

The Hot Zone Study Guide

The Hot Zone by Richard Preston

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Plot Summary

The Hot Zone, a true story that took place in the late 1980's, is based upon an outbreak of the Ebola virus in a monkey house located in the Washington, D.C. suburb of Reston, Virginia. The author weaves together the tales of several previous outbreaks in Africa to describe clearly the potential damage such an outbreak could cause. The first appearance of an Ebola-like virus takes place in Kenya and costs the life of a French expatriate named Charles Monet. His bloody, painful death is re-told in graphic and terrifying terms. Hospital personnel treating Monet become ill as well, demonstrating the extreme danger of exposure to this disease. Throughout the first half of the book, several outbreaks and deaths are described.

One of the U.S. Army personnel who is called upon when the Reston outbreak occurs is Major Nancy Jaax. Jaax is a mother and an Army veterinarian who works with the most lethal viruses and other dangerous agents in full-body "space suits" within laboratories known as "Hot Zones." Nancy Jaax struggles to keep a balance between her job and her family life, but the job usually takes priority. Her husband, Jerry Jaax, also works in the Army's Veterinary Corps, and he is uncomfortable with his wife's being at such a high risk of exposure to deadly agents at Fort Detrick, Maryland.

The monkeys at a research facility in Reston, Virginia, begin to fall ill, and after some time, the head veterinarian sends tissue samples to Nancy Jaax's colleagues. They determine the illness is a strain of Ebola. The military, along with the Centers for Disease Control (CDC), takes on the task of entering the monkey house and destroying the animals in an attempt to keep the virus from jumping into the human population and causing a potentially worldwide crisis. The entire facility must be treated as a Hot Zone, and hundreds of monkeys are killed. Scares abound throughout the procedure: one woman's ventilated suit runs out of battery power, a monkey thought to be unconscious wakes up on the operating table while it is being euthanized and tries to bite a soldier, and tears occur in various members' space suits. Eventually, the entire building is decontaminated, and the personnel return to their regular lives.

Some of the people who were infected first in the story were visiting a site in Kenya called Kitum Cave. A U.S. scientific expedition goes there in hopes of finding the origins of these viruses. Unfortunately for the U.S. scientists and military, the mission is unsuccessful, but the doctor who put the expedition together was able to stow the equipment used when the cave was treated as a Hot Zone. This experience and equipment made the eventual decontamination project at Reston possible. The story ends with the book's author visiting Kitum Cave to explore the place that is still suspected to be home to Ebola's host. Through all his research and writing on the book, he has learned how to keep himself as safe as possible during his explorations. Rather than searching for the actual origin of the virus, however, he is searching for the origin of the story.



Part 1, Chapter 1 Something in the Forest

Part 1, Chapter 1 Something in the Forest Summary

Chapter one introduces the reader to Charles Monet. He is a French expatriate working on a sugar plantation in western Kenya. The story begins on New Year's Day, 1980, when Charles and a woman take an overnight trip to Mount Elgon, a formerly active volcano. During their trip, they visit Kitum Cave.

After returning to his quiet life, Monet becomes ill. The reader knows that he is experiencing a catastrophic illness, but Charles and those who treat him are unaware of how serious it truly is. He experiences headaches and backaches for several days before spiking a fever and vomiting violently for a long period of time. His eyes turn red, his face becomes expressionless, and his personality changes. Finally, a coworker drives him to a hospital in the city of Kisumu.

Doctors at the hospital cannot explain Monet's illness, and their antibiotics have no effect, so they put him on a crowded plane to Nairobi Hospital. During the flight, Monet becomes so ill that he vomits huge amounts of blood with black specks. The author explains that this is *vomito negro* and that it is saturated with whatever virus is making Monet sick. His blood has been clotting in his blood vessels and internal organs, and by now his body has depleted the clotting agent. He is bleeding from his nose, as well as internally. By the time he reaches the hospital, Monet "crashes" and falls to the floor in a river of virus-infected blood.

Part 1, Chapter 1 Something in the Forest Analysis

The author develops the first chapter with extreme attention to detail. In the plot structure of *The Hot Zone*, Part 1 acts as the exposition. The landscape of the region is used to foreshadow the potential for fear and death that may follow throughout the book. In fact, humans' fear of death becomes a recurring theme throughout the book. The sugar fields have been burned for acres around, the dark clouds gather to create a rainstorm, and the cave is full of frightening images. Likewise, the graphic description of the progression of Monet's illness allows the reader to understand, step-by-step, the fate that awaits anyone else who becomes infected. It is quite clear from the narrative that Charles Monet is the first, but certainly not the last, human who will encounter a terrible virus during the course of this story. The origins of the outbreak are foreshadowed as Monet handles a dying bird, feeds a wild monkey, and encounters bat guano and crystals in the cave.

Part 1, Chapter 2 Jumper

Part 1, Chapter 2 Jumper Summary

In this short chapter, Charles Monet is placed on a gurney and wheeled into the intensive-care unit. Dr. Shem Musoke, a young, well-liked doctor is unsure of what is happening, but he recognizes that Monet cannot breathe. When Dr. Musoke attempts to insert a breathing tube, he realizes the patient has developed severe brain damage. During the insertion, the patient vomits blood upward and it gets into the doctor's eyes and mouth. Because Monet's blood will not clot, attempts to give him a transfusion only cause him to bleed more; and he dies that evening. The autopsy shows that his recently living body resembles a several-days' dead corpse on the inside.

Within a few days, Dr. Musoke begins showing signs of illness. He treats himself for malaria and typhoid fever, but neither treatment is helpful. His doctor, Antonia Bagshawe believes he may have gall stones and orders exploratory surgery. During the procedure they find no gallstones, but Musoke's blood refuses to clot. He is then placed in the care of Dr. David Silverstein, who suspects he has some sort of virus. Silverstein sends blood samples to the Institute of Virology in Sandringham, South Africa, and the CDC in Atlanta, Georgia.

Part 1, Chapter 2 Jumper Analysis

Having already described the onset of the illness in Chapter 1, the author is able to use this brief chapter to set the pace for how quickly the virus begins to spread. It is also important in telling this true story to trace each step in the progression. The author also creates an effective atmosphere of fear by showing that doctors, who are almost always viewed as being superhuman, can so easily contract this virus.



Part 1, Chapter 3 Diagnosis

Part 1, Chapter 3 Diagnosis Summary

Several years later, the author visits with Dr. David Silverstein, who has gained a huge reputation in Nairobi. Silverstein relates a 2 a.m. phone call that informed him that Dr. Musoke's blood tested positive for Marburg, a virus about which little is known. It was named after a town in Germany where, in 1967, citizens contracted the virus from monkeys transported from Uganda to a local laboratory. Many of the monkeys had been brought in by a trader who was more interested in money than the health of the animals.

The virus is different from most because rather than being ball-shaped, it is a *filovirus*, or has tendrils like hair or worms that tangle together. They can also roll up into loops, a very unique trait. The other well-known *filovirus* is Ebola. Marburg kills one in four humans who receive medical treatment and is so dangerous that the international community immediately tries to identify the source. The best they can do is to hypothesize that it was a "hot" island in western Africa populated by sick monkeys that were trapped and sold in other countries. This is also a popular theory about the origin of HIV and AIDS. The viruses mutate enough to spread from monkeys to humans and can have a catastrophic effect.

Sixty-seven individuals were quarantined at Nairobi Hospital. Not only did no other cases appear, but Dr. Musoke eventually recovered completely. This occurrence is considered a "microbreak." When a virus is on the verge of making a large outbreak into humans, several of these microbreaks may occur at different times and places.

Part 1, Chapter 3 Diagnosis Analysis

The author places less focus on the symptoms of the illness and shifts toward the pathology of "hot" viruses in general. The immediate threat is lessened since no new cases appear, and Dr. Musoke recovers. The discussion of how these extremely deadly viruses work and their possible origins builds a foundation for the reader. The reader begins to understand through the earlier graphic descriptions of the effects of the virus the basic evolution of a hot virus outbreak. The sense of the chapter is that things are returning to normal - for now. The allusion to HIV and AIDS eventually develops into one of the book's themes.



Part 1, Chapter 4 A Woman and a Soldier

Part 1, Chapter 4 A Woman and a Soldier Summary

The setting now shifts to 4 years later in the town of Thurmont, Maryland, home to Major Nancy Jaax. She and her husband, Jerry, both serve in the Veterinary Corps of the U.S. Army at Fort Detrick in the nearby town of Frederick. She is a petite, determined woman who oversees their family of two children, a parrot, a python, and two dogs. She has faced obstacles as a woman in the Army and studies martial arts as a way to advance her career, as well as to smooth out her hand motion, which others felt was too quick and could be a hindrance when working in dangerous situations (? This sentence is very awkward and raises more questions than it answers, but I can't fix it. What kind of obstacles? How does studying martial arts advance an Army vet's career? What dangerous situations call for smooth hand motion? Did her superiors criticize her performance during an emergency at an earlier time?).

Jaax is extremely busy with her family and job. She tries to save time, for example, by pre-cooking and freezing meals. When she opens a can of beans for dinner, she cuts her right palm very badly.

Part 1, Chapter 4 A Woman and a Soldier Analysis

This is a basic introduction to Major Nancy Jaax. She is a family woman who also cares deeply about her career. The author tells the audience not only about her actions, but also why she performs them. For example, she takes up martial arts to compete better with the men and to become more graceful. Nancy is tough enough to be able to break four boards with a back kick and take down 6-foot-tall men, but she appreciates it when her little girl climbs into bed with her. When she cuts her hand, the author mentions that she cannot stand the sight of blood because she knows what some blood contains. This sets up the next chapter, which describes her work.



Part 1, Chapter 5 Project Ebola

Part 1, Chapter 5 Project Ebola Summary

The following morning, Major Nancy Jaax rises early to study for her pathology-board exams before leaving for work, where she is in training for veterinary pathology, the study of disease in animals. Her building at Fort Detrick is the United States Army Medical Research Institute of Infectious Diseases, or USAMRIID (pronounced "you Sam rid"). USAMRIID researches ways to protect soldiers from biological weapons or naturally occurring diseases. Jaax is anxious to check in on several monkeys that had been recently infected with the Ebola virus to experiment with possible cures. The project is headed by a civilian Army scientist named Eugene Johnson who has developed a reputation for being a little crazy in his enthusiasm for working with such a deadly virus.

Various areas of USAMRIID are categorized by Biosafety levels ranging from zero to four (the number one is skipped for some reason). Jaax is cleared up to Level 2, but she could not progress because she was allergic to the vaccines. To continue her work with infectious agents, she skipped ahead to Level 4, for which there were no vaccines anyway. This is her second day, and she goes through the many steps required to don a "space suit" and prepares to autopsy the monkeys that have died overnight from the Ebola virus.

Part 1, Chapter 5 Project Ebola Analysis

This chapter explains both the procedures used to keep the population safe while "hot" biochemical agents are studied and the need for such standards. Simply dressing to enter the Level 4 area requires Jaax to remove all her clothing and put on a sterile scrub suit and surgical cap before entering the Level 2 area, where she is exposed to ultraviolet light and receives socks. She then enters Level 3, where she tapes her socks to her pants and her rubber gloves to her cuffs before entering an antechamber and donning the actual suit, which is then plugged into an air hose that inflates the suit. The author carefully describes how much precaution is needed.

Eugene Johnson is also introduced in this chapter. "Gene" is characterized both through his own actions and through the opinions of others. It is apparent that Gene is a very capable scientist, but some colleagues take issue with his messiness and the fact that he does not always publish his findings.



Part 1, Chapter 6 Total Immersion

Part 1, Chapter 6 Total Immersion Summary

Major Nancy Jaax and her supervisor, Lieutenant Colonial Anthony (Tony) Johnson, enter a room with monkey cages facing each other on either wall. One side has two control monkeys that have not been infected and the other side has several monkeys with Ebola derived from a nurse who had treated an Ebola patient in Zaire in 1976. Two monkeys have "crashed and bled out," and Jaax is careful to determine that they are dead before removing one from his cage. Like Monet, they have bloody noses and red eyes, and their faces are expressionless masks caused by the destruction of connective tissue beneath the skin. Jaax and Johnson don a third pair of gloves and begin to dissect the first animal.

While wearing space suits, partners constantly check each other for leaks or tears, and Johnson notices one on Jaax's right hand. Although she is terrified, she has to endure the entire decontamination process, during which she worries that if she is infected, there is no money at the house to pay the babysitter. The decontamination process reveals that the innermost glove taped to her cuff kept the Ebola blood from entering the cut on her hand. Most experts believe that at this point, the virus can spread only through fluid contact. Shortly after all the infected monkeys die, the two control animals begin showing symptoms, and it is determined that Ebola can be transmitted through the air.

Part 1, Chapter 6 Total Immersion Analysis

Viruses are pieces of DNA or RNA that are neither living nor dead. They are sticky and attach themselves to cells, which they then use to replicate themselves. Either the cell explodes and releases new virus particles, or it discharges them slowly. Once enough cells are destroyed, the host dies.

The author makes the point that the Ebola virus itself may be nearly as old as the planet, and no matter how immune from disease humans believe they are today, a microscopically small agent exists that has the potential to decimate the population. The author refers to this agent as a slate-wiper because 9 out of 10 infected people would die. The author postulates in Chapter 5 that an airborne strain of Ebola could circle the globe in about 6 weeks. Throughout the book, viruses are personified to some degree and can even be viewed as the story's antagonist. Again, the extensive measures the scientists take to protect themselves from the virus works to reinforce the theme of a fear of death.



Part 1, Chapter 7 Ebola River

Part 1, Chapter 7 Ebola River Summary

The story shifts to the summer of 1976 and follows the progression of the Ebola Sudan and Ebola Zaire strains of the virus. The latter is the one injected 7 years later into the monkeys at USAMRIID. It begins with the death of a storekeeper in a cotton factory in southern Sudan. He is known as Mr. Yu. G., and is considered the "index" case. A few days later two of his coworkers die, but not before at least one spreads the agent by touching and sexual contact. It passes through 16 generations and kills 50 percent of those infected. Ebola Zaire hits the hospital in the town of Maridi, where it kills patients and medical personnel alike. Perhaps because it kills its host so quickly, before they can infect others, the virus suddenly vanishes.

Two months later and 500 miles away, a twice-as-deadly filovirus emerges in Zaire at a mission hospital that uses five syringes a day to administer medicine to hundreds of people. The virus erupts in 55 villages around the hospital as a result. One nun from the village, Sister M.E., was taken to the city of Kinshasa where she infects Nurse Mayinga. Disregarding her own symptoms, the nurse travels around the city before returning to the hospital to die.

As the epidemic grows, samples of the nurse's blood were sent around the world to identify the illness. It was found to be related to Marburg. Dr. Karl Johnson of the CDC names it Ebola after a river in the area where it was discovered. The World Health Organization and international doctors travel to the area to try to stop the outbreak. Eventually, it dies out on its own.

Part 1, Chapter 7 Ebola River Analysis

This chapter is again very graphic in describing the effects of the virus. It also underscores the fear and bravery of the people trying to help the victims. In some cases the medical staff members of hospitals run away, which actually helps slow the spread of the virus. In one case, a woman treating Nurse Mayinga chooses not to continue wearing her gas mask to care for the patient more effectively. Still other international doctors become too petrified to even exit the aircraft once they have arrived in Africa. Entire villages with centuries of experience with smallpox barricade roads into their towns and quarantine victims in huts at the edge of the village. In the end, it is unclear why the outbreak suddenly stops. The author uses a flashback to communicate this history to the reader.

Part 1, Chapter 8 Cardinal

Part 1, Chapter 8 Cardinal Summary

At this point, the narrative jumps to September 1987, where a container of blood samples from a dead Dutch boy is smuggled to Eugene Johnson. The child, whose name was Peter Cardinal, died at Nairobi Hospital in Kenya of what Johnson identifies as a new strain of the Marburg virus. Johnson discovers that the boy had recently visited the Kitum Cave, which is the very same cave that Charles Monet visited in the first chapter. The child's death was very similar to Monet's except that rather than "bleeding out" through his orifices, the boy bled out under his own skin.

Part 1, Chapter 8 Cardinal Analysis

Although the story has moved forward in time, the author is still using flashbacks to build the history of the Marburg and Ebola viruses. The flashbacks make it clear at the beginning of this chapter that viruses never completely disappear from the planet; they simply go into hiding, living in animals or insects or even killing the occasional human without creating a large-scale outbreak. This is reinforced by the fact that the Cardinal strain appeared in the Danish boy 7 years after Monet succumbed to it. While hot viruses are parasites, it is easy to think of them as predators or personify them as villains especially since they appear to lie in wait and then surprise the unsuspecting victim in a vicious, deadly attack.



Part 1, Chapter 9 Going Deep

Part 1, Chapter 9 Going Deep Summary

After traveling to Kenya to investigate Peter Cardinal's death, Eugene Johnson convinces the government to let him explore Kitum Cave in the spring of 1988, and he recounts that story to the author years later. Thirty-five members treated the cave as a Level 4 hot zone and conducted all their work in the cave while wearing space suits and following all Level 4 protocols, such as taking decontamination showers after leaving the cave. The team took 17 monkeys and many guinea pigs into the cave to leave at various places in an attempt to expose them to the virus so that some would get sick, and the researchers would have a specific place to look for the Marburg virus.

During their stay, they collected between 30,000 and 70,000 biting insects, trapped and dissected hundreds of small animals, and eventually killed and studied all the monkeys. They did not find a trace of Marburg, although local people often shared stories of someone they knew dying a horrible bloody death from what may have been the virus.

In the summer of 1989, the Jaaxes were stationed at the Institute of Chemical Defense in Maryland. Nancy Jaax's former commander at USAMRIID changed jobs and promoted Nancy into his former position.

Part 1, Chapter 9 Going Deep Analysis

Eugene Johnson is intent on finding the origin of the Marburg virus. He conceives, orchestrates, and leads the expedition to Africa. Despite his obsession with the virus, he never loses his perspective regarding how deadly Marburg is. When the researchers go to Africa, they bring army-issue body bags and discuss what they want done with their remains should they die at Kitum Cave. The fear of death is very pervasive in this chapter, but so is the need to learn more to protect the greater public at large. Despite the lack of findings in Africa, Johnson keeps their equipment at USAMRIID, perhaps knowing it will someday be needed. The final detail of the chapter moves Nancy Jaax back into the story.



Part 2, Chapter 1 Reston

Part 2, Chapter 1 Reston Summary

The setting is Reston, Virginia, in October and November of 1989. A company called Hazleton Research Products houses the Reston Primate Quarantine Unit, where monkeys spend a month after being imported. Approximately 16,000 monkeys are imported into the U.S. annually, and they must be quarantined to ensure that they are disease free. Veterinarian Dan Dalgard is called in by the manager because many of a shipment of 100 macaque monkeys from the Philippines are dying, possibly because the heating system will not shut off. Dalgard identifies a couple of listless animals in Room F, and by the next day they are dead. He dissects the crab-eating monkeys and finds very enlarged and hardened spleens. He does not realize this is a result of the spleen being engorged with clotted blood. New monkeys are arriving and are put in Room H.

Meanwhile, Jerry Jaax's brother, who was a partner in a plastics business, is gunned down in his office. Jerry works with the authorities to catch the killer, but he has never been found. Nancy begins to suspect that Jerry is sinking into a clinical depression.

Part 2, Chapter 1 Reston Analysis

The first chapter of Part 2 of the book is really the beginning of the rising action of the story. A great deal of the chapter is devoted to showing how the planned community of Reston was designed. It is an orderly suburb where catastrophic disasters are unthinkable. That such a safe, ordinary community could be placed in jeopardy by an uncontrollable virus was impossible to contemplate.

In the monkey house the majority of dying animals are located in Room F at the end of the hall. The recently wild monkeys are agitated from being in captivity, and the broken heating system is making everything that much more unbearable. The growing chaos in the monkey house is juxtaposed with the order of the planned community outside. The suburb of Reston symbolizes the typical American community, while the interior of the monkey house symbolizes the havoc that ensues once a Level 4 virus has been unleashed. Just as a human host deteriorates over the course of the virus' cycle, so does the building.

Jerry Jaax discovers in this chapter that his brother John has been murdered. Jerry does not take this news well, and he begins to lose more and more sleep while obsessing about catching the killer. He is characterized by his own actions of constantly calling the police on the case, but the reader also learns that his wife believes he may be clinically depressed.



Part 2, Chapter 2 Into Level 3

Part 2, Chapter 2 Into Level 3 Summary

Dan Dalgard decides to call USAMRIID and sends samples of blood and spleen to a civilian virologist named Peter Jahrling. Jahrling dresses in surgical scrubs and takes the monkey meat into a Level 3 laboratory for tests. Somewhere along the line he jokes, "Good think this ain't Marburg."

While he and his assistants are growing the virus in test tubes full of monkey cells, Dan Dalgard learns that the animals in Reston seem to be doing better. His relief is short lived, as that night eight more monkeys die. Half the monkeys in room F are now dead. A few days later monkeys begin to die in other rooms, as well. Believing the animals have simian hemorrhagic fever, which is fatal to monkeys and harmless to humans, Dalgard euthanizes the remaining monkeys in Room F.

Part 2, Chapter 2 Into Level 3 Analysis

By describing the way Peter Jahrling is dressed and the haphazard way Dan Dalgard has wrapped the monkey tissue, the author shows that no one is unduly concerned about the virus that is killing the monkeys in Reston. Although it is a sad situation, no one seems to feel it is any threat to humans. Suspense is built around the fact that it takes days to grow the virus in test tubes, and no one involved realizes the urgency with which they should be working. The dramatic irony is that the reader is aware of the urgency, and this works well to create tension.



Part 2, Chapter 3 Exposure

Part 2, Chapter 3 Exposure Summary

On November 17, an intern at USAMRIID named Thomas Geisbert checks on the test tubes. Geisbert is characterized as an outdoorsman who loves to hunt and fish, but who is also engrossed in his job. He notices that the cells are dying, puffy and full of black specks. He and Jahrling think that some bacteria must have contaminated the samples, and they sniff the test tubes to try to detect a bacterial odor. They decide to take a closer look, and Geisbert prepares some of the liquid for the electron microscope. It is late on Friday, however, and Geisbert leaves for a week-long hunting trip. The chapter ends on an ominous note about how a filovirus incubates in a human for 3 to 13 days before the headaches begin.

Part 2, Chapter 3 Exposure Analysis

While the main goal of the chapter is to depict how Tom Geisbert and Peter Jahrling are exposed to the unknown virus, it is done in a very subtle way. As if it were just another simple detail of the story, the author describes off-handedly how Jahrling waved his hand over the test tube to bring the scent to his nose. Jahrling then offers it to the intern to teach him the method of detecting certain bacteria. The dramatic irony is that the audience knows the characters have been exposed to a filovirus while the characters themselves do not.

Part 2, Chapter 4 Thanksgiving

Part 2, Chapter 4 Thanksgiving Summary

The Jaxx family is living through a horrible Thanksgiving. They have turkey with Nancy's dying father on the family farm and then drives to Andale, Kansas, for another dinner with Jerry's family. His family is still in turmoil following his brother's murder. They spend a couple of extra days to take Nancy's father to the hospital for cancer treatment.

Dan Dalgard has been anxious all weekend to get the test results from Jahrling, who says he believes the monkeys have simian hemorrhagic fever, but that he cannot be certain just yet. This is bad news for Dalgard because it has such a high fatality rate in monkeys. He is also concerned because it is showing up in animals that are far away from Room F.

Part 2, Chapter 4 Thanksgiving Analysis

So many things are going wrong. This creates a sense in the reader that these are real people, dealing with really difficult issues. That is underscored by the fact that it is a true story. It is also interesting to consider these personal tragedies against the backdrop of a potential Level 4 virus at large in the human population. While human tragedies are all-consuming to those involved, a tiny virus has the potential to dwarf that suffering.

Part 2, Chapter 5 Medusa

Part 2, Chapter 5 Medusa Summary

Tom Geisbert returns to work on November 27 and uses a diamond knife to cut his prepared specimen into slices about the size of a period on a page. The slices are suspended on a drop of water, lifted out on a tiny grid, and taken to the electron microscope. Each slice has many cells in it, and examining it under the electron microscope is like looking at the landscape from an airplane. He sees that the cells have been blown apart, and that they appear to be crawling with microscopic worms. Geisbert experiences what is known in this line of work as "the puke factor" when he realizes that the cells look just like those drawn from Peter Cardinal who had died from Marburg.

One of Tom Geisbert's first thoughts is that he and Peter Jahrling have been handling it without proper precautions and that they have, in fact, inhaled the air over the test tube, checking for odor. As he goes about taking and developing photos, he is constantly trying to decide whether he may be ill. In addition to the snake-like protrusions, he sees that the dark specks in the cells are "inclusion bodies." These are crystal-like blocks in the cells that contain and replicate the virus.

Part 2, Chapter 5 Medusa Analysis

While looking through the electron microscope, the specimen "was like looking at a landscape from high altitude." Tom Geisbert sees what looks like rivers and forests and towns. The picture this creates offers a glimpse into the idea that even something so incredibly tiny is amazingly complex, and it builds on the theme that size is irrelevant.



Part 2, Chapter 6 The First Angel

Part 2, Chapter 6 The First Angel Summary

Tom Geisbert develops his pictures of what looks to be the Marburg virus and takes them to Peter Jahrling. As he looks at the photographs, Jahrling remembers his comment while working with the monkey tissue, "Good thing this ain't Marburg." He decides it does look like a filovirus and interrupts a meeting with Colonel Clarence James Peters by quickly flashing the photographs so no one else in the room would see them. Peters orders more tests, and Jahrling sets up one that will better determine the type of filovirus.

After meeting with Colonel Peters, Tom Geisbert and Peter Jahrling shut themselves into Jahrling's office and decide not to tell anyone they had sniffed the test tubes of infected cells. They want to continue working and stay out of "The Slammer," USAMRIID's long-term quarantine area. They agree to check their blood continually for infection.

Part 2, Chapter 6 The First Angel Analysis

Recognizing the infection as a filovirus has some very ominous implications. All three of the filoviruses identified thus far have the potential to devastate the human population. There is real cause for concern because several people have now been exposed, and if the virus is growing, or amplifying, in them, they are exposing many more people daily as they go about their lives. The author does not make judgments about their decision, however, and the reader is left to make his or her own determinations of these men's characters.



Part 2, Chapter 7 The Second Angel

Part 2, Chapter 7 The Second Angel Summary

The next morning, Tom Geisbert confirms that the monkeys at Reston have the filovirus. Peter Jahrling calls Dan Dalgard to let him know there is a danger, but he does not share how big of a potential danger it really is. All necropsies are suspended to lower the humans' exposure to infected blood. Meanwhile, Jahrling is conducting his test to determine the type of virus they have. It involves introducing the unknown virus to blood that is infected with known agents. If the virus comes into contact with its own kind, the sample will glow. Peter Jahrling is horrified when he looks through his microscope, and blood from Nurse Mayinga of Zaire is glowing. The filovirus is not Marburg. It is the even more fatal Ebola Zaire.

Part 2, Chapter 7 The Second Angel Analysis

It is tempting to see the revelation of the *filovirus* as the climax of the story, but this chapter makes sure the action continues to rise. While waiting for the test results, Dan Dalgard is becoming agitated. Tom Geisbert goes home to his young children. The monkey keepers continue about their work at the monkey house in Reston. Agitation is one of the symptoms of the illness caused by the viruses. Geisbert could be infecting his toddlers. The monkey keepers are repeatedly being exposed to a Level 4 hot agent. The tension is definitely growing. Each ordinary detail takes on a new meaning when the reader considers that these people may be infected.



Part 2, Chapter 8 Chain of Command

Part 2, Chapter 8 Chain of Command Summary

Peter Jahrling repeats the test and again it shows that he has been exposed to Ebola Zaire, which kills approximately 9 out of 10 humans. He calls Colonel Peters, and they take it up the chain of command to Colonel David Huxsoll. They call all the proper parties, including Major General Phillip K. Russell, and decide to bring Lieutenant Colonel Nancy Jaax on board as well. Because of their expertise, both she and Jerry would be involved. One of their major concerns is that Gene Johnson showed previously that Ebola can be transmitted through the air.

The group now faces several problems. Because there is no cure or vaccine, they decide to use biocontainment at the monkey house. Rather than letting the disease run its course, they plan to euthanize the animals and minimize their suffering. Finally, there is a political aspect to the operation that could become ugly. For example, the Army has the ability to run the operation, but not the mandate. Meanwhile, the CDC has the authority but is not equipped to handle the problem. Russell calls Frederick Murphy of the CDC personally. Murphy is one of the original discoverers of Ebola.

The politics get even more convoluted as more groups get involved. There is the company that runs the monkey house, the Virginia state health authorities, county authorities, the U. S. Department of Agriculture and the Environmental Protection Agency; in addition to the Army and the CDC. Because the monkey house sits on private property, permission has to be granted for anything to happen, and the company is not very forthcoming about letting the Army into their domain.

Part 2, Chapter 8 Chain of Command Analysis

As if the potential for a national health emergency is not enough, the number of organizations that need to be involved makes everything more complicated. The company's reluctance to have the Army intervene sets the tone for the power struggles that ensue in this type of situation. Politics and bureaucracy become a central theme of the story.



Part 2, Chapter 9 Garbage Bags

Part 2, Chapter 9 Garbage Bags Summary

Colonel Peters calls Dan Dalgard the next day and asks him whether they can send some folks down. Dalgard is fine with their picking up some tissue samples but dodges Peters' request to see the monkey house. Dalgard gets a shock when he learns that one of the animal caretakers has gone to the hospital over the weekend with a heart attack. Dalgard worries it could have been caused by a blood clot resulting from Ebola in the body. He chooses not to tell the hospital that the man has been exposed.

Nancy Jaxx and Colonel Peters travel in civilian cars to Reston where Jaxx is able to look at some of the monkey's tissue under a microscope. It is so full of inclusion bodies that some sections of cells had simply exploded and liquefied. Peters requests some samples of monkeys and they are directed to a gas station out of town where they are met by the monkey house manager, who has a van full of dead monkeys in plastic garbage bags. Jaxx and Peters are horrified at the lack of protection between the dead animals and themselves. Despite their fear and the fact that it was probably illegal to transport dead animals with infectious diseases across state lines, they load the bags into Peters' trunk.

Part 2, Chapter 9 Garbage Bags Analysis

Colonel Peters and Gene Johnson have both begun to think that USAMRIID may have to quarantine the monkey house and destroy every living thing inside. Because the sight of so many uniformed military personnel might cause alarm, the caravan dresses in civilian clothes. In life, as well as in the book, the military symbolizes protection--and the need to be protected. Peters wonders what difference it would have made if something like this could have been done when AIDS first emerged from the jungle. Johnson realizes that such an operation would have to be very carefully planned and executed.



Part 2, Chapter 10 Space Walk

Part 2, Chapter 10 Space Walk Summary

Peters and Jaxx transport the dead monkeys to USAMRIID, and they are taken to the Level 4 hot zone. She and an assistant perform necropsies with sharp instruments on animals full of Ebola-infected blood. The first monkey may have died of Ebola, but the necropsy is not conclusive.

Part 2, Chapter 10 Space Walk Analysis

The only glass allowed in the hot zone is in the form of slides for microscopes. The mention of this, along with the description of the danger remind the reader of the first time Nancy Jaxx went into the Level 4 area and came out with Ebola blood inside her space suit. Throughout the story, any sharp implement comes to symbolize potential infection; and there is no shortage of syringes, scalpels and teeth in the story. The people working in these areas must be extraordinarily careful because they simply do not want to die.



Part 2, Chapter 11 Shoot Out

Part 2, Chapter 11 Shoot Out Summary

Colonel C.J. Peters is holding a meeting that includes nearly every person in the world who understands the meaning of the Ebola virus, including Joe McCormick of the CDC, who had lived in a hut full of people dying of the virus in the southern Sudan in Africa. When the author writes this story years later, McCormick remembers that at this meeting he offered to help with the outbreak, while the Army contends the CDC tried to take over the operation. What is known is that McCormick's experience of living in such close proximity to people dying with Ebola convinced him that it is difficult to contract and that perhaps the Army is being overly cautious. In the end, Fred Murphy of the CDC recognizes that his organization is outgunned and backs down. The group decides that the Army will handle the monkeys and the monkey house, while the CDC will handle any human outbreaks of Ebola.

Part 2, Chapter 11 Shoot Out Analysis

Up to this point, the narrative has featured stories of those who have contracted Ebola or Marburg, and these people have died horrible deaths. The fact that Joe McCormick breathed the same air as the others in that hut in Africa gives the reader some hope that perhaps the illness is not quite as contagious as was previously thought. However, the main players in the story do not even seem to consider this, and since they drive the story, the reader trusts them and their concerns. It is clear that the theme of politics and bureaucracy is coming into play yet again during these conversations.



Part 2, Chapter 12 The Mission

Part 2, Chapter 12 The Mission Summary

While waiting for permission to enter the building, Colonel Peters chooses Colonel Jerry Jaax to lead a team into the monkey house. Jaax and Gene Johnson plan the operation to euthanize all the monkeys in one room and see whether the virus continues to spread. The entire building would be treated as a Level 4 hot zone, and Jerry Jaax has never donned a space suit. They would use the gear Johnson had hidden away after his African trip to Kitum Cave.

Dan Dalgard goes home that evening after stopping at the store to buy flowers for his wife. As he is revisiting all the events of the monkey house in his head (and on his computer diary), the phone rings. Colonel Nancy Jaax is calling to say that the necropsies on the dead monkeys were inconclusive. It is possible that the monkeys died of Ebola, but it could have been simian hemorrhagic fever.

Part 2, Chapter 12 The Mission Analysis

As Jerry Jaax and Gene Johnson are planning to enter the building, they treat it the same way they would if they were going into a hospital full of humans with Ebola. Team members will be wearing space suits and will follow all the protocols they would follow if they were back in the Level 4 lab. While they are there to euthanize the monkeys and gather scientific specimens, the number one priority is the safety of the human population. That population includes everyone in the world, not just those entering the monkey house.



Part 2, Chapter 13 Reconnaissance

Part 2, Chapter 13 Reconnaissance Summary

On Thursday morning, one week after Thanksgiving, Dan Dalgard invites the Army to euthanize the monkeys in Room H. Jerry Jaax gets his team together and knows that Nancy will want to be a member, too. That means that their kids will be on their own while Mom and Dad are both in a Level 4 hot zone. Gene Johnson drives down to Reston to take a look around and is horrified to find that very few precautions have been taken by the humans working there. While he is trying not to breathe deeply, the building manager is snacking on candy.

Others begin to arrive, including some of the monkey house lab workers who heard reports about the deadly Ebola virus on a radio during their drive to work. They nearly panic, but Nancy Jaax shows up and calms them down. She and Colonel Peters notice that none of the workers wears respirators, and no one offers them any before taking them into the building. During the tour, Jaax is respectful toward the monkeys, so they will not spit at her and possibly make her ill. She sees that they still have their canine teeth, which poses more danger to those who will have to handle the animals. Nancy does not reach home until long after her kids are in bed, and she learns that her father is very close to death.

Part 2, Chapter 13 Reconnaissance Analysis

A major source of concern for all of the USAMRIID folks is that the workers in Reston do not seem to have any idea of how serious their situation is. They enter and exit the building without protection. In fact, Dan Dalgard has ordered them to wear respirators, but most just ignore the demand. The team must walk a fine line between keeping themselves safe and not causing a huge panic.

The author reminds the reader that now not only is Nancy taking the chance of being exposed to a Level 4 agent, but that Jerry will also enter a biocontainment area for the first time. There is a brief mention of Jerry's taking care of the kids on his own while she stays late at the lab. This adds to the overall idea that her job keeps her from her family.



Part 3, Chapter 1 Insertion

Part 3, Chapter 1 Insertion Summary

Jerry Jaax and Gene Johnson gather all the equipment used for the Kitum Cave expedition and load it into unmarked vans. They drive to Reston as the *Washington Post* is carrying a story about the Ebola outbreak in the monkey house. Colonel C.J. Peters has managed to downplay the severity of the operation to avoid a panic.

They park their vehicles out of sight behind the monkey house. They also develop a system for getting personnel into the building that includes putting their space suits on inside in case a reporter were to come around the building. Jaax is the first person in. He suits up and walks down a long hallway that serves as sort of an airlock between the Level 4 area and the outside world. He and his partner, Captain Mark Haines check out the animals and then get to work by using a mop handle to pin the monkeys down in their cages and then injecting them with a syringe on a pole.

Meanwhile, Nancy Jaax gets the kids off to school, letting them know that they will be on their own that evening. She drove to Reston and entered the monkey house where Dan Dalgard gave four sick animals injections that stopped their hearts. She safely secured the carcasses and took them back to USAMRIID for necropsies. This time, there was no doubt the animals were infected with Ebola.

The following morning, Dalgard pulls up to the monkey house to find one of the workers outside vomiting.

Part 3, Chapter 1 Insertion Analysis

This chapter is the culmination of everything that has happened so far and is really the climax of the story. All the research on Marburg and Ebola, all the experience in Level 4 laboratories, and all the equipment used exploring Kitum Cave have now come into play. The tension is maintained, however. When Jerry Jaax and Mark Haines enter the hot zone, they run into two workers outfitted only with respirators. While working inside the Level 4 area, Nancy Jaax notices that someone's spacesuit has a rip. People are still being exposed to the virus. It is possible that everyone's worst fears are coming true when Dalgard pulls up to find an employee throwing up outside the building.

Part 3, Chapter 2 A Man Down

Part 3, Chapter 2 A Man Down Summary

Dan Dalgard helps the sick employee into the building and has him lie down. Now two people are ill. One employee, Jarvis Purdy, is recovering in the hospital from a heart attack, and now this man, Milton Frantig, has a fever. Dalgard is overwhelmed and turns the entire facility over to USAMRIID. The CDC puts Frantig into the hospital, even though Colonel C.J. Peters wants to place him in the Slammer because of the possible spread of disease in the hospital. An ambulance picks up Frantig, and a news crew is there to catch it. The remaining monkey house workers leave their jobs, and 450 monkeys are hungry, many of them dying, in a building with a temperature of over 90 degrees.

Part 3, Chapter 2 A Man Down Analysis

The fact that Milton Frantig becomes ill is the turning point for Dan Dalgard. Up to this point he felt the virus was something that could be contained, but the reality of the situation has hit him. As he was requesting an evacuation for the company, he broke down in tears. He has been characterized as a loyal employee and solid worker, but this action shows him to be a compassionate person, as well. Seeing Frantig sick and taken away in an ambulance was also the last straw for the other workers, who walked away from the building and the Ebola.



Part 3, Chapter 3 91-Tangos

Part 3, Chapter 3 91-Tangos Summary

The monkey house is turned over to the Army, and Jerry Jaax has to take another, larger crew in to euthanize the rest of the animals. The animal technicians are classified as 91-T. In Army-speak that becomes 91 Tango, and it is the basis for the chapter title. Many of the 91-Tangos are young and untested, but they volunteer to don the space suits and do the work. Gene Johnson stays up all night playing out scenarios and making notes so that there is an effective plan in place for the operation the next day.

Jerry Jaax leads the teams and begins by feeding the animals that have not eaten since the caretakers hurriedly left. He notices that there are sick animals all over the building, which reinforces the idea that the Ebola is traveling through the air. They inject the monkeys to knock them out and then retrieve blood from the animals before giving them another injection to kill them. Then a necropsy is done, and samples of each animal are taken.

Part 3, Chapter 3 91-Tangos Analysis

Destroying so many animals is grueling work. It is over 90 degrees in the building, and each team member is wearing an awkward spacesuit. Even worse, the act of killing these innocent animals is heartbreaking to the veterinarians. The job is both mentally and physically exhausting. Gene's act of staying up all night to devise procedures for use in the monkey house shows not only his fear of dying, but also the fear of others.



Part 3, Chapter 4 Inside

Part 3, Chapter 4 Inside Summary

That evening, there is an emergency when the fan in one team member's self-contained suit begins to die. They get a new battery to her, but the suit loses pressure, and it is enough to rattle her. Jerry Jaax sends her out of the building. On her way through the decontamination process, a soldier notices that she has a hole in her suit. Gene Johnson assures her the pressure in her suit would have kept the virus out. She and her partner are sent to hide out in a vehicle because a news crew has arrived. The crew sees no action in the front of the building, grows bored, and leaves without coming around the back and discovering the operation.

Part 3, Chapter 4 Inside Analysis

This chapter explores the ongoing danger for the people working in the monkey house. Each little tear or minor problem can have disastrous results because such a small amount of the virus is needed to effectively kill a human being. Size is, after all, irrelevant in this case. The 91-Tangos are risking their lives for this operation, and because they are wearing space suits, they are not even eligible for hazard pay.

Part 3, Chapter 5 A Bad Day

Part 3, Chapter 5 A Bad Day Summary

The second day of the massive operation is Wednesday. At USAMRIID, a scientist named Thomas Ksiazek develops a test that can quickly determine whether someone is infected with Ebola. Milton Frantig is not infected. It is a complete mystery why none of the monkey house workers have been diagnosed with Ebola.

During the day's work, one monkey escapes. The animals are vicious fighters, and this one may be infected with Ebola, so it is a very tense situation. The animal runs, hides, and leaps about the facility getting the other monkeys agitated. They decide to continue their work and deal with the loose monkey later. Rhonda Williams, the same woman who had trouble with her suit yesterday, is taking a blood sample from an unconscious monkey, when its eyes move. The monkey wakes and grabs her hand, trying to bite it. Another soldier gets there in time to sedate the animal before it can hurt her.

Back at the USAMRIID laboratories, Peter Jahrling and Tom Geisbert continue studying the virus to determine where it came from and how it is spread. Neither of them have any symptoms of Ebola, despite having sniffed the test tube of infected blood. Jahrling continues to check their blood for signs of the virus, and it remains untainted.

Part 3, Chapter 5 A Bad Day Analysis

The news that Milton Frantig is not infected with Ebola should be a great relief to all involved with the operation, but everyone remains concerned. That night, Specialist Rhonda Williams even dreams that she is being attacked by a monkey with an infected syringe. The situation takes its toll on everyone involved. That one, tiny, loose monkey in the building symbolizes the virus itself. The animal is small, like Ebola, but it can take down a man 10 times its size. It is also unpredictable and can hide anywhere--much like the virus in the jungles of Africa.



Part 3, Chapter 6 Decon

Part 3, Chapter 6 Decon Summary

On Thursday morning, Nancy Jaax is awakened when her brother calls to say that their father is just about to die. Nancy decides she cannot go see him in the middle of the crisis. She goes to work, where a few of the dead monkeys that are not being incinerated are awaiting necropsies. As she works, her father passes away, and she flies home over the weekend to attend the funeral.

On Friday, December 7, the last monkey, the little one that escaped earlier, is finally put down. The crewmembers think they are finished until they find a chest freezer containing the remains of some of the first monkeys to die in Room H 2 months ago. Once they are exposed, the decon team arrives, led by Merhl Gibson. The walls are so caked with matter that they have to bring in putty knives and scrape the inside of the building before setting up 39 electric frying pans, each holding a handful of disinfecting crystals. The building is sealed airtight, and the heated crystals kill every living thing - plant, animal or virus - in the building. The teams also receive word that Milton Frantig, the monkey house employee who had fallen ill, has recovered from what appears to have been a mild flu. Again, everyone wonders how the virus managed not to kill any human beings.

Part 3, Chapter 6 Decon Analysis

The decon team's job is to completely destroy anything left that could potentially be a host to the virus, as well as the virus itself. It is practically impossible to verify that an area has been completely sterilized, but the decon team places sheets of a harmless, but hard to kill, bacteria in the building. When they test the bacteria and find it is all dead, they can assume that anything else that may have been living in the building is also dead.

The CDC attempts to trace the virus back to its source. They can trace it back as far as a monkey-storage facility in Manila in the Philippines. The facility also experienced a large number of monkey deaths, but no humans had fallen ill there, either. This adds to the mystery of the virus since it appears to have originated in Africa, but it was also present in the Philippines; and no one can figure out how it killed so many monkeys but no humans.



Part 3, Chapter 7 The Most Dangerous Strain

Part 3, Chapter 7 The Most Dangerous Strain Summary

The month ended, and in January 1990, Hazleton Research Products resumes importing monkeys from the Philippines. They bring with them a fresh bout of Ebola, and the company, the Army, and the CDC decide to let the disease run its course in a sort of experiment. They find that it jumps from room to room easily and that once one monkey becomes sick, about 80% of the monkeys in that room die. The virus seems to have mutated into more of a flu-like illness this time.

The virus is named Ebola Reston, and it kills every monkey in the monkey house. All four of the animal caretakers eventually test positive for Ebola Reston, but the virus merely incubates for a period and then vacates the system with no ill effects. The author visits Nancy Jaax and gets a chance to look at Ebola under a microscope. Marburg, Ebola Zaire, and Ebola Sudan have been joined by Ebola Reston. Researchers say that it is so much like Ebola Zaire that they cannot say why it does not seem to make humans sick.

Part 3, Chapter 7 The Most Dangerous Strain Analysis

This chapter encompasses the falling action of the plot structure. The truly frightening thing about Ebola Reston is the potential it had to jump into the human population. Many of those exposed continued to interact with other people. If this virus affected people, the possibility of a major emergency was huge. Instead, the Ebola Reston virus becomes more and more of a mystery.



Part 4, Chapter 1 Highway

Part 4, Chapter 1 Highway Summary

Three years later, author Richard Preston travels to Africa on his own to see where Marburg and many other viruses may have originated. He and his companions travel the Kinshasa Highway, which practically cuts Africa in half. When much of it was paved in the 1970's AIDS began appearing in the cities along the road. When it became easier for people to travel, it also became easier for viruses to travel. They are heading to Mt. Elgon and Kitum Cave.

Part 4, Chapter 1 Highway Analysis

With this new section of the book, the author signals the denouement of the story. AIDS makes up a theme the book, and this chapter focuses on the HIV virus. Like Marburg or Ebola, it has survived for thousands of years in some unknown host in the jungle. There is some living creature that carries the virus without becoming ill, and eventually it comes into contact with humans. Before the Kinshasa Highway was paved, it was very difficult for people to travel long distances, and the virus stayed somewhat contained in smaller populations. Once people began to travel more freely, they carried the virus with them to the outside world, and millions of deaths have resulted. The author believes that if it had been noticed earlier, the true threat would have been masked by the long incubation period, and very little would be different now. One is concerned that AID and HIV are foreshadowing another faster-spreading virus.



Part 4, Chapter 2 Camp

Part 4, Chapter 2 Camp Summary

Along with his guide, Robin McDonald, a few others accompany Richard Preston to the cave. There is trouble in the area, and visitors must also have an armed guard to keep them safe from poachers. The author has a written list of instructions sealed up for them to follow should he become ill. They chose to camp where Charles Monet had camped all those years ago. Everywhere he looks, Preston sees potential hosts. He considers that the stinging nettles of a tree may contain Marburg or that the moths flying around him to carry the virus. He has brought the makings of a Level 4 spacesuit with him and puts it all on before entering the cave alone.

The inside of Kitum Cave is dry and dusty, which is unusual for a cave and great for a virus. He notices sharp crystals and wonders whether the young boy, Peter Cardinal had perhaps cut himself there and gotten Marburg into his bloodstream. Further in, he finds a spider's nest and thinks that perhaps the Cardinal boy and Charles Monet had been bitten by spiders and acquired the virus that way. At one point, the author hits his head and worries that the virus could have gotten in through tiny cracks in his skin.

The author's final step is to visit the now-abandoned monkey house in Reston. He finds no people but there are plants growing inside the building. There is also a spider web and egg sac in another window. Life has returned to the monkey house, but not in the same way.

Part 4, Chapter 2 Camp Analysis

Again, the author reflects on the origin and spread of AIDS. He sees it as sort of a price paid for destroying the natural habitat in Africa. He points out that the rain forest holds most of the plant and animal life in the world and that all life carries viruses. If the earth could be viewed as a living thing, it is as if the extreme "amplification" of the human race is a virus. Perhaps AIDS is the planet's immune system kicking in to get rid of the problem. If it is unable to do the job, there are other viruses hiding out there that may do it instead.



Characters

Major Nancy Jaax

First introduced in the chapter entitled "A Woman and a Soldier," Major Nancy Jaax (who will become Lieutenant Colonel Nancy Jaax) seems to be a somewhat frazzled mother. She was a veterinarian in the Army, and her work at Fort Detrick in Maryland often took her away from her children. Consequently, she often made up batches of meals in advance so they could easily be thawed and reheated in the microwave. She and her husband, Jerry, met in college and both became veterinarians. They eventually entered the military together as members of the Army's Veterinary Corps. They lived in Maryland with their two children, Jason and Jaime, and various pets. Nancy's work took her away from her family in other respects, as well, and she missed saying goodbye to her dying father because she felt that leaving during the decontamination mission would be a "dereliction of duty."

Nancy Jaax had to fight to get into the pathology group at the United States Army Medical Research Institute of Infectious Diseases (USAMRIID). At that time, her status as a "married female" made other people feel that she was unqualified for the job and that she would panic in a dire situation. The military at that time was still a very male-oriented organization. In addition, Nancy had bad reactions to the vaccinations necessary to enter the program. She actually wanted to get into the Level 4, or the highest-risk part of the program, because there is no vaccine for those agents. Finally, Nancy's hands tended to move very quickly, and that made others nervous. When individuals handle sharp instruments that could be contaminated with virus-infested blood, everyone wants to believe that his or her partner is going to handle these instruments safely.

Over the course of time, Nancy battled through each of these objections. She studied martial arts to control her movements, and at 5 feet, 4 inches, she could knock a 6-foot-tall man to the ground easily. Getting accepted into the program also included her standing up for herself to the colonel in charge of the program. She proved her desire and her competency, and by the time of the outbreak at the monkey house in Reston, Nancy Jaax had been promoted to the Chief of Pathology at USAMRIID.

Eugene "Gene" Johnson

Gene Johnson was a civilian scientist working for the Army at USAMRIID. He was an expert in Ebola-like viruses (*filoviruses* like Ebola and Marburg) and ran the Institute's Ebola research program. Gene was a disheveled and somewhat disorganized man who would travel all over the world to scour jungles in search of the origins of Ebola. Despite his desire to track down Ebola's natural host, Gene was terrified of the virus and suffered from nightmares of exposure. Some people grew frustrated with him because he tended not to publish the results of his work.



One of the expeditions Gene led but did not document was to the Kitum Cave. He turned the entire cave into a Level 4 Hot Zone and created a decontamination area outside the cave to replicate a lab. Gene took dozens of animals with him, none of which became infected with Ebola or Marburg. After collecting hundreds of samples, the group did not pinpoint the source of the virus. Gene's most important contribution may have been in gathering all the necessary equipment and creating the procedures necessary for the Kitum Cave expedition. Upon returning to Fort Detrick, Gene Johnson was able to keep and stow all the gear that would become central to the success of the decontamination project at Reston. Gene's experience also played a major role in the operation's success since he designed procedures and policies to keep the soldiers safe at the monkey house.

Colonel Clarence James "C.J." Peters, MD

Colonel Peters oversaw the actual operation at the Reston monkey house and was instrumental in keeping the mission quiet. When it was discovered that the virus infecting the Reston monkeys was a *filovirus*, Peters was the first soldier notified because of his role as the chief of disease assessment at USAMRIID. His experience included hunting "hot" viruses in the jungles of South America. He took great joy in eating whatever the locals ate, whether it was vegetation or bugs. Peters was responsible for creating the right team to investigate and possibly eradicate the virus.

The Colonel was a colorful character with a lot of experience. He was known for shunning his military uniform, preferring Hawaiian shirts and sandals and for keeping un-military-like hours. Peters also had a tendency to butt heads with others. His strong will helped him cut through a lot of red tape, but it also led to rocky relationships. This animosity extended to both Gene Johnson and Joe McCormick of the CDC. Colonel Peters' laid-back approach helped him to intercept a television crew investigating the monkey house, and his quick thinking and casual appearance kept the crew from discovering a very involved, and very frightening, biocontainment operation.

Dan Dalgard

Dan Dalgard was a scientist for a company called Hazelton Washington, but was also the consulting veterinarian for the monkey house at Reston. He was a very professional man with a good reputation and a Texas drawl. When the manager from the monkey house called to tell him that a recent shipment of monkeys was dying in larger numbers than usual, it took him until the next week to get there and check it out because he was very busy with his other job. He did necropsies and thought that the monkeys had expired from heat stress because the heating and air-conditioning units at the monkey house had shut down. When they continued to die, he began to keep a journal of events, which would prove helpful to the book's author.

Dalgard felt a sense of responsibility to his company and was cautious about getting USAMRIID involved. It was not until his second employee got sick that he really began



to understand the possible consequences of having Ebola in the monkey house. Dalgard's sense of responsibility struck again, and he called the company and recommended they turn the facility over to the military. He could not fight the tears as he imagined how many people could have been infected by the employees he had not evacuated when the virus was first discovered.

Peter Jahrling

Peter Jahrling worked at USAMRIID as a civilian virologist. He was the first person there to work with the Ebola Reston virus, although he had no idea it was a hot agent at the time. He and Tom Geisbert both actually inhaled a tiny amount of the virus before discovering what it was. Throughout much of the book, Jahrling tests his blood to see whether he is developing Ebola. Because of his work during the incident, Jahrling and Geisbert are listed as co-discoverers of the Ebola Reston virus and were given the honor of naming it.

Tom Geisbert

Tom Geisbert was another civilian working at USAMRIID during the time of the Ebola Reston crisis. Geisbert was an outdoorsman who enjoyed his job working with the electron microscope in a Level 4 Hot Zone. Because of his fascination with viruses, Geisbert was the first person to recognize Ebola Reston as a *filovirus*. He and Peter Jahrling worked closely together, and both were accidentally exposed to the virus early on. Neither contracted Ebola, however, and their work led them to be named as co-discoverers of the virus.

Colonel Jerry Jaax

Jerry Jaax was the husband of Major Nancy Jaax and was also an Army veterinarian. He was uncomfortable with his wife's work in Level 4 Hot Zones but accepted it. Throughout the story, Jerry became very distressed over the murder of his brother, but he was completely effective when called to lead a team in to destroy the monkeys at the facility in Reston. Jerry is seen as a supportive husband and father who has his own demons to fight.

Charles Monet

Introduced in a flashback at the onset of the story, Charles Monet was a French expatriate working in Kenya. On a weekend trip to Kitum Cave, he contracts a horrible illness and spreads it all the way to a hospital in Nairobi. Monet died a bloody death of what was later discovered to be the Marburg virus, and his death created a profound backdrop of fear for the rest of the characters in the book who come into contact with unknown viruses.

Peter Cardinal

Peter Cardinal was a young Dutch boy brought into the story via a flashback. While in Kenya with his parents, Cardinal visited the Kitum Cave. Shortly thereafter, he also died a terrible death of the Marburg virus. USAMRIID received some of the boy's blood and used it in trying to identify the Ebola Reston virus. Cardinal's death was the impetus that got Gene Johnson to put together a team and explore Kitum Cave.

Dr. Joseph B. McCormick

Dr. McCormick worked for the Centers for Disease Control and had experience with the Ebola virus. He was therefore involved in the cleanup operation in Reston. Several years prior, McCormick attempted to treat victims of Ebola Sudan in an African village when he stuck himself with a dirty needle. Believing he was probably infected, he stayed in a hut full of dying people to give them care. When he didn't die, McCormick concluded that Ebola was not as easy to contract as previously thought. He came into conflict with C.J. Peters during the Reston situation.



Objects/Places

Airborne

While some agents can be spread only through contact with body fluids, those that travel into the body through the lungs are considered airborne.

Biocontainment

Rather than letting a virus run its course, humans choose to contain it and eradicate it.

Filovirus

Viruses that, when viewed under an electron microscope, look like hairs or snakes. Ebola and Marburg are both filoviruses.

Fort Detrick

USAMRIID is located on the Fort Detrick Army base in Frederick, Maryland.

Hot Agent

These viruses could potentially be lethal. They are handled very carefully in controlled environments.

Hot Zone

Specific parts of the laboratories at USAMRIID are self-contained and are used for working with lethal and infectious agents.

Kitum Cave

The cave reoccurs as a setting of the story. First, Charles Monet travels to the cave. Later it is discovered that a young boy who developed Marburg also visited the cave. During the course of the story, Gene Johnson leads an expedition there; and at the end of the story, the author does the same.



Necropsy

A necropsy is an autopsy performed on an animal to determine its cause of death or to collect tissue specimens.

Puke Factor/Pucker Factor

These are two of the terms used to describe the physical reaction one has to realizing he or she has been exposed to a hot agent.

Reston

Reston was one of America's first planned suburbs and is located about 10 miles from Washington D.C.

Room F

Most of the infected shipment of monkeys was placed in Room F in the Reston monkey house. The spread of the virus to other rooms supports the idea that Ebola can be spread through the air.

Slammer (The)

If someone becomes exposed to a hot agent, they are assigned to stay in the Slammer, which is basically a solitary quarantine. The thought of spending time in the Slammer terrifies most people.

Space Suit

When handling hot agents, it is necessary to protect the human body from infection. The space suits are self-contained garments with clear faceplates designed to be worn in Hot Zones.

USAMRIID

The United States Army Medical Research Institute of Infectious Diseases is located at Fort Detrick in Maryland and was the workplace of Nancy Jaax, Gene Johnson, C.J. Peters and many others.

Virus

A tiny, disease-causing agent, a virus infiltrates body cells and forces the cells to replicate the virus until they explode, releasing the virus into the bloodstream.



Themes

Fear of Death

Probably the most prevalent theme in *The Hot Zone* is the humans' fear of death. In fact, the power and appeal of this book come from the fear evoked in the reader. The gory, horrific deaths of Charles Monet, Nurse Mayinga, and Peter Cardinal set the reader on edge in anticipation and dread of what will happen if the virus at Reston jumps into the human population.

One of the obvious indicators of the fear is the setup of the Level 4 Hot Zones and the numerous procedures and policies in effect for anyone entering one. The outside world is separated from the Hot Zone by a "gray area" that is considered neither sterile nor hot. There is an elaborate ritual to donning the space suits, including what to wear, how to provide layers of protection between the skin and the hot zone, and the necessity of partners continually checking each other's suits. Any breach in a space suit increases the drama of the story immediately because of the fear that a deadly virus may have entered the suit and infected the wearer.

Jerry Jaax's fear is clear from the beginning, since he does not want Nancy working with Ebola. She is also aware that working in such dangerous conditions is especially risky in her case because her death would leave her children motherless. Likewise, Jerry and his team were horrified when they entered the monkey house in Reston to find employees still working in the facility with little or no protection.

There is very specific terminology used in the book that reinforces this fear of death. The scientists experience what they call "the puke factor" upon exposure to a Level 4 agent. The realization that they worked on infected monkey tissues and took few or no precautions becomes clear once Ebola has been discovered in those same tissues, and the scientist must fight a physical urge to vomit. C.J. Peters and the other military personnel refer to the fear as the "pucker factor." This term references the physical sensation of certain body parts drawing tight in fear when faced by a deadly situation. The simple fact that soldiers, who are symbols of courage and strength, are so scared of dying from the virus also adds to the tension of the story.

Size Is Irrelevant

Repeatedly throughout the story, the author reminds the reader of just how tiny a virus is. You must use an electron microscope to even view one. The impact of Ebola or Marburg, however, could devastate the entire planet if it got a foothold. Within 24 hours, a virus could make its way out of Africa on a plane and into such hubs as London, Paris, or New York and then fan out to the rest of the world. The tiny HIV virus has already spread havoc throughout the human population of the globe, and this is a point the author drives home again and again.



This theme is also stressed by the author's descriptions of landscapes. He paints vivid pictures of the area surrounding Mount Elgon, for example. His descriptions include the vast savanna, dense forests, and snaking rivers. Interestingly, this is nearly the same view one gets when viewing a cell through an electron microscope. When Tom Geisbert scans his samples of cells to determine whether they are infected with a virus, he sees how the interior of a cell resembles an aerial view of a rain forest. It is almost as if an entire world can exist in the tiny space encompassed by the walls of a blood cell. It takes a very minute amount of tainted blood to infect a human with the Ebola virus, so those working in the Hot Zone must constantly be on their guard for tiniest little tear that might allow it into their space suits.

The irrelevance of size is also illustrated when a tiny monkey escapes as the team is destroying the animals at the monkey house in Reston. Monkeys can use their tails almost like a fifth limb and can grab or hold onto a human with even more strength. The animals also instinctively go for the eyes during an attack. A 10-pound monkey and a full-grown man are estimated to be an even match. Again, a small size does not necessarily equal a lack of power.

AIDS

It would be difficult to ignore the AIDS epidemic in such a story, so the author makes an effort to highlight it. The HIV virus was actually just making its way into the human population about the time that Charles Monet contracted Marburg. It appears that the origins of Marburg and HIV are very similar. For example, both seem to have originated in African monkeys, possibly from islands around Lake Victoria, and it mutated to be able to "jump" into human beings.

A bit later in the story, the author underscores the severity of Ebola by writing, "Ebola does in 10 days what it takes AIDS 10 years to accomplish." C.J. Peters spends some time comparing AIDS and Ebola, as well. He theorizes about what would have happened if there had been a research station in Africa to monitor viruses. Perhaps AIDS could have been stopped or slowed. Ebola kills its host so quickly that there is little time for it to be spread. HIV, on the other hand, takes its time and is claiming lives and, therefore, has a larger window through which it can spread to other hosts.

In the last section of the book, Richard Preston writes about the so-called "AIDS Highway." The road is the Kinshasa Highway, which bisects Africa. During the 1970's portions of this road were paved. Shortly thereafter, AIDS began to appear in the villages that line it. As humans made travel into the heart of Africa easier, they also eased the way out for the virus. The author explores the idea that as humans capture and destroy more and more of the rain forests, they may release many more previously unknown viruses. It is as if the viruses act as the forests' immune system, which is truly ironic since HIV and AIDS destroy the human immune system.



Bureaucracy and Politics

In the face of a virus that has the potential to wipe out the human population of the planet, one would think that organizations, and indeed, people, would be eager to work together. Throughout the course of the story, however, the many organizations and departments are in constant strife with each other. This is abundantly clear in the chapter entitled "Shoot Out." There is a struggle between the Army and the CDC over which group has the authority to take control of the operation in Reston. It is clear throughout the story that Colonel C.J. Peters has strained relationships with several of the other important figures, and Joe McCormick from the CDC is one of those people. This is further supported by an entire chapter entitled "Chain of Command."

In addition to strife regarding which federal group will oversee the project, there is also a variety of other groups that must be notified and perhaps play a role in it. The U.S. Department of Agriculture, the Environmental Protection Agency, and the Pentagon are all players in this situation, and the state and county health departments must also be involved. Finally, the company (Corning, Inc.) and division (Hazelton Research Products) must give their consent for the operation to be undertaken. The company even takes the bureaucracy so far as to try to get the Army to sign an agreement in which the Army would take legal responsibility for the building. The Army refuses, and it is clear that both the company and the government are trying to avoid lawsuits. In fact, the Army personnel often bring up the need for lawyers to keep them from being sued for their actions in attempting to stop the virus.

The theme of bureaucracy and politics is completely intertwined in the writing, as well. Because it is a true story, the author must be careful to mention the appropriate people. This is heightened because of the subject. The discovery of a virus is very big news in the scientific world, and everyone involved wants credit for their part of the discovery. Where a fiction story might simply refer to an "assistant" in a scientific procedure, this book very carefully denotes both the person's name and title. This extends not only to the scientists, but also to listing names and ranks of military personnel involved in the story.

Style

Point of View

The majority of *The Hot Zone* is written from the third-person omniscient point of view. Of course, the author is not simply composing characters' thoughts and emotions. This book recounts a true story, and Richard Preston interviewed many, many people to learn directly from those involved. Therefore, the reason the author is able to be omniscient is because he has taken great pains to be accurate in his telling of the tale. If he describes someone's internal reaction to an event, he is relating what that person told him. He is also careful to give credence to everyone's viewpoints in the cases where people have differing recollections of a sequence of events.

There are a few places in which the point of view switches to first person. This is a result of the author's reporting on his interviews with the various people engaged in the crisis at Reston, as well as those involved in earlier Ebola outbreaks. He writes of meeting Gene Johnson at Fort Detrick, talking to Dr. David Silverstein in a coffee shop, and viewing photos of the Ebola virus with Nancy Jaax. This serves to remind the reader that the story is not a piece of fiction, and it also allows the author to tell portions of the story in the participants' own words.

Setting

There are multiple settings in the book because it spans a long period of time (1980 to 1993) and follows viruses all over the world. Much of the African portion of the story takes place in Kenya and Sudan, and the real centerpiece is Kitum Cave in western Kenya. The story starts and ends there although under very different circumstances. On the international level, there are also references to the Marburg virus' stint in Germany, and a monkey farm in the Philippines. Aside from these brief mentions, the true settings of the story are Africa and the United States.

The North American portion of the book takes place near Washington, D.C. Fort Detrick, the base of operations for the United States Army Medical Research Institute of Infectious Diseases (USAMRIID) is located near Frederick, Maryland, and many of the story's participants work at this installation. The other important setting is the monkey house in Reston. The fact that the potential Ebola outbreak is happening so near the capital of one of the most powerful nations on earth certainly adds to the tension of the story.

Language and Meaning

The language used in *The Hot Zone* is very descriptive. The novel could easily have been a litany of medical terms and acronyms. It is, after all, a true story involving science, medicine, government, and military. The author is concerned with drawing the



reader into the story. He wants to create such a vivid picture that it is occasionally quite disturbing. On the other hand, he must be very accurate and must attribute each action to the appropriate person to tell the story truthfully and to follow a rather strict protocol required by the parties concerned. Therefore, he must be able to write from a scientific standpoint.

Richard Preston's ability to write literature is also evident. His use of imagery is very effective. By the time there is an outbreak in the monkey house, the reader has been thoroughly apprised of the terribly painful, bloody death that awaits anyone infected by the virus. This is accomplished through both narration and dialogue. A sense of foreboding is created early on when the storm clouds gather over Mt. Elgon, and it continues through the operation at Reston. He even carries the uncertain mood through the ending, when the author himself enters Kitum Cave in a space suit. Throughout the entire tale, Preston combines scientific understanding with literary writing.

Structure

The Hot Zone uses a fairly typical five-part plot structure. The first section of book, called "The Shadow of Mt. Elgon" serves as the exposition of the story. In this section, the reader is introduced to the Marburg virus, via people who have contracted it. It sets up a graphic depiction of the virus and gives some history, as well. The exposition likewise introduces us to characters like Nancy and Jerry Jaax.

The second portion of the plot structure is the rising action. This coincides with Part 2 of the book, entitled "The Monkey House." While this section provides more history of the Marburg and Ebola viruses, it does this alongside descriptions of an unknown agent appearing in a monkey house in suburban America. This section also includes tidbits on how the situation progressed, who was involved, and what steps were taken throughout the unraveling of what was going on in Reston.

The climax of the story appears with Part 3, "Smashdown." This is where the main characters must encounter the virus face-to-face in the monkey house. There are some frightful events during the destruction of the animals, such as an escape by one monkey and failures in the protective suits worn by personnel. The climax acts as the most exciting and perilous part of the story.

The climax is followed by the falling action, which begins directly after the building has been decontaminated. Most of this action is summed up in a single chapter called "The Most Dangerous Strain." Right on its heels follows the denouement in the form of Part 4 of the book, "Kitum Cave." The author uses this opportunity to follow up with the main characters and bring everything to a close.



Quotes

"AIDS had already fallen like a shadow over the population, although no one yet knew it existed." Part 1, Chapter 1, Page 4.

"A hot virus from the rain forest lives within a twenty-four-hour plane flight from every city on earth." Part 1, Chapter 1, Page 16.

"The kill rate in humans infected with Ebola Zaire is nine out of ten." Part 1, Chapter 3, Page 38.

"When you begin probing into the origins of AIDS and Marburg, the light fails and things go dark, but you sense hidden connections." Part 1, Chapter 3, Page 45.

"Well, sir, I am no plow horse!" she roared at him, and slammed her resume on his desk. He reconsidered the matter and allowed her to join the group." Part 1, Chapter 5, Page 61.

"I think I have never met someone who is more afraid of viruses than Gene Johnson." Part 1, Chapter 5, Page 63.

"Both species, the human and the monkey, were in the presence of another life form, which was older and more powerful than either of them, and was a dweller in blood." Part 1, Chapter 6, Page 81.

"A characteristic of a lethal, contagious, and incurable virus is that it quickly gets into the medical people." Part 1, Chapter 7, Page 98.

"The more one contemplates the hot viruses, the less they look like parasites and the more they begin to look like predators." Part 1, Chapter 8, Page 136.

"The monster lived in a cave, and he was going in there to find it." Part 1, Chapter 8, Page 144.

"Jahrling turned to the other man and remarked, 'Good thing this ain't Marburg,' and they chuckled." Part 2, Chapter 2, Page 176.

"Jahrling unscrewed the little black cap and waved his hand over the flask to bring the scent to his nose, and then he took a whiff." Part 2, Chapter 3, Page 185.

"The incredible thing about living systems is that no matter how small the view, it is just as complicated as ever. He could see forms and shapes that resembled rivers and streams and oxbow lakes, and he could see specks that might be towns, and he could see belts of forest." Part 2, Chapter 5, Page 194.



"The doors of the Slammer are kept locked, the air is kept under negative pressure, and your telephone calls are monitored - because people have emotional breakdowns in the Slammer." Part 2, Chapter 6, Page 206.

"He saw cells dimly outlined in a faint glow. It was like flying over a country at night, over thinly populated lands. It was normal to see a faint glow. He was looking for a bright glow. He was looking for a city." Part 2, Chapter 7, Page 217.

"One of the animal caretakers was very sick, might be dying." Part 2, Chapter 9, Page 239.

"Surely some smart Army lawyers could figure out why the act of carrying Ebola-ridden dead monkeys across state lines in the trunk of a private automobile was so completely legal that there had never even been any question about it." Part 2, Chapter 9, Page 249.

"People wearing biohazard space suits tend to step around one another like two wrestlers at the beginning of a match, watching the other person's every move, especially watching the hands to make sure they don't hold a sharp object. This cringing becomes instinctive." Part 2, Chapter 10, Page 253.

"Nancy and C.J. noticed with some concern that the monkey workers around the building were not wearing respirators, despite Dalgard's order. No one offered a respirator to Nancy or C.J. either. This made them both nervous, but they did not say anything. When in a monkey house, do as the monkey workers do." Part 2, Chapter 13, Page 277.

"C.J. knew that if people learned what this virus could do, there would be traffic jams heading out of Reston, with mothers screaming at television cameras, 'Where are my children?'" Part 3, Chapter 1, Page 287.

"The soldiers didn't sleep much that night, and neither did Gene Johnson. He was terrified for the 'kids,' as he called them." Part 3, Chapter 3, Page 315.

"It did not occur to them to go around to the side of the building and point their video camera toward a window. If they had done that, they would have gotten enough footage to fill the entire evening news, with something left over for CBS's *60 Minutes*." Part 3, Chapter 4, Page 331.

"The question of whether he, Peter Jahrling, was infected with Ebola had become somewhat more pressing since the animal caretaker had puked on the lawn." Part 3, Chapter 5, Page 343.

"Her father died that day, while Nancy worked in the hot suite." Part 3, Chapter 6, Page 350.



"For a short while, until life could re-establish itself there, the Reston Primate Quarantine Unit was the only building in the world where nothing lived, nothing at all." Part 3, Chapter 6, Page 356.

"Did we dodge a bullet?" "I don't think we did," Jahrling said. "The bullet hit us. We were just lucky that the bullet we took was a rubber bullet from a twenty-two rather than a dum dum bullet from a forty-five." Part 3, Chapter 7, Page 368.

"So the three sisters - Marburg, Ebola Sudan, and Ebola Zaire - have been joined by a fourth sister, Reston." Part 3, Chapter 7, Page 370.

"The paving of the Kinshasa Highway affected every person on earth, and turned out to be one of the most important events of the twentieth century." Part 4, Chapter 3, Page 383.

"The tropical rain forests are the deep reservoirs of life on the planet, containing most of the world's plant and animal species. The rain forests are also its largest reservoirs of viruses, since all living things carry viruses." Part 4, Chapter 2, Page 406.



Topics for Discussion

The author builds the tension of this story in several ways. Discuss what you thought was most effective in creating suspense for the reader.

How do you feel about Tom Geisbert and Peter Jarhling's decision not to tell their superiors of "the whiffing incident?" Does it differ from what Nurse Mayinga did when she left the hospital?

Discuss how you think the story would change if news crews had shown up and filmed the biocontainment operation.

Why do you think Gene Johnson did not have results of the Kitum Cave expedition published?

Discuss how her work with hot agents affected Nancy Jaax's personal life. How did it affect her professional life?

What is the allure of working with hot agents? Why do these people do it? Would you do it?

Do you think the author's method of blending his research and interviews together worked well in the telling of this story? What differences did you notice between this and a fiction story?