystals that act as a structural gatekeeper, orchestrating a series of self-assembly processes using nanoDNA. This led to an explanation of the polymeric structure of DNA and of how life may have emerged from the prebiotic clutter.

DNA Nanoscience takes us on a journey into the future, where sub-microscopic gadgets built from DNA may be used to detect specific molecules one-at-a-time or to deliver therapeutic drugs specifically to cancer cells. Looking in the other direction, the journey takes us back 4 billion years to a time when the self-organization of DNA into liquid crystals may have facilitated the reproduction of what would become our genetic material, arguably the key step in the origin of life. DNA Nanoscience is scholarly and full of technical figures. But the science is accompanied by clear explanations that make it accessible to college student and science-savvy citizens. It is a pleasure to find a book that is so true to the science while being so enjoyable to read. Thomas R. Cech Distinguished Professor, University of Colorado-Boulder; Director, BioFrontiers Institute; Nobel Laureate (Chemistry 1989). Douglas DNA Nanoscience is something of a miracle. Stuart Kauffman Emeritus Professor Biochemistry and Biophysics, University of Pennsylvania; Affiliate Professor, The Institute for Systems Biology, Seattle; Author of *At Home in the Universe*. This book changed my life. Every seven years, as my sabbatical approaches, I search about for a new direction to focus my research and Ken Douglas book, *DNA Nanoscience*, appeared just in time. Seth Fraden Professor of Physics; Director, The Bioinspired Soft Materials Center, Brandeis University. Instructive like a textbook and exciting like a novel! For everybody interested in modern natural sciences, this book is a must to read. Andreas Herrmann Professor of Polymer Chemistry and Bioengineering; Chair of the Board, The Zernike Institute for Advanced Materials; University of Groningen, The Netherlands. To sum up, this is both a lively and profound book, the reading of which I strongly recommend. Jacques Prost Director Emeritus of CNRS (Le Centre national de la recherche scientifique) at Institut Curie, Paris; Distinguished Professor, National University of Singapore. This book tells a fascinating new story about DNA. The subject matter also stretches as needed into biology to teach basic ideas about cell membranes and metabolism. It provides a wonderful taste of DNA nanoscience at the research frontier. Arjun G. Yodh James M. Skinner Professor of Science, Endowed Chair; Director, PENN Laboratory for Research on the Structure of Matter, University of Pennsylvania. The only way that the general public will continue to trust the proclamation of the scientific establishment is through books like this one where the foibles and fears and eccentricities of the scientists are shown to be the same as those of the artist, musician and businessman. Scientists are just artists who want to work with mother nature, without the freedom to make up new worlds as we go along. The real world is magical enough for them. Joseph A. Zasadzinski 3M Harry Heltzer Chair in Multidisciplinary Science and Technology; Chemical Engineering and Materials Science, University of Minnesota. 'The books eclectic and elaborate vision, looking back to the ancient past and forward to the equally unknowable future sets Douglas DNA Nanoscience apart from other attempts to present DNA nanoscience.... Written in beautiful prose and richly illustrated with over 200 full-color figures ... it also serves as a birds-eye survey for a more general readership, viz., for those in the public who are curious and enjoy thinking. These citizens are aware of DNA nanoscience snippets making it into the daily news but would like to acquire a deeper, more meaningful and thorough understanding of what the fuss is all about. Douglas book *DNA Nanoscience: From Prebiotic Origins to Emerging Nanotechnology* covers an astoundingly broad ground.... By writing this book on the emerging field of DNA nanoscience Kenneth Douglas has thus done a double service to science as well as to its public image. I believe that the reception of the book will do justice to the meticulous research and artistry of this tome.' Rudolf Podgornik (Joef Stefan Institute) *Journal of Biological Physics* (August 2016), DOI: 10.1007/s10867-016-9425-4. About the Author Kenneth Douglas is a member of the Research Faculty in the Department of Physics at the University of Colorado-Boulder. He received his B.A. (mathematics) and M.S. (physics) at the University of Chicago and his Ph.D. (physics) at the University of Colorado-Boulder. His area of specialization is biomimetic nanofabrication. He devised a strategy that employs the surface layers of bacterial extremophiles e.g., *Sulfolobus acidocaldarius* as masks to fabricate nanoscale periodic patterns on inorganic substrates. He is co-inventor of the first-ever U.S. patents for parallel fabrication of nanoscale multi-device structures. His work has appeared in *Science*, *Nature*, *Biophysical Journal*, *Applied Physics Letters*, *Physical B*, *Surface Science*, *FEMS Microbiology s*, *Journal of Applied Physics*, *Popular Science* and elsewhere. Douglas has authored multiple book chapters and seven U.S. patents.