The Emperor of All Maladies: A Biography of Cancer Study Guide

The Emperor of All Maladies: A Biography of Cancer by Siddhartha Mukherjee

BOOKRAGS

Contents

Plot Summary

Siddhartha Mukherjee (1970 -) is the author of The Emperor of all Maladies: a Biography of Cancer. Mukherjee is a cancer researcher and physician who gives a brilliant and thorough examination of the history of cancer while explaining the disease in such a way that the lay person can understand its origins and the battle to treat, prevent and cure it.

Mukherjee gives objective views and historical facts about cancer in its various forms and also details all of the major discoveries in medical history and research related to finding a cure for the disease that is on its way to becoming the number one cause of death in America. He also reveals personal insights and opinions about various practices, discoveries and events.

There are times when the tone takes on a more personal bent, such as when the author describes his first encounter with Carla Reed. Mukherjee, learned about Carla after she had checked into Massachusetts General Hospital. Mukherjee was one of seven cancer fellows at the hospital involved in an immersive training program. During this time, Mukherjee began to wonder about the age of cancer. The author follows Carla's journey throughout the book, ending with the fact that she is still in remission five years after her last treatment. In the world of cancer, this is as close to a cure as one can get.

While Mukherjee is consumed with learning about the disease, he also relates that there is a personal side to it and details how it may affect various people, including the doctors and researchers invested in applying specific treatments as well as finding a cure.

Modern medicine is one of the themes in the story. The word "modern" must be applied to the stories as they are told. Some research mentioned is ancient in chronological age yet ties into "modern" treatments such as pre-screenings, preventive measures, chemotherapy, drugs, surgery, and other treatments.

Each treatment builds on what went before; however, there are many references to doctors and scientists returning to treatments and ideas used even 100 years previous when it became necessary to return to the beginning to find where some treatments and procedures had gone awry or had in some way missed the mark. As Mukherjee mentions more than once, it is necessary to go back to the genesis of the disease to find the cause when focusing on the cure seems to be unsuccessful.

The majority of the book focuses on different types of leukemia and includes its discovery, initial diagnosis and how each doctor and scientist built upon the works of those that had gone before. The book also discusses how and why many of those researchers had to go back to the beginning to try to understand cancer in order to find a cure or at least a suitable treatment.

The book is comprehensive and well-written, threading stories through medical facts. The author sums it all up well with the story of Atossa, a Persian princess who lived thousands of years ago and what her journey might have looked like if she had traveled alongside cancer up until the current time.

Prologue; Part 1: A Suppuration of Blood

Prologue; Part 1: A Suppuration of Blood Summary and Analysis

Prologue

The Emperor of all Maladies begins with the tale of Carla Reed, a 30 year old kindergarten teacher from Ipswich, MA. One morning Carla awoke with a bad headache which she described as numbness. The problem worsened as time went on. Carla's symptoms were unexplainable from a medical point of view. She began to feel so fatigued that she could do little besides sleep. On some days, she had to crawl across the room because she could not walk. There were also pains deep in her bones. The pains and other symptoms waxed and waned. Although Carla had seen a doctor, there was no solid diagnosis. Eventually, it was determined that Carla had leukemia.

The author, Siddhartha Mukherjee, learned about Carla after she had checked into Massachusetts General Hospital. Mukherjee was one of seven cancer fellows at the hospital involved in an immersive training program. Mukherjee describes the immersive training program as being so intensive that nothing outside of the hospital exists for the trainees. Residents eat, sleep and breathe medicine. One member of the hospital staff warned Mukherjee that he had to have a life outside the hospital or he would never make it. Rates for burned out doctors were very high. During this time, Mukherjee began to wonder about the age of cancer.

Mukherjee met with Carla. They discussed the survival rate of leukemia. At one time, there was almost no chance that Carla could have been able to survive the onset of the leukemia. With the advent of modern medicine and new treatments, Carla had a 30% chance of surviving the disease.

Part 1: "A Suppuration of Blood"

In 1947, a pathologist named Sidney Farber waited impatiently in his laboratory for a parcel from New York. Farber's laboratory was a 14' x 20' space in the basement of Boston's Children's Hospital. Farber was a pediatric pathologist and had worked in the subterranean room for nearly 20 years. Although Farber was the chief pathologist at Children's Hospital he became tired of working with the dead and never treating a live patient. Farber decided to switch professions and moved into the upstairs clinic where he would be able to work with children. The parcel Farber was expecting from New York contained aminopterin, a yellow crystalline chemical that Farber hoped could be used in deterring the growth of childhood leukemia.

Mukherjee believes it is fortunate that Farber had not asked any of the pediatricians about creating an anti-leukemic drug. The pediatricians would have told Farber not to bother.

"Childhood leukemia had fascinated, confused, and frustrated doctors for more than a century. The disease had been analyzed, classified, subclassified, and divided meticulously; in musty, leather bound books on the library shelves at Children's - Anderson's Pathology or Boyd's Pathology of Internal Diseases - page upon page was plastered with images of leukemia cells and appended with elaborate taxonomies to describe the cells." (Part 1, p. 12)

In 1845 John Bennett, a Scottish physician, had described the case of a 28-year-old slate layer who complained of a mysterious swelling in his spleen. After much investigation Bennett discovered that the patient's blood had an extremely high level of white blood cells - the principal constituents of pus. While the presence of the pus explained the swelling in the man's spleen, it could not explain the nature of the pus. According to Bennett the blood had spoiled - suppurated and spontaneously combusted in two parts. Bennett referred to this as a suppuration of blood. Mukherjee discusses why Bennett was wrong.

Several months later Rudolf Virchow, a German researcher, published a case study strikingly similar to Bennett's case. Virchow argued with Bennett's theory saying that blood had no reason to transform itself impetuously into anything. Virchow ultimately referred to the disease as "weisses Blut" or white blood. In 1847 the name was changed to leukemia.

Mukherjee explains that biology is based on two fundamental tenets. One tenet is that all bodies are made up of cells. The second tenet is that cells arise only from other cells. Cells perform in one of two ways regarding growth. Either they increase in number or in size.

"Virchow called these two modes hyperplasia and hypertrophy. In hypertrophy, the number of cells did not change; instead, each individual cell merely grew in size - like a balloon being blown up. Hyperplasia, in contrast, was growth by virtue of cells increasing in number. Every growing human tissue could be described in terms of hypertrophy and hyperplasia." (Part 1, p. 15)

Mukherjee discusses how Virchow stumbled upon cancer. Virchow began to notice uncontrolled growth of cells or hyperplasia in an extreme form. Virchow referred to this as neoplasia or distorted growth. Virchow could not understand what caused the cells to grow at an accelerated rate and into a new form.

Mukherjee discusses various types of leukemia and how they are formed.

Sidney Farber was born in 1903 only one year after Virchow died in Berlin. The author discusses Farber's childhood.

"In the late 1940s, a cornucopia of pharmaceutical discoveries was tumbling open in labs and clinics around the nation. The most iconic of these new drugs were the antibiotics." (Part 1, p. 21)

The history of Penicillin is discussed. Antibiotics that followed penicillin included chloramphenicol in 1947; tetracycline in 1948; and streptomycin in 1949. The author claims that new drugs were being developed at an astonishing rate. By 1950 more than half of the medicines that were in common use had not existed a decade earlier. Mukherjee also discusses the drastic decline in illness due to the increase in public hygiene. Despite the decline in illnesses cancer continued to grow.

"But scientifically, cancer still remained a black box, a mysterious entity that was best cut away en bloc rather than treated by some deeper medical insight. To cure cancer (if it could be cured at all), doctors had only two strategies: excising the tumor surgically or incinerating it with radiation - a choice between the hot ray and the cold knife." (Part 1, p. 23)

The author discusses government involvement in the fight against cancer. In 1937 President Franklin Delano Roosevelt signed the National Cancer Institute Act. The National Cancer Institute (NCI) was designed to coordinate cancer research and education. It would be operated by an advisory council comprised of scientists assembled from various hospitals and universities. These scientists would be given a state-of-the-art laboratory complete with conference rooms and leafy gardens. It was located in Bethesda, Maryland. The efforts of the NCI were quickly changed when the Nazis set the stage for World War II.

By the time Farber began his work in 1947 the public outcry against cancer had all but silenced. Work took place behind closed doors and little was said about the disease. Farber believed that if a cure for cancer was to be found it would be found through the study of blood. Much of Farber's knowledge about blood had come from George Minot. Farber had worked with Minot in the 1920s before joining Children's Hospital.

Minot's research pertained mostly to pernicious anemia. This condition was not caused by an iron deficiency but by a lack of vitamin B12. Lucy Wills, a hematologist who had recently graduated from the London School of Medicine for Women, became fascinated with pernicious anemia. Wills traveled to Bombay to solve the issue. Wills found that the case of anemia she encountered in Bombay could not be reversed by using vitamin B12 or any of Minot's concoctions. Wills determined that this type of anemia could only be cured with folic acid.

Farber became fascinated with the links between bone marrow, vitamins and normal blood. Farber decided to use folic acid to treat children with leukemia. Instead of stopping the progression of the disease the folic acid accelerated the cancer and many children died prematurely. Farber wondered if the disease could be halted with an antifolate.

"Farber's Gauntlet" details the story of Robert Sandler, the two year old son of a Boston ship worker. The child fell mysteriously ill. His twin brother was the picture of perfect health. Little Robert was taken to Children's Hospital when his spleen became swollen. Farber examined Robert and injected him with pteroylaspartic acid (PPA) which was one of the first antifolates. At that time, it was common for neither patients nor the

parents of minor patients to be informed of any type of clinical trial, let alone asked for permission.

Robert's condition worsened. Farber administered aminopterin and goggled in wonder as Robert's disease went into remission almost immediately. Farber kicked his work into high gear. The remission was not a cure but still significant.

"The remissions, even if temporary, were still genuine remissions - and historic." Part 1, p. 35

Robert would eventually die but he and many other patients had survived past the six month period. At the time, six months was an eternity.

"A Private Plague"

Susan Sontag compares cancer to tuberculosis. "Both diseases, as Sontag pointedly noted, were similarly 'obscene - in the original meaning of that word: ill-omened, abominable, repugnant to the senses.'" Part 1, pp. 37-38.

Mukherjee begins to discuss the age of cancer, referring to the ancient discoveries of Imhotep in 2625 BC. Mukherjee talks about the surprising accuracy and acuity involved in Imhotep's work. It was not a collection of superstitions and guesswork as one might expect but a collected school of thought with a surprising amount of medical knowledge. However, cancer seemed to all but disappear from public view for a long period of time after Imhotep's discoveries.

"More than two millennia pass after Imhotep's description until we once more hear of cancer." Part 1, p. 41

Mukherjee also details the story of Atossa, a Persian princess who developed a cancerous tumor. After a long period of exile, Atossa permitted the court's doctor to perform surgery. Shortly after the tale of Atossa's surgery, the woman disappeared from the history books. No one knows if the surgery was successful.

"Onkos"

The first official naming of cancer took place around 400 BC. Hippocrates referred to it as "karkinos," the Greek word for crab. It reminded Hippocrates of a crab because of its ability to dig in and take hold.

"Another Greek word would intersect with the history of cancer - 'onkos,' a word used occasionally to describe tumors, from which the discipline of oncology would take its modern name. Onkos was the Greek term for a mass or a load, or more commonly a burden; cancer was imagined as a burden carried by the body." Part 1, p. 47

"Vanishing Humors"

In 1533, Vesalius, a medical student, began to realize that the current method of studying anatomy was far from effective. Without charts and diagrams, medical students were instructed to cut apart cadavers. Vesalius had learned nothing this way except for an ineffectual type of butchering the human body. Vesalius took it upon himself to create an anatomical chart detailing nerves and muscles. The chart became wildly popular with professors and students.

Mukherjee discusses the findings of the time. If one wanted to prevent cancer, then bleeding - which was still a common practice - would have to take place at the farthest point from the site that was at risk. To cure a cancer, the bleeding would have to take place at the site of the tumor.

In 1793, Matthew Baillie took Vesalius' work one step farther and mapped out the abnormal body. Once again, it was discovered that Galen's theories about black bile were incorrect.

"Remote Sympathy"

There were two major discoveries in surgery - anesthesia and antiseptic.

"A Radical Idea"

William Stewart Halsted is known as the father of radical surgery. Halsted began to test various ways to operate on cancer patients. Halsted ingested cocaine to make sure it was safe as an anesthetic. Halsted became addicted to cocaine and eventually to its "cure" - morphine. Halsted was a brilliant doctor on the fast track to destruction until he was recruited to the newly formed Johns Hopkins. The move changed Halsted's life. He committed himself to cancer research. He performed the first radical surgery in his time - a mastectomy. The radical surgery was not always enough since the cancer often metastasized. However the concept of radical surgery became "glamorous." This worried Halsted because he knew it was not the only answer. There needed to be some form of prevention.

"The Hard Tube and the Weak Light"

In 1895, William Rontgen invented x-rays through a fluke in his lab when an electron tube leaked. He tested the concept on his wife, who was soon convinced she would die. It was soon learned that not only would the rays penetrate the flesh and all that was contained therein, but it would also stay and bind to cells. But the discovery was not without problems.

"The complex intersection of radiation with cancer - cancer-curing at times, cancer-causing at others - dampened the initial enthusiasm of cancer scientists. Radiation was a powerful invisible knife - but still a knife. And a knife, no matter how deft or penetrating, could only reach so far in the battle against cancer." Part 1, p. 78

"Dyeing and Dying"

"A systemic disease demands a systemic cure - but what kind of systemic therapy could possibly cure cancer?" Part 1, p. 80

This is the question asked by all scientists at this time. The opening quote used by Mukherjee is quite apt in describing the problems faced by doctors:

"Those who have not been trained in chemistry or medicine may not realize how difficult the problem of cancer treatment really is. It is almost - not quite, but almost - as hard as finding some agent that will dissolve away the left ear, say, and leave the right unharmed. So slight is the difference between the cancer cell and its normal ancestor." William Woglom, Part 1, p. 80

Chemists believed that they might have found such a chemical in an unlikely place. It was found in the industrial application of dyeing fabric. However, while chemical held promise for curing cancer, it was also discovered that it burned flesh and bone marrow.

"Poisoning the Atmosphere"

"Every drug, the sixteenth-century physician Paracelsus once opined, is a poison in disguise. Cancer chemotherapy, consumed by its fiery obsession to obliterate the cancer cell, found its roots in the obverse logic: every poison might be a drug in disguise." Part 1, p. 89

One of the most startling discoveries along this line came when the ship John Harvey was blown up by allied forces. Mustard gas exploded, killing many men. However, it was learned that the poison had targeted bone marrow cells.

"The Goodness of Show Business"

Farber continued to be mesmerized by remissions. If one chemical worked, there must be others.

Catherine Variety Sheridan was born and abandoned on the steps of the Sheridan Theater - home to the Variety Club. The club members took the girl in and raised her. The club was almost immediately considered to be a philanthropic organization. The club, of which Koster was a member, embraced the new identity and began to support pediatric cancer research. Koster and Farber formed the Children's Cancer Research Fund. The organization grew quickly, mostly due to the notoriety of Catherine Sheridan.

Ralph Edwards, host of the radio show Truth or Consequences, introduced another famous young person to the world. Jimmy was a boy from Boston who had cancer. Jimmy was a huge Braves fan. Edwards and his team arranged for the Braves to visit Jimmy in the hospital. The public response was enormous. The Jimmy Fund was born. An initial plea to raise $20,000 netted an astonishing $231,000.

"The House that Jimmy Built"

The world loved Jimmy. Soon, the monies sent afforded the building of a treatment center. In 1952 the center was built. It soon became flooded with cancer patients and it wasn't long before the house the Jimmy built became too small.

Part 2: An Impatient War

Part 2: An Impatient War Summary and Analysis

Part 2: An Impatient War

"They form a society"

Farber knew that in order to launch a national attack on cancer he would have to form a society. Only a formidable group would be able to convince Congress to fund research.

Mukherjee tells the story of Mary Woodward Lasker. Mary Woodward was the daughter of a dynamic sales woman named Sara Johnson. Sara gave up her career to become a philanthropist. Years later, Mary would follow in her footsteps. Mary married Albert Lasker, an advertising genius. The couple began to campaign for funds to fight cancer. In the late 1940s, the Laskers - especially Mary - joined forces with Farber.

"These new friends of chemotherapy"

The Farber-Lasker friendship grew and soon the small society was making headway. Things changed when Albert Lasker was diagnosed with colon cancer and eventually died. Farber was also diagnosed with a type of colon cancer but survived. Farber would not speak about his illness. The more personal brushes with cancer fueled the fire for Farber and Lasker.

"In the shadow of Albert's death, Mary Lasker's cancer campaign took on a more urgent and insistent tone. She no longer sought a strategy to publicize a crusade against cancer; she sought a strategy to run it. 'We are at war with an insidious, relentless foe,' as her friend Senator Lister Hill would later put it - and a war of this magnitude demanded a relentless, total, unflinching commitment." Part 2, p. 117

Thus the War on Cancer was officially launched.

Farber and Lasker worked fervently with sick children and politicians. Farber was determined to make people understand the nature and devastating effects of cancer.

"Cancer, he insisted, was a total disease - an illness that gripped patients not just physically but psychically, socially, and emotionally. Only a multipronged, multidisciplinary attack would stand any chance of battling this disease." Part 2, p. 125

Mukherjee gives a brief update on Carla Reed's case.

"The Butcher Shop"

Gordon Zubord worked to keep cancer research out of trouble and to do so he developed a consortium to keep doctors, scientists and health facilities from working at cross purposes. The group galvanized cancer medicine.

Doctors began to experiment with using four drug combinations to combat cancer cells.

Mukherjee gives another update on Carla Reed, discussing the chemotherapy treatments that might save the woman's life.

"An Early Victory"

Frei and Freireich were excited to learn about a new discovery amidst their trials with four and five drug combinations. Min Chiu Li, an outsider in the community, was working with patients with a rare form of leukemia - choriocarcinoma - which involves the placenta in a pregnant woman. Li treated one patient with antifolates and was thrilled when the woman recovered. The issue that arose was that some people did not believe that further treatment was needed.

"Mice and Men"

Freireich was obsessed with continuing clinical trials. The combinations of drugs provided an infinite number of combinations. The researchers met with Howard Skipper, a "mouse doctor" who had been injecting rodents with leukemic cells. Possibilities began to be discussed.

"VAMP"

VAMP is a four drug combination that was proposed for cancer treatment. Frei, Freireich and Skipper believed that the combination would prove to be the answer they were looking for, yet when Frei proposed it to Zubrod, the man was stunned.

The first VAMP trial was launched in 1961. The results were abysmal. Refinements showed progress and even success. However, the cost was quite high for the young patients.

"But the story of leukemia - the story of cancer - isn't a story of doctors who struggle and survive, moving from one institution to another. It is the story of patients who struggle and survive, moving from one embankment of illness to another." Part 2, p. 148

"An Anatomist's Tumor"

Ben Orman is introduced. Orman was an athlete who found a lump in his neck. The lump grew in size until Orman sought medical attention. The lump was the tip of a large iceberg of masses that reached down into his chest. Orman had cancer in his lymph nodes. Orman was diagnosed with Hodgkin's lymphoma. Mukherjee speaks about his work with Orman.

Mukherjee also speaks about Henry Kaplan, a methodical and persistent doctor who had treated Hodgkin's with x-rays.

"An Army on the March"

In 1963, George Canellas and Tom Frei spent time in the lab matching various drugs to various cancers. Included on the drug list were cytotoxic drugs cytoxan, vincristine, procarabazine, and methotrexate. The cancers being matched to the drugs included breast cancer, ovarian cancer, lung cancer and lymphomas.

Mukherjee discusses the origin of drugs. Also discussed is the method by which doctors chose which cancers might respond best to which drugs.

Vincent DeVita led tests on intensive chemotherapy by using 4 drugs referred to as MOPP. It was learned that VAMP could kill by infection; MOPP caused severe nausea plus untold long term effects.

"The Cart and the Horse"

In 1968, there were noteworthy successes in Bethesda and Memphis. However, gathering and presenting proof remained a problem. Farber celebrated the successes as well as the 21st anniversary of the Jimmy Fund. The person notably absent from the celebration was Jimmy himself. Jimmy (the name was an alias) was living in Maine and had spent twenty years out of the limelight. Farber insisted that Jimmy was an icon. All of the people who had come together to fight cancer were to be celebrated.

The search for the right cure for cancer continued.

"As DeVita described it, 'The missing piece of the therapeutic puzzle, effective chemotherapy for systemic cancers,' had been discovered. High dose combination chemotherapy would cure all cancers - once the right combination had been found.'" Part 2, p. 172

"A moon shot for cancer"

In 1969, the New York Times published an open letter to Richard Nixon begging him to support cancer research. The letter asked, if we can put a man on the moon, why can't we cure cancer?

Cancer returned to the media spotlight in every way, particularly through movies. People began to develop an internal fear about the disease.

"The Times ad marked a seminal intersection in the history of cancer. With it, cancer declared its final emergence from the shadowy interiors of medicine into the full glare of public scrutiny, morphing into an illness of national and international prominence. This was a generation that no longer whispered about cancer." Part 2, p. 181

Eventually, a panel was formed to investigate the possibility of creating a government agency focused on battling cancer. A final report from the panel agreed that such an agency should be formed. Mukherjee discusses the details of the new agency.

In 1973, Sidney Farber died from cardiac arrest.

Once again, Mukherjee updates Carla Reed's condition. The intensive treatment was working - Carla was in remission.

Part 3: Will You Turn Me out If I Can't Get Better?

Part 3: Will You Turn Me out If I Can't Get Better? Summary and Analysis

"In God We Trust. All Others [Must] Have Data"

"Farber was fortunate to have lived in the right time, but he was perhaps even more fortunate to have died at the right time. The year of his death, 1972, marked the beginning of a deeply fractured and contentious period in the history of cancer." Part 3, p. 193

A battle began between two schools of thought - the concept of radical surgery and simple surgery. Radical surgery was accelerated to "superradical" surgery and then "ultraradical surgery" which had little thought about the patient and much more concern regarding results. Some doctors believed that any form of radical surgery yielded no benefits.

"The only way to turn the upside down tapestry of Halstedian theory around was to run a controlled clinical trial to test the radical mastectomy against the simply mastectomy and lumpectomy+radiation." Part 3, p. 199

Due to the resistance of patient involvement, the clinical trials lasted for ten years.

"The Smiling Oncologist"

"Every battle needs its iconic battleground, and if one physical place epitomized the cancer wars of the late 1970s, it was the chemotherapy ward. It was 'our trench and bunker,' a chemotherapist recalls, a space marked indelibly in the history of cancer." Part 3, p. 202

A great deal of trial and error continued.

The use of MOPP continued to be used in the treatment of breast cancer. One patient commented that she was tired of the smiling oncologist whose goal was to fight the cancer but who had no real interest in knowing how sick the patients became from the treatment.

"Knowing the Enemy"

Dissenting voices began to be heard. The two major arguments:

1. Chemotherapy cannot be the only way.

2. Therapies needed to be developed from the bottom up, not the top down as was the common practice.

"Halsted's Ashes"

Moya Cole takes another look at Halsted's theories on radical surgery. Cole believed that surgery was often unnecessary and had harmful, disfiguring results. Cole believed that Halsted may have had the right concept in some cases but lacked the right tools to achieve his goals and to execute the procedure correctly.

"Counting Cancer"

Harvard John Cairns began to resurrect the concept of counting, i.e., measuring cancer.

Part 4: Prevention Is the Cure

Part 4: Prevention Is the Cure Summary and Analysis

"Part 4: Prevention Is the Cure" begins with a quote from David Cantor: "It should first be noted, however, that the 1960s and 1970s did not witness so much a difficult birth of approaches to prevention that focused on environmental and lifestyle causes of cancer, as a difficult reinvention of an older tradition of interest in these possible causes." Part 4, p. 235

"Coffins of Black"

In 1775, Percival Pott began to notice a shocking increase in the number of patients that suffered from scrotal cancer. The trend was targeted toward chimney sweeps and their apprentices. Originally, doctors dismissed the cancer, assuming that it was simply a sexually transmitted disease. In those days, chimney sweeps were often believed to be sexually promiscuous and prone to sores in the genital region. Pott believed that because the condition was external in nature that it could be prevented. The trend also raised questions regarding the amount of soot that the chimney sweeps carried home with them under the surface of their skin. The interesting thing to Pott was that the disease rarely, if ever, affected children.

During that time period, children were often employed as assistants to chimney sweeps, often with fatal results. The discovery of scrotal cancer helped to promote child labor laws to prevent such incidents in children.

Doctors began to associate tobacco and cigarettes with various forms of cancer. With the consumption of tobacco products growing rapidly, links between cigarettes and lung cancer began to become clear.

"In 1870, the per capita consumption in America was less than one cigarette per year. A mere thirty years later, Americans were consuming 3.5 billion cigarettes and 6 billion cigars every year. By 1953, the average annual consumption has reached thirty-five hundred per person." Part 4, pp. 240-241

Despite the rise in tobacco consumption and cancer, not all doctors were convinced. One said that cancer might as easily be tied to wearing stockings.

"The Emperor's Nylon Stockings"

In 1942, UK statisticians approached the Ministry of Health with the shocking news that cancer morbidity had risen 15 fold in the past 20 years. The Ministry asked the Medical Research Council to arrange a conference of experts to study the rise of lung cancer. The results were mixed and were not even remotely conclusive. The conference determined that lung cancer could be caused by practically anything, including pollution, lack of sun, flu, x-rays, industrial pollution, auto exhaust, gasworks, road tar, the

common cold, coal fires, and more. It was obvious that a more systematic study was needed. The Americans fared no better in their attempts to determine the cause. Some scientists began to wonder if there was a carrier. After all, sleeping sickness was carried by the tsetse fly and malaria was carried by the mosquito. Was there something that carried cancer?

In London, the socialized health program required that all doctors be registered with the government. Deaths were noted, as were their causes. Smokers were also noted in reports. The results of the studies conducted from those reports was not conclusive.

"A Thief in the Night"

Richard Doll and Bradford Hill published a report in 1956 that delineated the connection between tobacco and lung cancer. The extent of the cooperation of the tobacco companies is detailed.

Evarts Graham dies.

The US Public Health Service is approached regarding a warning on cigarettes.

"A Statement of Warning"

In 1963, three men visited Oscar Auerbach, a noted lung pathologist. Auerbach was one of the foremost pathologists and was certainly a top choice when choosing a scientist that may be able to find the cause of lung cancer.

"Rather than initiating his studies with cancer in its full-blown form, Auerbach has tried to understand the genesis of cancer." Part 4, p. 258

In 1961 the American Cancer Society, the American Heart Association and the National Tuberculosis Association wrote a letter to President John F. Kennedy, asking for help in fighting cancer. Kennedy assigned the job to the surgeon general who in turn created a committee that would reignite the interest in the link between tobacco and lung cancer. This time a significant link was found. Lobbies began to appear to put filters on cigarettes and to ban TV ads for the product. It was a war that would not soon end.

"It is difficult for me to convey the range and depth of devastation that I witnessed in the cancer wards that could be directly attributed to cigarette smoking." Part 4, p. 274

"Curiouser and Curiouser"

"The classification of tobacco smoke as a potent carcinogen - and the slow avalanche of forces unleashed to regulate cigarettes in the 1980s - is rightfully counted as one of cancer prevention's seminal victories." Part 4, p. 276

More specific links became evident between smoking and cancer.

In the 1960s, Bruce Ames at Berkeley stumbled upon a test for chemical carcinogens. Ames had been studying salmonella. The discovery was a strong start but it was learned that not all carcinogens are linked to chemicals. Scientists would have to return to studying carcinogenesis.

"A Spider's Web"

The battle to attack pre-cancer versus full blown cancer raged on. One of the most significant discoveries was made by George Papanicolaou, a student who was assigned to studying the menses of guinea pigs. The task seemed fruitless since guinea pigs shed no visible tissues or fluids during this time. What Papanicolaou discovered was that abnormal cells would shed themselves and pre-cancerous cells could be detected on slides. Papanicolaou took the tests several steps further and realized that a woman's cervix could be checked for pre-cancerous cells. Many tests were conducted, most of which involved Mrs. Papanicolaou, who consented to undergo tests every day.

In 1952, the largest clinical trial of secondary prevention in the history of cancer was underway. Papanicolaou had successfully determined that pre-screening could indeed help to prevent cancer.

After the introduction of the Pap smear came the clinical trials for mammograms.

Several pages of illustrations are included, titled: Humors in Tumors, The Rise of Radical Surgery, New Arms in the Battle, Building the Edifice, Early Victories, The Politics of War, Prevention is the Cure, and The Fruits of Long Endeavors.

STAMP is introduced. Solid Tumor Autologous Marrow Program (STAMP) is thought to be the new hope and the treatment that will effectively "stamp" out breast cancer.

Susan Sontag is diagnosed with cancer. She begins to notices parallels between cancer and AIDS.

"The Map and the Parachute"

STAMP continues to be used. Many doctors believe that the regimen of massive doses of chemotherapy seems to be effective and that no trials are necessary.

Mukherjee details the cases of several patients.

Part 5: A Distorted Version of Our Normal Selves

Part 5: A Distorted Version of Our Normal Selves Summary and Analysis

"A Unitary Cause"

In Spring 2005 Mukherjee had to make a decision - to work as a clinician or a laboratory scientist. The author says his heart was in clinical work.

"The choice between the two paths is instinctual. Some of us inherently perceive ourselves as clinicians; others primarily as scientists. My own inclinations have changed little since the first day of my internship." Part 5, p. 337

Three of the seven people in Mukherjee's group continued at the clinic where they would run clinical trials and focus on the day to day care of patients. The remaining four people went to work in the lab. On the last day of their time as a solid unit, the group began to memorialize the patients who had not survived their battle with cancer. Carla was still in remission.

The author discusses lab work, theories, experiments and the potential genetic causes related to cancer.

"Under the Lamps of Viruses"

"By the early 1950s, cancer researchers had thus split into three feuding camps. The virologists, led by Rous, claimed that viruses cause cancer, although no such virus had been found in human studies. Epidemiologists such as Doll and Hill, argued that exogenous chemicals caused cancer, although they could not offer a mechanistic explanation for their theory or results. The third camp, of Theodor Boveri's successors, stood at the farthest periphery." Part 5, p. 350

Mukherjee goes on to explain that while Boveri's successors possessed only circumstantial evidence to prove that internal genes to the cell might be the cause of cancer.

It was determined that a DNA copy of virus' genes could attach themselves to a cell's genes. Thus begins a destructive circle.

The study of retroviruses is discussed.

"Hunting the Sarc"

Scientists begin to analyze genes that were altered in mutant viruses and attempted to isolate the gene in the virus. The gene, the SRC gene, is also known as the sarc, short for sarcoma.

"The Wind in the Trees"

In 1976, the quest for the cure for cancer through the study of cancer biology underwent a drastic reorganization. Scientists returned to studying genes. The oncogene theory developed by Varmus and Bishop provided the first comprehensive theory of carcinogenesis. The theory showed how soot, radiation, cigarette smoke and other outside insults could cause cancer by mutating oncogenes within the cell. Geneticists needed to learn to "see" the gene in a new way.

"A Risky Prediction"

A "Risky prediction" is a term coined by Karl Popper. Popper stated that it was a risky prediction to attempt to verify untested theories through clinical trials. Mukherjee relates this concept to the study of isolating an activated mutated oncogene in a cancer cell.

"The Hallmarks of Cancer"

The author discusses the importance of Leder's "OncoMouse."

"The mouse embodied the maturity of cancer genetics: scientists had created real, living tumors, (not just abstract, etiolated foci in petri dishes) by artificially manipulating two genes, ras and myc, in an animal." Part 5, p. 384

Leder created what he believed to be the answer; however, those two oncogenes did not perform as expected. Thus the question arose - if two oncogenes were not sufficient to create cancer, how many would it take?

Mukherjee goes on to discuss the parallels between various types of cancers despite the fact that the genetics between subjects were often very different.

Part 6: The Fruits of Long Endeavors; Atossa's War

Part 6: The Fruits of Long Endeavors; Atossa's War Summary and Analysis

"Part 6: The Fruits of Long Endeavors" begins with a quote by James Watson: "The National Cancer Institute, which has overseen American efforts on researching and combatting cancers since 1971, should take on an ambitious new goal for the next decade: the development of new drugs that will provide lifelong cures for many, if not all, major cancers. Beating cancer now is a realistic ambition because, at long last, we largely know its true genetic and chemical characteristics." Part 6, p. 393

"No One Had Labored in Vain"

Phyllis Clauson writes to the Jimmy Fund about her brother, Einar Gustafson, the real "Jimmy." Einar is alive and well, living in Maine with three children. Einar had been a truck driver by trade. He is 63 years old.

Phyllis Clauson said she felt that the world needed to know that Einar was still alive and that the treatment all those years ago had been successful. The letter was received by Karen Cummings at the Jimmy Fund development office. At first it was seen as a hoax. People had been claiming to be or to know Jimmy for decades. However, Phyllis gave details that were not known to the general public. Cummings decided to meet with Einar Gustafson. Cummings learned that Einar truly was Jimmy. Einar confirmed many details about his trial at Children's Hospital and being treated by Sidney Farber. Einar also produced the Braves uniform he had been given and had worn to every treatment. It was 50 years later when Einar Gustafson returned to Children's Hospital to a full fanfare. It could not be determined why Jimmy had survived; all that was known was that Jimmy was alive.

Mukherjee discusses the stories of other patients told earlier in the book. Included is the survival story of Ben Orman, who had been diagnosed with Hodgkin's Lymphoma.

"These were all deep, audacious, and meaningful victories borne on the backs of deep and meaningful labors. But, in truth, they were the victories of another generation - the results of discoveries made in the fifties and sixties." Part 6, p. 402

"New Drugs for All Cancers"

The author compares the cure for cancer to the story of Achilles. Most cancer originates as a localized disease. Surgery and radiation exploit those vulnerabilities. A second vulnerability comes from the rapid growth of cancer cells. In the end, those vulnerabilities can leave the body susceptible, just as Achilles' heel was his weak point.

Most chemotherapy drugs by the 1980s targeted cell growth. One of the most difficult forms of cancer to treat is acute promyelocytic leukemia, which was discovered in the 1950s. The author discusses how new drugs might be able to target that type of cancer since old drugs were unsuccessful.

"A City of Strings"

Mukherjee discusses the links between various types of genes. Proto-oncogenes and tumor suppressors act the as the molecular pivot points of all cells. They are the gatekeepers of cell division. Mukherjee also discusses how cell division is central to every part of our biology.

In 1976, a company named Genentech (Genetic Engineering Technology) was formed in San Francisco. The company imagined leveraging genetic technology in order to manipulate and engineer genes in a new way. Genes could also be shuffled from one organism to another. More cases and trials are highlighted.

"Drugs, Bodies and Proof"

By 1993, Slamon's early phase clinical trials had become a hot topic among breast cancer patients. People began to talk about Herceptin and did not want to wait for the trials to be completed or for the FDA to approve the new treatment.

"A Four-Minute Mile"

Mukherjee discusses a new drug for the treatment of Chronic Myeloid Leukemia (CML). Gleevec seemed to be the right drug to conquer CML. As of 2009, patients diagnosed with CML lived an average of 30 years.

"The Red Queen's Race"

This section tells the story of Jerry Mayfield, a CML patient who stopped responding to Gleevec. Doctors needed something else instead of a non-targeted drug to combat those who had become resistant.

The Red Queen Syndrome refers to something that moves incessantly but never gets anywhere.

The author debunks the concept that cell phones cause cancer.

"Thirteen Mountains"

When asked how Mukherjee intended to end the book, he would never answer. Secretly, Mukherjee believed that the book would end with Carla's death. He was wrong. Carla survived treatment and had lasted five years without a relapse. In the world of cancer, that is as close to a cure as one can get.

Mukherjee visited Carla to check in on her. He asked how she survived.

"'There was no choice,' she said, motioning almost unconsciously to the room where her children were playing. 'My friends often asked me whether I felt as if my life was somehow made abnormal by my disease. I would tell them the same thing: for someone who is sick, this is their new normal.'" Part 6, p. 449

That thought leaves the author wondering what normal is considering the ever changing presence of cancer.

"Atossa's War"

Atossa's War asks the reader to go on a thought provoking journey. Imagine going back thousands of years to the time of the Persian princess Atossa. The woman had suffered with breast cancer and had finally consented to have surgery to remove the tumor. No one knew what happened to Atossa after the surgery because she disappeared from the history books.

Imagine if Atossa had traveled alongside cancer from her day until the present time. What kinds of treatments might she have undergone? What might have been the reaction of Atossa and her disease when faced with Sidney Farber and all of the other scientists who made astounding breakthroughs in regards to fighting breast cancer and cancer in general? What might Atossa look like today if she was cancer's Dorian Gray?

Mukherjee ends with the tale of Germaine, a woman diagnosed with cancer, one who fought every one of cancer's moves until cancer finally won.

Characters

Siddhartha Mukherjee

Siddhartha Mukherjee (1970 -) is the author of The Emperor of all Maladies: a Biography of Cancer. Mukherjee is a cancer physician, researcher and author. Mukherjee currently works as an Assistant Professor of Medicine at Columbia University and also serves as staff physician at Columbia University Medical Center.

Mukherjee, who was born in New Delhi, India, attended Stanford University where he majored in biology. The author was awarded with a Rhodes scholarship to Oxford University. Mukherjee earned a DPhil in immunology while at Oxford. Following graduation, Mukherjee attended Harvard Medical School. The author became an Internal Medicine resident at Massachusetts General Hospital which was followed by an oncology fellowship.

In the book, Mukherjee discusses his role as one of seven cancer fellows at the hospital involved in an immersive training program at Massachusetts General Hospital. Mukherjee describes the immersive training program as being so intensive that nothing outside of the hospital exists for the trainees. Residents eat, sleep and breathe medicine. One member of the hospital staff warned Mukherjee that he had to have a life outside the hospital or he would never make it. Rates for burned out doctors were very high. During this time, Mukherjee began to wonder about the age of cancer. This curiosity led to the writing of The Emperor of all Maladies: a Biography of Cancer. The book was awarded the Pulitzer Prize for General Nonfiction. The work was also nominated for a National Book Critics Circle Award. The New York Times included the book on "The 10 Best Books of 2010."

Sidney Farber

Sidney Farber is considered to be the father of pediatric pathology. Farber was born in Buffalo, New York in 1903. He was the son of Simon Farber, a bargeman from Poland turned insurance agent. Sidney was one of 14 children who grew up in modest circumstances. The family lived in a Jewish community of factory workers, shop owners and bookkeepers. Simon Farber held his children to high academic standards. The family spoke Yiddish upstairs but was directed to speak only English and German downstairs.

Sidney was the third child of the Farbers. He thrived under his father's watchful eye. Farber studied philosophy and biology at the University of Buffalo from which he graduated in 1923. Farber played the violin to pay for college tuition. Farber also trained in medicine at Freiberg and Heidelberg before moving to Boston where he attended Harvard Medical School. Farber's colleagues often referred to him as being insufferable and arrogant. His manner was precise, formal and meticulous.

Farber became a full-time pediatric pathologist at Boston's Children's Hospital in the late 1920s. During Farber's tenure at Children's Hospital he wrote The Postmortem Examination which is considered to be a classic in the field of pathology. In the mid-1930s he became a preeminent pathologist. In 1947, Farber decided that he would prefer to work with the living and began to work on an anti-leukemic treatment.

Sidney Farber died in 1973.

John Bennett

In 1845, John Bennett, a Scottish physician, had described the case of a 28-year-old slate layer who complained of a mysterious swelling in his spleen. After much investigation Bennett discovered that the patient's blood had an extremely high level of white blood cells - the principal constituents of pus. While the presence of the pus explained the swelling in the man's spleen, it could not explain the nature of the pus.

Rudolf Virchow

Rudolf Virchow (1821 - 1902) was a German researcher. Virchow argued with Bennett's theory saying that blood had no reason to transform itself impetuously into anything. Virchow ultimately referred to the disease as "weisses Blut" or white blood.

Lucy Wills

Lucy Wills (1888 — 1964) was a hematologist and graduate from the London School of Medicine for Women. Wills became fascinated with pernicious anemia. Wills traveled to Bombay in the 1920s to solve the issue. Wills found that the cases of anemia she encountered in Bombay could not be reversed by using vitamin B12 or any of Minot's concoctions. Wills determined that this type of anemia could only be cured with folic acid.

George Minot

George Minot (1885 - 1950) was a medical researcher who worked closely with many students from Harvard University Medical School, including Sidney Farber. Minot's research pertained mostly to pernicious anemia. This condition was not caused by an iron deficiency but by a lack of vitamin B12.

George Papanicolaou

George Papanicolaou (1883-1962) was a researcher who determined a way in which pre-cancerous cells could be detected. The pre-screening process would become known as the Pap smear.

Carla Reed

Carla Reed is a patient whose story is told throughout the entire book. Reed, a young mother and school teacher, was diagnosed in her thirties with leukemia. Reed was one of Mukherjee's patients.

Robert Sandler

Robert Sandler was a two year old boy who became the focus of many studies on leukemia. The book is dedicated to Sandler.

Percival Pott

Percival Pott (1714 - 1788) was a London surgeon who believed if cancer had an external presence then there must be a way to prevent it from entering the body. Pott's work began with the high rate of scrotal cancer in chimney sweeps.

Objects/Places

Cancer

Siddhartha Mukherjee is a cancer researcher and physician. Mukherjee gives a brilliant and thorough examination of the history of cancer while explaining in such a way that the lay person can understand its origins and the battle to treat, prevent and cure the disease.

Cancer is a disease that is borne in the cells. Abnormal cells change and grow at an alarming rate and overtake the normal cells. Mukherjee explains that biology is based on two fundamental tenets. One tenet is that all bodies are made up of cells. The second tenet is that cells arise only from other cells. Cells perform in one of two ways regarding growth. Either they increase in number or in size. "Virchow called these two modes hyperplasia and hypertrophy. In hypertrophy, the number of cells did not change; instead, each individual cell merely grew in size - like a balloon being blown up. Hyperplasia, in contrast, was growth by virtue of cells increasing in number. Every growing human tissue could be described in terms of hypertrophy and hyperplasia." (Part 1, p. 15)

Mukherjee discusses how Virchow stumbled upon cancer. Virchow began to notice uncontrolled growth of cells or hyperplasia in an extreme form. Virchow referred to this as neoplasia or distorted growth. Virchow could not understand what caused the cells to grow at an accelerated rate and into a new form.

The book looks at the research of Virchow, Sidney Farber, Frei, Freidreich, Papanicolaou and many other doctors and scientists. Each scientist exhibits innovative studies and works through trial and error, building on the experiences and teachings of those who went before. Mukherjee discusses the new treatments in cancers as well as the people and foundations which have made clinical trials possible. The author also discusses his personal experiences and hopes for the future of cancer research.

Leukemia

Leukemia is a disease that is the presence of abnormal cells. The name comes from "leukos." It was originally called "weisses Blut" or white blood because the disease is formed through an accelerated level of white blood cells. While leukemia is often related to children, the majority of leukemic patients are adults, like Carla Reed, whose case is presented as one of the main stories in the book.

There are four types of leukemia:

Lymphocytic leukemia - acute and chronic; and Myelogenous leukemia - acute and chronic.

In "A suppuration of blood," Mukherjee explains the first noted case of leukemia.

In 1845 John Bennett, a Scottish physician, had described the case of a 28-year-old slate layer who complained of a mysterious swelling in his spleen. After much investigation Bennett discovered that the patient's blood had an extremely high level of white blood cells - the principal constituents of pus. While the presence of the pus explained the swelling in the man's spleen, it could not explain the nature of the pus. According to Bennett the blood had spoiled - suppurated and spontaneously combusted in two parts. Bennett referred to this as a suppuration of blood. Mukherjee discusses why Bennett was wrong.

Several months later Rudolf Virchow, a German researcher, published a case study striking similar to Bennett's case. Virchow argued with Bennett's theory saying that blood had no reason to transform itself impetuously into anything. Virchow ultimately referred to the disease as "weisses Blut" or white blood. In 1847 the name was changed to leukemia.

In 1947, Sidney Farber, Chief Pathologist Boston's Children's Hospital, began to experiment with aminopterin, a yellow crystalline chemical that Farber hoped could be used in deterring the growth of childhood leukemia. At that time, Farber's dream of developing a drug to fight leukemia seemed like little more than a pipe dream.

Mukherjee believes it is fortunate that Farber had not asked any of the pediatricians about creating an anti-leukemic drug. The pediatricians would have told Farber not to bother. "Childhood leukemia had fascinated, confused, and frustrated doctors for more than a century. The disease had been analyzed, classified, subclassified, and divided meticulously; in musty, leather bound books on the library shelves at Children's - Anderson's "Pathology" or Boyd's "Pathology of Internal Diseases" - page upon page was plastered with images of leukemia cells and appended with elaborate taxonomies to describe the cells." (Part 1, p. 12)

Massachusetts General Hospital

Massachusetts General Hospital is the site of Siddhartha Murkherjee's residency and the location where he first met Carla Reed.

Children's Hospital

Children's Hospital is located in Boston. It was the site of Sidney Farber's most astounding work with cancer. Farber began as a pathologist and became a cancer researcher, working mostly with children and leukemia.

Hematology

Hematology is the study of the blood. It was believed that cancer must begin in the blood and, therefore, hematology was at the forefront of the cancer research movement.

Cells

Cells are considered to be the birthplace of all cancers. As such, the genesis of cancer is traced to the cells - normal or abnormal and pre-cancerous - so that it could be learned how cancer is formed and therefore, how it can be treated, prevented, and/or cured.

Harvard University Medical Center

Harvard University Medical Center was the home to many clinical trials for cancer.

National Cancer Institute

The National Cancer Institute is the government-funded agency devoted to cancer research, including prevention and treatment.

Dana-Farber Cancer Institute

The Dana-Farber Cancer Institute is the research facility founded by Sidney Farber as the Children's Cancer Research Foundation. It expanded to include people of all ages. Eventually it was renamed due to the long-term assistance from the Charles A. Dana Foundation.

Washington, D.C.

Washington, D.C. was the site of the majority of government programs that were mandated with the primary purpose of researching cancer.

Themes

Cancer

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Modern Medicine

Modern medicine is one of the themes in the story. The word "modern" must be applied to the stories as they are told. Some research mentioned is ancient in chronological age yet ties into "modern" treatments such as pre-screenings, preventive measures, chemotherapy, drugs, surgery, and other treatments.

Each treatment builds on what went before, however, there are many references to doctors and scientists returning to treatments and ideas used even 100 years previous when it became necessary to return to the beginning to find where some treatments and procedures had gone awry or had in some way missed the mark. As Mukherjee mentions more than once, it was necessary to go back to the genesis of the disease to find the cause when focusing on the cure seemed to be unsuccessful.

In the past 30-40 years, modern medicine has made astonishing achievements in the treatment, prevention and cure of cancer. Mukherjee takes the reader through the entire

journey so that one can better understand where the path started and where it will go next.

Style

Perspective

Siddhartha Mukherjee (1970 -) is the author of The Emperor of all Maladies: a Biography of Cancer. Mukherjee is a cancer physician, researcher and author. Mukherjee currently works as an Assistant Professor of Medicine at Columbia University and also serves as staff physician at Columbia University Medical Center.

Mukherjee, who was born in New Delhi, India, attended Stanford University where he majored in biology. The author was awarded with a Rhodes scholarship to Oxford University. Mukherjee earned a DPhil in immunology while at Oxford. Following graduation, Mukherjee attended Harvard Medical School. The author became an Internal Medicine resident at Massachusetts General Hospital which was followed by an oncology fellowship.

In the book, Mukherjee discusses his role as one of seven cancer fellows at the hospital involved in an immersive training program at Massachusetts General Hospital. Mukherjee describes the immersive training program as being so intensive that nothing outside of the hospital exists for the trainees. Residents eat, sleep and breathe medicine. One member of the hospital staff warned Mukherjee that he had to have a life outside the hospital or he would never make it. Rates for burned out doctors were very high. During this time, Mukherjee began to wonder about the age of cancer. This curiosity led to the writing of The Emperor of all Maladies: a Biography of Cancer. The book was awarded the Pulitzer Prize for General Nonfiction. The work was also nominated for a National Book Critics Circle Award. The New York Times included the book on "The 10 Best Books of 2010."

Tone

Siddhartha Mukherjee (1970 -) is the author of The Emperor of all Maladies: a Biography of Cancer. This is a work of non-fiction. The tone of the book is typically non-partisan. This is a particularly difficult tone to achieve considering the personal experiences and controversial material in the text.

Mukherjee gives objective views and historical facts about cancer in its various forms and also details much of the medical history and research related to finding a cure for the disease that is on its way to becoming the number one cause of death in America. He also reveals personal insights and opinions about various practices, discoveries and events.

There are times when the tone takes on a more personal bent, such as when the author describes his first encounter with Carla Reed. Mukherjee learned about Carla after she had checked into Massachusetts General Hospital. Mukherjee was one of seven cancer fellows at the hospital involved in an immersive training program. Mukherjee describes

the immersive training program as being so intensive that nothing outside of the hospital exists for the trainees. Residents eat, sleep and breathe medicine. One member of the hospital staff warned Mukherjee that he had to have a life outside the hospital or he would never make it. Rates for burned out doctors were very high. During this time, Mukherjee began to wonder about the age of cancer.

While Mukherjee was consumed with learning about the disease, he also relates that there is a personal side to it and details how it may affect various people, including the doctors and researchers invested in applying specific treatments as well as finding a cure.

Structure

The Emperor of all Maladies: a Biography of Cancer by Siddhartha Mukherjee is a work of non-fiction. It is 571 pages in length. It contains a prologue, 6 parts, notes, glossary, acknowledgments, and an index.

Without the notes, glossary, acknowledgments and index, the total length of the work is 470 pages. The shortest part is 44 pages in length; the longest part is 99 pages in length. The average length of the parts is 75 pages. The prologue is 8 pages in length; the epilogue is 9 pages in length.

Each chapter is separated into sections with subheadings. The work is generally chronological in nature.

"Part 1, Of Blacke Cholor, Without Boyling," includes the following sections: A Suppuration of Blood; A Monster More Insatiable than the Guillotine; Farber's Gauntlet; A Private Plague; Onkos; Vanishing Humors; Remote Sympathy; A Radical Idea; The Hard Tube and the Weak Light; Dyeing and Dying; Poisoning the Atmosphere; The Goodness of Show Business; The House that Jimmy Built.

"Part 2: An Impatient War" includes the following sections: They Form a Society; These New Friends of Chemotherapy; The Butcher Shop; An Early Victory; Mice and Men; VAMP; An Anatomist's Tumor; An Army on the March; The Cart and the Horse; A Moon Shot for Cancer.

"Part 3: Will You Turn Me out If I Can't Get Better?" includes the following sections: In God We Trust. All Others [Must] Have Data; The Smiling Oncologist; Knowing the Enemy; Halsted's Ashes; Counting Cancer.

"Part 4: Prevention Is the Cure" includes the following sections: Coffins of Black; the Emperor's Nylon Stockings; A Thief in the Night; A Statement of Warning; Curiouser and Curiouser; A Spider's Web; The Map and the Parachute.

"Part 5: A Distorted Version of Our Normal Selves" includes the following sections: A Unitary Cause; Under the Lamps of Viruses; Hunting the Sarc; The Wind in the Trees; A Risky Prediction; The Hallmarks of Cancer.

"Part 6: The Fruits of Long Endeavors" includes the following sections: No One Had Labored in Vain; New Drugs for All Cancers; A City of Strings; A Four-Minute Mile; The Red Queen's Race; Thirteen Mountains; Atossa's War.

Quotes

"For an oncologist in training, too, leukemia represents a special incarnation of cancer. Its pace, its acuity, its breathtaking, inexorable arc of growth forces rapid, often drastic decisions; it is terrifying to experience, terrifying to observe, and terrifying to treat." Prologue, p. 3

"Cancer was an all-consuming presence in our lives. It invaded our imaginations; it occupied our memories; it infiltrated every conversation, every thought." Prologue, p. 4

"Childhood leukemia had fascinated, confused, and frustrated doctors for more than a century. The disease had been analyzed, classified, subclassified, and divided meticulously; in musty, leather bound books on the library shelves at Children's - Anderson's Pathology or Boyd's Pathology of Internal Diseases - page upon page was plastered with images of leukemia cells and appended with elaborate taxonomies to describe the cells." Part 1, p. 12

"To understand the phenomenon, a scientist must first describe it; to describe it objectively, he must first measure it. If cancer medicine was to be transformed into a rigorous science, then cancer would need to be counted somehow - measured in some reliable, reproducible way." Part 1, p. 19

"In the late 1940s, a cornucopia of pharmaceutical discoveries was tumbling open in labs and clinics around the nation. The most iconic of these new drugs were the antibiotics." Part 1, p. 21

"The remissions, even if temporary, were still genuine remissions - and historic." Part 1, p. 35

"If Farber's antifolates were his first discovery in oncology, then this critical truth was his second. It set off a seismic transformation in his career that would far outstrip his transformation from a pathologist to leukemia doctor." Part 1, p. 100

"But the story of leukemia - the story of cancer - isn't a story of doctors who struggle and survive, moving from one institution to another. It is the story of patients who struggle and survive, moving from one embankment of illness to another." Part 2, p. 148

"When the disease insinuates itself so potently into the imagination of an era, it is often because it impinges on an anxiety latent within that imagination." Part 2, p. 182

"As the armada of cytotoxic therapy readied itself for even more aggressive battles against cancer, a few dissenting voices began to be heard along the peripheries." Part 3, p. 210

"It is difficult for me to convey the range and depth of devastation that I witnessed in the cancer wards that could be directly attributed to cigarette smoking." Part 4, p. 274

"The mechanistic maturity of cancer science would create a new kind of cancer medicine, Weinberg and Hanahan posited: 'With holistic clarity of mechanism, cancer prognosis and treatment will become a rational science, unrecognizable by current practitioners.'" Part 5, p. 392

Topics for Discussion

What might have happened if Farber had approached the pediatricians at Children's Hospital regarding his idea for an anti-leukemic drug? Do you think Farber would have continued with his plans? How do you think the doctors reacted when Farber announced his ideas? Do you think there was resentment or opposition to using the new drugs? What do you think the hospital administration thought? Do you think someone in a lesser position than Farber would have had the same success? Explain.

What do you think would happen in today's society if a doctor would hasten the death of pediatric cancer patients by administering folic acid or another natural element into the treatment? Do you think the doctor would be permitted to continue the research and clinical trials?

Mukherjee talks about becoming removed from patients and their illnesses. Do you think this is due to the immersion into the medical atmosphere or is it due to the necessity of maintaining objectivity in the job? What are Mukherjee's personal opinions on this topic?

Discuss in detail the most important discoveries regarding the treatment of various cancers.

In your opinion, do you think there will ever be a cure for cancer? Explain. If so, when do you think it will be found? What type of discoveries would have to be made to find a cure? Will there ever be a blanket cure or do you think each type of cancer will have to be treated and cured separately?

Discuss the people who have been most influential in developing treatments for cancer. Who has been the most influential in Mukherjee's opinion? Why?

Discuss the career of Siddhartha Mukherjee. Do you think the author is qualified to write such a book? Is the book easy to understand? What have you learned from the material?