Double Helix Essay, Research Paper

Double HelixA review of Watson, James D. The Double Helix. New York: Atheneum, 1968. James Watson’s account of the events that led to the discovery of the structure of deoxyribose nucleic acid (DNA) is a very witty narrative, and shines light on the nature of scientists. Watson describes the many key events that led to the eventual discovery of the structure of DNA in a scientific manner, while including many experiences in his life that happened at the same time which really have no great significant impact on the discovery of the DNA structure. The Double Helix begins with a brief description of some of the individuals that played a significant role in the discovery of DNA structure. Francis Crick is the one individual that may have influenced Watson the most in the discovery. Crick seemed to be a loud and out spoken man. He never was afraid to express his opinion or suggestions to others. Watson appreciated Crick for this outspoken nature, while others could not bear Crick because of this nature. Maurice Wilkins was a much calmer and quieter man that worked in London at King’s College. Wilkins was the initial person that excited Watson on DNA research. Wilkins had an assistant, Rosalind Franklin (also known as Rosy). Initially, Wilkins thought that Rosy was supposed to be his assistant in researching the structure of DNA because of her expertise in crystallography; however, Rosy did not want to be thought of as anybody’s assistant and let her feelings be known to others. Throughout the book there is a drama between Wilkins and Rosy, a drama for the struggle of power between the two. Watson’s “adventure” begins when he receives a grant to leave the United States and go to Copenhagen to do his postdoctoral work with a biochemist named Herman Kalckar. Watson found that studying biochemistry was not as exciting as he hoped it would be; fortunately, he met up with Ole Maaloe, another scientist doing research on phages (Watson studied phages intensively while in graduate school). He found himself helping Ole with many of his experiments and soon he was helping Ole with his experiments more than he was helping Herman with his experiments. At first, Watson felt like he was deceiving the board of trustees by not studying the material that the board sent him to study. However, Watson felt justified because Herman was becoming less and less interested in teaching Watson because of Herman’s current personal affairs (Herman and his wife decided to get a divorce). With Herman’s lack of interest in teaching biochemistry, Watson found himself spending the majority of the day working with Ole on his experiments. While in Copenhagen, Herman suggested that Watson go on a spring trip to the Zoological station at Naples. It was in Naples that Watson first met Wilkins. It was also in Naples that Watson first became excited about X-ray work on DNA. The spark that ignited Wilkins’ fire was a small scientific meeting on the structures of the large molecules found in living cells. Watson had always been interested in DNA ever since he was a senior in college. Now that he learned of some new research on how to study DNA, he had the craving to discover the structure of the mysterious molecule that he believed to be the “stuff of life”. Watson never had the chance to discuss DNA with Wilkins that spring; however, that did not kill Watson’s desire to learn about its structure. Watson’s fire was further kindled by Linus Pauling, an incredibly intelligent scientist out of Cal Tech. Pauling had partly solved the structure of proteins. He discovered that proteins have an alpha-helical shape. Watson thought this was an incredible discovery! He was excited to research and learn about the DNA structure. Watson was worried about where he could learn more about DNA and how to solve X- ray diffraction pictures so the structure of DNA could be understood. He knew he could not do this at Cal Tech with Pauling because Pauling was too great a man to waste time with Watson and Wilkins continually put Watson off. Soon Watson became aware that Cambridge was the place he could get experience to solve the DNA problem. It was about this time that Watson’s grant was about to expire. He decided to write Washington and request that his grant be renewed, continuing his studies in Cambridge rather than Copenhagen. Thinking that Washington would not deny his request, Watson packed up and went to Cambridge. He worked several months in Cambridge when finally he received a return letter from Washington. The letter stated that his grant would not be continued. Nevertheless, Watson decided to remain in Cambridge and continue his stimulating intellectual experience. It was in Cambridge that Watson first met Francis Crick. Here, Watson discovered the fun of talking to Crick. In addition, Watson was elated that he found someone in the lab that thought DNA was more important than proteins. Soon Watson and Crick found themselves having a daily lunch break together discussing many scientific topics, in particular, the unique aspects of DNA. As reports came to Watson and Crick about Paulings efforts to discover the structure of DNA, they began to feel pressure to discover the structure before Pauling did. However, Watson and Crick were at a disadvantage because they did not have access to some valuable research done by Wilkins and Rosy. This did not discourage Watson and Crick. With the limited information they had, they began to riddle over the possible structures of DNA. So far all the evidence they had (and also their intuition) indicated that DNA was a helical structure like proteins with either one, two, or three strands. Pauling was able to discover the alpha-helix by fiddling with models; by trial and error he came up with the correct structure. Watson and Crick decided to try model building as a method of solving the structure of DNA.

Over a period of weeks to months, Watson and Crick fumbled around with DNA models. All did not go smoothly. One of the difficulties was that Watson and Crick did not have all the materials available to construct a model with the inorganic ions like DNA. With some manipulation of on-hand material they were able to create a model to their liking. Watson and Crick had constructed a beautiful three chain helix representing DNA. The next obvious step would be to check the parameters with Rosy’s quantitative measurements. To their knowledge the model would certainly fit the general locations of the X-ray reflections. Upon completion, Watson and Crick were ecstatic about their accomplishment. To be the first to discover the structure of such an important molecule like DNA was going to make a major impact in the world. A phone call was made to Wilkins asking that he come to Cambridge to view the model and issue his opinion on its validity. The next day both Wilkins and Rosy came to Cambridge to view the model. Watson and Crick had their presentations prepared. They planned to dazzle their audience as they explained how they solved the complexity of the DNA structure. As their discussion went forth, Wilkins was skeptical on many aspects of the model. Rosy was completely dissatisfied with the model, especially with the fact that the model had Mg++ ions holding together the phosphate groups of the three-chain model. She noted that the Mg++ ions would be surrounded by tight shells of water molecules which contradicted the results she had gained on the water content of DNA molecules from her experiments. The rest of the day was spent trying to salvage what little argument Watson and Crick had. Over lunch was no success, neither did they prevail when they returned to the lab. Soon the day was over and Wilkins and Rosy returned to London. When Watson and Crick’s supervisors heard of the failure with the model, they ruled that no further research would be done at Cambridge on DNA. For over a year Watson and Crick let DNA alone, only to be pondered upon while not working on other projects. That year Watson worked on researching the tobacco mosaic virus (TMV). A vital component to TMV was the nucleic acid, so it was the perfect front to mask his continued interest in DNA. Over time and hard work, Watson was able to show that some parts of TMV were helical in shape and thus decided to return to work on the structure of DNA. With more knowledge and expertise the research went forward with passion. Watson had seen an X-ray picture taken by Rosy that to him gave sure evidence that DNA was helical. Wilkins data only furthered his conviction. Watson and Crick were back at it again with a new fervor. They knew that there was a sugar phosphate backbone to the structure and it was held together somehow by the nucleic acids (adenine, thymine, cytosine, and guanine). Watson had a hunch that the shape was going to be a double helix. At first Watson thought the two backbones were held together by a like-with-like structure (adenine-adenine, thymine-thymine, etc.) holding the nucleic acids together with a hydrogen bonds. After about a day Watson realized that a like- with-like structure just was not possible. Watson knew that the amounts of adenine always equaled thymine and amounts of cytosine equaled guanine. With the help of Crick, they tried to construct a model by pairing adenine with thymine and guanine with cytosine. This fell together very nicely. After obtaining several opinions on the validity of their work they placed a call to Wilkins. Wilkins and Rosy came down and to the surprise of Watson and Crick, Wilkins and Rosy were immediately pleased with the model. After comparing results and measuring the model they decided that Wilkins and Rosy would publish a paper at the same time Watson and Crick published their paper, announcing their discovery. This was indeed an incredible discovery for the world, especially for the world of biology. The structure for the “stuff of life” was finally discovered. Watson and Crick went on to win the Nobel Prize for their work. Pauling who had worked so hard to discover the structure was not disgruntled by the fact that someone had beaten him to the discovery, but rather pleased that the problem was finally solved. Everyone was enthusiastic about the new discovery. This was excellent reading. Watson not only told the story of how the structure of DNA was discovered but he also let us in on the developments of parts of his personal life. He would speak of how he tried to have dinners at a school that was teaching young, pretty French girls English. He also spoke much of his relationship with Crick and Crick’s wife, Odile. He made the book come alive and science seem more fun, breaking the stereotype of the scientist. I especially enjoyed how he described Rosy and her firm dedicated feministic attitude. The reader could feel sympathy for the tribulations Wilkins had to go through working with her. The book was an excellent account of the discovery of the structure of DNA. Throughout the text, Watson mostly eluded to the greatness of others rather than to his own greatness. Even though he played probably the most significant part in the discovery of DNA’s structure he gave credit to those that have inspired him.