

Siddhartha Mukherjee

The Gene: An Intimate History



The #1 NY TIMES Bestseller A New York Times Notable Publication A Washington Post and Seattle Occasions Best Reserve of the entire year From the Pulitzer Prize- (Milwaukee Journal-Sentinel), The Gene is the revelatory and magisterial history of a scientific idea arriving at life, the most important science of our time, intimately described by a master. a remarkable background of the gene and "a magisterial account of how human minds possess laboriously, ingeniously picked apart what makes us tick" (Elle). In this biography Mukherjee brings to life the quest to understand individual heredity and its own surprising impact on our lives, personalities, identities, fates, and choices. "Siddhartha Mukherjee dazzled readers along with his Pulitzer Prize-winning The Emperor of All Maladies this year 2010. That accomplishment was evidently only a warm-up for his virtuoso overall performance in The Gene: A ROMANTIC History, in which he braids science, background, and memoir into an epic with all the current range and biblical thunder of Paradise Shed" (The Washington Post)."Dr.Mukherjee expresses abstract intellectual suggestions through emotional stories...s own family- (THE BRAND NEW York Moments).from Aristotle and Pythagoras to Mendel and Darwin, from Boveri and Morgan to Crick, Watson and Franklin, completely the revolutionary twenty-first century innovators who mapped the human genome.[and] swaddles his medical rigor with rhapsodic tenderness, amazing vulnerability, and occasional flashes of genuine poetry" using its tragic and bewildering history of mental illness-reminds us of the questions that hangover our ability to translate the science of genetics from the laboratory to real life. In riveting and dramatic prose, he describes the centuries of analysis and experimentation— Throughout, the story of Mukherjee' "A remarkable and often sobering history of how humans found understand the roles of genes to make us who we are—and what our manipulation of those genes might mean for our future"winning writer of The Emperor of All Maladies— "The Gene is a book most of us should read" (USA TODAY).



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"We used to believe our upcoming was in the superstars. Now we realize it's in our genes." Genetics is humanity and existence writ large, which book on the gene by doctor and article writer Siddhartha Mukherjee paints on a canvas as large as existence itself. It handles both the background of genetics and its applications in health and disease. It displays us that learning the gene not merely keeps the potential to transform the treating human disease also to feed the globe's burgeoning populace, but promises to provide a window into life's deepest secrets and into our very identity as humans." The gene may be the ultimate key of this kind, and Mukherjee's publication explores its okay contours in all their glory and tragedy. The book devotes a great deal of space to this foundation and will so with verve and authority. The volume ends by contemplating some philosophical questions: What are the moral and societal implications to be able to engineer genomes even in the fetal stage? The tale begins with a trip to an asylum to see his troubled cousin; two of his uncles have also suffered from several "unravelings of the mind". While such illnesses have obvious genetic determinants, as Mukherjee expounds upon at length, genetic causes for diseases like tumor, diabetes and specifically the mental disease which plagues members of the writer's family members are woefully illunderstood, largely because they are multifactorial and have problems with weakly correlated markers. The book can roughly be divided into two parts. The first part is usually a sweeping and vivid history of genetics. The second half is normally a meditation on what studying the gene opportinity for human biology and medication. The account is pretty much chronological and this approach naturally serves the historical portion well. Mukherjee will a commendable job shedding light on the signal traditional achievements of the men and women who deciphered the trick of life. Kicking faraway from the Greeks' nebulous but intriguing concepts on heredity, the reserve settles on the genetics pioneer Gregor Mendel. Mendel was an abbot in a little known city in Central European countries whose pioneering experiments on pea vegetation provided the first home window in to the gene and development. The same crucial opens the gates of hell. Mukherjee's discussion of the HGP focuses primarily on the rivalries between the scientists and the competing initiatives led by Francis Collins of the NIH and Craig Venter, the maverick scientist who broke off and started his own company. Rather, a triumvirate of scientists rediscovered Mendel's work nearly thirty years after his death and spread the term all over. Mendel's work displays us that genius can emerge from the most unlikely quarters; There are a few minimal scientific infelicities: for example Linus Pauling's structure of DNA had not been really flawed because of a insufficient magnesium ions but due to the fact it sported a kind of the phosphate groups that wouldn't can be found at the marginally alkaline pH of the body. however I would have valued a fuller account of Friedrich Miescher who discovered DNA in pus bandages from soldiers. Galton was the father of eugenics. Addititionally there is an important foray into using genetics to understand embryology and human advancement, a topic with ponderous implications for our potential. I'm now deep into "The Gene" (book and audio). That said, a remarkable publication in all respects. We have quite a distance to go prior to the majority of human diseases could be treated using gene-structured treatment. Eugenics was enthusiastically backed in the usa; Mukherjee discusses the infamous Supreme Courtroom case where Oliver Wendell Holmes sanctioned the forced sterilization of an unfortunate woman named Carrie Buck by proclaiming, "Three generations of imbeciles are plenty of". It talks about early attempts to sequence the gene at Harvard and Cambridge and describes the founding of Genentech, the first company to exploit the new technology which pioneered many uses of genes for creating drugs and hormones: much of this important function was finished with phages, viruses which infect bacteria. General I came across "The

Gene: An Intimate History" to end up being beautifully written with a literary flair, and in spite of the omissions, the parts of genetic background and medicine which it can discuss are essential and instructive. The horrific racial depredations of the Nazis which the narrative documents in a few detail of training course "put the ultimate mark of shame" on eugenics. A notable portion of the reserve is devoted to the latest discovery that Neanderthals and human beings probably interbred. Morgan and his co-workers found a potent device to review gene propagation in normally happening mutations. Mutations in particular genes (for example ones causing changes in attention color) allowed them to track the flow of genetic material through several generations. Genetics is coupled with nanotechnology, cryonics, robotics etc by many fantasizers to come up with even more fanciful theories. Mukherjee also has an eye for historic detail; for example, right at that time that Morgan was experimenting on flies, Russia was experimenting with a bloody revolution. This coincidence provides Mukherjee an opening to go over hemophilia in the Russian royal family members - a genetically inherited disease. A parallel discussion discusses the fusion of Darwin's and Mendel's tips by Ronald Fisher, Theodosius Dobzhansky and others into a modern theory of genetics supported by statistical reasoning in the 40s – what's called the present day Synthesis. Morgan and others' work paved the best way to recognizing that the gene isn't just some abstract, ether-like ghost which transmits itself in to the next era but a material entity. That materials entity was known as DNA. The scientists most important for recognizing this truth had been Frederick Griffiths and Oswald Avery and Mukherjee tells their tale well; The baton of the gene was following found by Francis Galton, Darwin's cousin. Griffiths demonstrated that DNA could be in charge of converting non-virulent bacterias to virulent ones; A lot more than you think This is not only a story about genetics additionally it is a tale about eugenics and the horrible way this knowledge, from Darwin to provide, has been used to justify horrendous acts. It's a WONDERFUL read, written in a style that exquisitely details not only the science, however the character of the scientists along with the zeitgeist of that time period. Many of these pioneers were inspired by a little book by physicist Erwin Schrodinger which argued that the gene could be understood using precise concepts of physics and chemistry; his arguments switched biology into a reductionist technology. Mukherjee's accounts of the seminal discovery is sharp and vivid. He papers Franklin's struggles and unfair treatment and also Watson and Crick's do-what-it-takes attitude to use all possible info to crack the DNA puzzle. As a female in a guy's establishment Franklin was in turn patronized and sidelined, but unlike Watson and Crick she was averse to building models and applying the concepts of chemistry to the problem, two traits which were essential to the duo's success. The main thread pursuing from DNA to proteins was the cracking of the genetic code which specifies a correspondence between nucleotides on a gene and the proteins of a protein: the guiding philosophers in this effort were Francis Crick and Sydney Brenner. I really like that the writer discusses not only the science, but the social and policy consequences of genetics. Each one of these developments laid the foundation for our modern era of genetic engineering. While there is ample description of the science, the focus is actually on the brilliant human beings who made it all feasible. Another misuse of genetics was by Trofim Lysenko who tried to use Lamarck's theories of obtained features in doomed agricultural campaigns in Stalinist Russia; Eugenics has now acquired a bad reputation, but Galton was a polymath who made important contributions to technology by introducing figures and measurements in the analysis of genetic variations. With the new technology also emerged new moral problems, as exemplified by the 1975 Asilomar conference which tried to hammer out agreements for the accountable usage of genetic engineering. I am pleased Mukherjee

emphasizes these occasions, since their importance will still only grow as genetic technology becomes even more widespread and accessible. Likewise, information on cutting-edge sequencing techniques which have outpaced Moore's Legislation are also generally omitted. From the notions of introns and exons to the polygenic character of all phenotypes, the responses from environment to gene mutation and the substantial role played by non-gene elements in most our characteristics, the author uncovers an astounding number of interesting findings in a highly understandable manner. Darwin came tantalizingly near discovering Mendel's ideas (the two had been contemporaries), but inheritance was mostly of the things he got incorrect. This discussion is somewhat brief but it culminates in the announcement of the map of the human being genome at the White Home in 2000. The author's biggest success is in weaving a beautiful narrative. we still need to understand what the parts mean. Part of that lake of ignorance was uncovered by the discovery of so-called 'epigenetic' elements that modify not the essential sequence of DNA but the way it's expressed. Epigenetics can be an as however ill-understood mixture of gene and environment which the book describes in some detail. It's worthy of noting that Mukherjee's debate of epigenetics has confronted some criticism lately, especially predicated on his article on the topic in the New Yorker. this experiment which very elegantly illuminated the central feature of DNA replication offers been called "the most gorgeous experiment in biology". The writer could possess added a chapter or two to go over gene therapy and additional recent experiments to total the excellent work further. Mukherjee specifically has an excellent account of Nancy Wexler, the discoverer of the gene causing Huntington's disease, whose seek out its origins led her to households stricken with the malady in remote control parts of Venezuela. This burden of personal inheritance pieces the stage for many of the queries about character, nurture and destiny asked in the web pages that follow. Unfortunately their ideas fed into the unfortunate history of eugenics in America and European countries. In its latter fifty percent the reserve also describes tries to link genes to homosexuality, race, IQ, temperament and gender identity. Finally, a new technology called CRISPR which has taken the globe of research by storm gets an honorary mention: by promising to edit and propagate genes with unprecedented precision - also in the germ collection - CRISPR provides resurrected all the angels and demons from the annals of genetics. More study is clearly needed. The last section of the book focuses on some cutting edge research on genetics that's uncovering both potent tools for precise gene engineering and also deep insights into individual evolution. The book then moves on to Thomas Hunt Morgan's extremely important experiments on fruit flies. Transgenic organisms, stem cells and gene therapy also get yourself a healthy review, and the writer talks about successes and failures in these areas (an account of a gene therapy trial gone wrong can be poignant and rattling) as well as ethical and political questions which they raise. The essential verdict is that while there is unquestionably a genetic element of each one of these factors, the complicated interplay between genes and environment implies that it's very hard currently to tease aside influences from the two. What we decide about systems like CRISPR today will effect what our children perform tomorrow. The clock is ticking. In a task as ambitious as this there are bound to be always a few gaps. Gene is a must-read history reserve on genetics. one wonders how rapidly his work might have been disseminated got the Internet been with us. The reserve's treatment of the genetic code leaves out some key exciting moments, such as whenever a scientific bombshell from biochemist Marshall Nirenberg disrupted a significant meeting in the previous Soviet Union. I also kept wondering how any debate of DNA's history could omit the well-known Meselson-Stahl experiment; The book then discusses early successes in correlating

genes with illness that came with the advent of the human genome and epigenome; Likewise I could see no reference to Barbara McClintock whose experiments on 'jumping genes' were critical in focusing on how genes can end up being fired up and off. I was also amazed to find few details on a technique called PCR without which modern genetic research will be virtually impossible: both PCR and its own inventor Kary Mullis possess a colorful history that could have been worth including. These early attempts exploded to the stage when the Individual Genome Project (HGP) was announced, and that's where in fact the first area of the reserve roughly ends. I understand that a 600 page background cannot include every single scientific detail, but some of these omissions seem to me to become too vital that you be left out. The author's biggest success is in weaving a beautiful narrative. Nor will there be very much exploration of using gene sequences to illuminate the 'tree of life' which Darwin tantalizingly pulled the veil back on: in general I would have appreciated a bigger discussion of how DNA connects us to all living creatures. There are also no accounts of a few of the exciting applications of DNA in archaeological investigations. Finally, and this is not his fault, the author suffers from the natural drawback of not having the ability to interview most of the pioneers of molecular biology since they aren't around any more (luckily, Horace Freeland Judson's superb "The Eighth Day time of Creation" fills this gap: Judson surely got to interview almost every one of them for his book). This makes his accounts of science audio a little more linear than the messy, human procedure that it's. The author's personal troubling genealogy of mental illness serves as a backdrop and retains on rearing its mind just like a looming, unresolved question. Just how do we control the evils to which genetic technology could be put? Very informative This book does an excellent job of explaining genetics for non-scientists like myself. Just how do we balance the relentless, almost inevitable pace of science with the human search for responsible carry out, dignity and equality? Mukherjee leaves us with a picture of these questions in addition to one of his family members and their shared burden of mental illness: a mirage looking for realization, a sea of questions looking for a small boat filled up with answers. as an absurd example, he tried to "re educate" wheat using "shock therapy". Its individual stories are poignant, its lessons for future years pregnant with pitfalls and possibilities. Its sweeping account of existence's innermost secrets cannot help but remind me of a Japanese proverb quoted by physicist Richard Feynman: "To every guy is given the main element to the gates of heaven. He discovered that discrete traits could be transmitted in statistically predictable ways from one generation to following. The volume benefits from Mukherjee's elegant literary style, novelist's eye for character sketches and expansive feel for human history. We've a choice in determining which of the contours you want to follow. More broadly, there is no discussion of the advantages and disadvantages of using DNA to convict criminals: that could have designed for a compelling human interest story. Great read Could not put the book down, it answered several of my questions regarding genetics and hereditary features and illnesses. The structure of DNA of course inaugurated probably the most sparkling periods in the annals of intellectual thought since it immediately suggested an exact mechanism for copying the hereditary materials as well as a web page link between DNA and proteins which will be the workhorses of existence. A few of the gaps left me a bit befuddled though. Many accounts have been penned on Relativity and Quantum Mechanics, for instance, to make their importance known to the non-professionals. Gene fills the void for the similarly important research of Genetics. It really is clear now that this "map" was only a listing of components; You start with the emotionally-charged personal links to the field to the regular detailing of personalities of or anecdotes including famous scientists, the subject is kept

'human'. There are abundant scientific notions to fulfill any reader picking right up the book to understand the real subject matter, but not really in the general bland fashion of studies-andconclusions that tend to lose many a lay people. The book also excels due to the simplicity with which countless exotic concepts are explained. You start with the HGP, the next part mainly focuses on the medical history and implications of the gene. The narrative is certainly laced with historical episodes of all types to emphasise the criticality of the queries confronting us as we make more scientific progress. Amid all this, the writer keeps the concentrate on various moral and ethical issues. For instance, the book beautifully explains the dangers of genetic modification - which tantamounts to replacing organic selection with human being selection. As experts or parents seek to weed out particular deformities, there are real risks folks eliminating some essential evolutionary traits primarily out of ignorance of how genes actually work at this stage but also out of their feasible other utilities in lengthy future. The biggest flaw of the book is insufficient focus on latest advancements and near absence of what this science is with the capacity of solving in coming decades. The optimists out there anticipate congenitally blind people to see and cancers all cured. Some expect us in order to develop a third arm if we therefore choose or re-create a dinosaur in a hundred years or so. Not only did they make the crucial discovery that genes lie on chromosomes, but they also found that genes could be inherited (and in addition segregated) in groups rather than by themselves. genetics offers been very useful in finding determinants and medicines for diseases like sickle cell anemia, childhood leukemia, breast malignancy and cystic fibrosis. many of them had been well designed if patronizing, wanting to 'improve the poor', however they did not see the ominous slippery slope that they were on. Must Read Dr. A deep look into a magical world - our genes. Exactly as described, thank you! Exactly as described, many thanks! Impressive This book should easily have 2 million reviews. It is beautifully written and heartfelt. Science around the world ought to be applauded - the research the author is helping ordinary people understand is mind boggling. Murkerjee writes a comprehensive history of gene study in a way a lay-person can understand. Great read, no scientific background needed Insightful book within the history and repressions of the gene. Delighted to end up being reading this book. Starting with the emotionally-billed personal links to . Highly recommend it for anyone wanting to learn more about the annals and science if genetics. What is natural and what isn't in the age of the artificial gene? A parallel thread follows the crucial work of the French biologists Francois Jacob and Jacques Monod - both of whom had fought in the French resistance during World War 2 - in establishing the mechanism of gene regulation. Avery showed that it is a definite molecule separate from proteins (a lot of people thought that proteins with their practical significance had been the hereditary material). I'm having a hard time putting the book down, and look forward to each new chapter. It's a WONDERFUL read, written in a style that exquisitely details ... Most of the early eugenicists subscribed to the racial theories that were common in those days; All these occasions arranged the stage for the golden age group of molecular biology, the deciphering of the structure of DNA simply by James Watson (to whom the quote in the title is definitely attributed), Francis Crick, Rosalind Franklin and others. It underscores the importance of science in formulating our understanding of the globe, including how it was created. Consider it, what would it be like living in a global devoid of technology? No biology. No chemistry. No physics. Is it any wonder why religious beliefs has the stronghold it offers today?



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