When Pamela Reed was only three years old, she began to read children's books. She was not only very intelligent, but extremely inquisitive as well. She constantly broke her toys in an attempt to understand how they worked. By the time she was five, instead of breaking her toys, she disassembled them and began putting them back together. When she started school, she was able to read and understand high school level textbooks.

Two weeks after starting kindergarten, it was obvious she would not be able to learn anything in that environment. So, her parents decided to put her into a private school where her education could continue at a level that would challenge her. She continued to learn at a phenomenal rate, but what really peaked her interest was when she began to study biology. Now she wanted to know how living things worked. She knew she couldn't disassemble something living and put it back together again like she could do with mechanical things. So, she began studying anatomy and other medical textbooks. But she still wasn't satisfied, she wanted to study living things at their smallest level. That lead to the study of DNA and genetics.

At the age of eleven she received a high school diploma. She desperately wanted to go to college, but because of her age, no college would accept her. Her parents made a personal appeal to the governor who interceded on her behalf. As a result, just before her twelfth birthday she was admitted to a state college as a premed student. For the first time she felt challenged in a school environment and she loved it.

In addition to her regular classes, she soon discovered she had access to more information about genetics than she dreamed existed. She virtually devoured every book she could get her hands on.

As her studying continued, she began to concentrate on the causes of aging. She knew that as people reached a specific age range, their bodies changed, and she wanted to

know what caused the changes to occur. She believed they were caused by mutations in our DNA, and those mutations were preprogrammed to occur at a specific age. She was sure that if she looked hard enough, she would discover what she called the *eternity gene*.

Pamela divided the time she was awake evenly between her studies and her quest to discover the cause of aging. She graduated at the top of her undergraduate class and was admitted to medical school shortly after her sixteenth birthday. She soon realized her knowledge of genetics far surpassed that of her professors. At the beginning of her final year in medical school she realized she was at the point where textbooks were no longer useful. She needed to begin working with animals. She realized Dean Crenshaw was the only person she knew who was in a position to help her.

Ben Crenshaw had been the Dean of the medical school for more than twenty years. He was a practicing physician for fifteen years. Then over a period of just a few weeks, ten of his regular patients died unexpectedly. He felt that somehow he was responsible for their deaths. He made the decision to teach instead of practicing medicine. He began teaching undergraduate classes and discovered he was a natural born teacher. When the Dean retired, Ben was offered the job. He immediately accepted the offer. He missed teaching and the students, but felt what he was doing was very important.

Pam made an appointment with Dean Crenshaw. She was twenty years old and the youngest student in medical school. Normally she was completely unconcerned with her appearance, but decided she had to look more mature for her appointment. So, she bought a new dress and shoes. Then she went to a beauty salon to get her hair done. When she was finished getting ready for the appointment she looked at herself in the mirror and was really pleased. The dark blue dress matched her eyes perfectly and her

shoes made her look taller than her petite five foot four height. Her auburn hair was perfect as well.

When she walked into Dean Crenshaw's office he looked at her and said, "Wow! I knew you were very intelligent, but I never realized you're beautiful too. So, why did you want to see me?"

Pam spent the next few minutes explaining what she wanted to do and asked for his help. He thought about her request and said, "I think your idea is well thought out, and if your hypothesis is correct, all of mankind will benefit. So, how could I not approve your request? There's a space in the basement that could be easily converted into a small laboratory. We will supply you with the equipment you need. However, you must agree that any discovery you make becomes the property of the university."

Pam smiled broadly and immediately said, "Yes! Yes, I agree. Thank you Dean Crenshaw."

Pam believed deeply that all life was sacred, and she knew she could never kill an animal just so she could study it. So, she needed to find an animal that exhibited obvious external changes as it matured. She selected white tailed deer for her first experiment, since they lost their white spots when they became adults.

Pam made arrangements with a local zoo to draw blood samples from a fawn and the mother shortly after the mother gave birth. The zoo had twenty-four mated pairs of white tailed deer, and fourteen of the females were pregnant. It was early spring, so she knew she would not have to wait very long.

In the first week of May, Pam received a call from the zoo telling her two fawns had just been born and the vet at the zoo had blood specimens for her. She went to the zoo immediately and picked up the samples. She sent them to the university hospital for analysis. When the results came back a week later, she spent two days studying them. Her initial findings indicated that the genetic material in the

mother and fawns were 97.6% identical. So now she knew she had to concentrate on the 2.4% that were different. That still represented more than seven thousand genes, so the task was not going to be easy.

A week later another doe gave birth to two fawns. When she had the blood analyzed she found that this time the differences between the mother and fawns was 2.2%. Six weeks later she had data for fourteen mothers and thirty-one fawns. Although the sample was small, and statistically insignificant, it was a start. By the time Pamela graduated from medical school she had narrowed her search down to one hundred twenty-three genes. All of the fawns were now adults, and all but two of them were released in a local state park.

Pam's obsession with her genetic studies had affected her classes during the final months of medical school. As a result, she ended up second in her class of one hundred thirty-one students. She could have gone to any hospital in the country for her internship, but just prior to graduation she had a conversation with Dean Crenshaw. He convinced her to stay at the university and continue her research instead of becoming a practicing physician. They agreed on a salary, and in exchange, Pam agreed to teach some classes in genetics.

Two years later she was sure she had found the gene that caused the deer to lose their spots. She was surprised, and pleased, when she discovered the gene was only present in the mother's egg. Male deer sperm did not contain the gene. That would make her task much easier. She had the zoo harvest several deer eggs and she removed the gene from the eggs. The eggs were fertilized and inserted back into the mother. After the fawns were born, genetic analysis proved they didn't have the gene. As the fawns grew their spots never faded, and as adults they were still visible. This proved her theory was sound, but it was a long way from finding the cure for human aging.

Pamela spent the next month writing a report describing her research which she gave to Dean Crenshaw. She also sent copies to several medical journals. She was surprised to discover that Dean Crenshaw was waiting for her in her lab when she arrived the next morning. She said, "Good morning, sir. Do you need something?"

"I have some questions regarding the report you sent yesterday."

"Of course. I thought I covered my research very thoroughly, but if something needs clarification, please feel free to ask."

"Aside from retaining their white spots, did the deer have any indication that other systems which typically change when they become adults did not mature correctly?"

"Not as far as we have been able to determine. The reproductive systems have not been validated yet, but that's a matter of timing. Fawns are born in the spring, and the gestation period for a deer is about seven months. Since it's now May, we will have to wait until fall to find out if they matured sexually."

"So, the digestive, circulatory, and nervous systems all seem normal?"

"Yes, sir. May I ask why you are asking these questions?"

"A son of one of our biggest benefactors has asked a young woman to marry him. She is hesitant because most of the females in her family do not survive past the age of fourteen, and she doesn't want to get married and have children if they will never become adults."

"What is the cause of their deaths?"

"Liver failure, as a result of severe primary biliary cirrhosis."

"Okay, what is it you want me to do?"

"The condition is obviously genetic. Find the gene responsible and remove it from her eggs so they can have normal children. In exchange for the research, our

benefactor has agreed to fund your research for ten years, regardless of the outcome. But he wants a report within six months."

Pamela thought about the project for a few moments and said, "I obviously can't test on humans. Do you know if mice can get primary biliary cirrhosis?"

"I have no idea, but I'm sure someone in our veterinary school knows."

"So, I assume the questions you asked was to verify that removing a gene that causes body changes as the subject ages has a limited effect."

"Exactly. Also, one of our students who only needs to complete his dissertation is going to be working with you. His name is Dennis Trent. I believe you know him."

"Yes, I do. He has asked me about my work on several occasions. He's extremely intelligent and will be a great asset to the project. Is he planning on using this project for his dissertation?"

"Yes, that's his plan. You should know he's a true believer in your work and was very anxious to be working with you. I'll ask him to stop by and speak with you tomorrow."

"Perfect. I'll get him started on researching animals we can use for testing."

Dennis Trent was twenty-five years old. He was tall, almost six feet three, and only weighed a hundred seventy pounds. He had dark wavy hair that was seldom combed and bright blue eyes. He didn't like shaving, and only did so twice a week. His clothes were too big for him and looked like they were "hand me downs" from an older and larger brother. All in all, he looked like a slob. But Dennis could not have cared less. All he had wanted to do since he was a teenager was to study genetics. His studies took priority over everything else in his life. He had never even been on a date.

Dennis showed up at Pamela's lab at 1:00. She was in the midst of researching primary biliary cirrhosis and didn't notice him walking into the lab. When he said, "Good afternoon Dr. Reed," it surprised her. She looked up from the document she was reading and said, "Hello Dennis, Dean Crenshaw told me you were coming, but he neglected to say when. Anyway, I'm glad you're here. First, please call me Pam. I really don't like formality, and it's unnecessary. I have a project for you."

Dennis said, "Okay Pam, what do you want me to do?"

"I'm sure you know we're looking for the gene that causes primary biliary cirrhosis. For obvious reasons, we can't do our testing on humans, so we need to find an animal we can use for testing. That will be your first project."

"When Dean Crenshaw told me about the project, I began studying the disease. It appears to be genetic and the studies I read indicated it does not occur naturally in lab mice. But they can be infected with the disease by injecting them with bile from an infected human."

"Was there anything that indicated it could be passed from an infected parent to their offspring?"

"No, not in the articles I read. Of course, that doesn't mean it wouldn't happen. To my knowledge it has never been researched."

"Then that should be our starting point."

"Okay, I'll get started on that immediately."

"Please feel free to requisition whatever you need. The project is fully funded by one of the university's doners, so money isn't a problem."

The first part of the project took over two months to complete. They were able to infect female lab mice by injecting them with bile. When their offspring were born, about 40% of the females had the disease, and only 9% of the males were infected.

The next part involved comparing the DNA of a healthy mouse to an infected one. The problem is no two living things, even siblings, have identical DNA. So, it was a formidable task to determine which gene was responsible for passing the disease to the offspring.

After two more months of working sixteen hour days, they narrowed it down to seven genes. They decided to test two mice for each gene. So, they infected fourteen female mice with the diseased bile. When the mice became fertile, they removed their eggs. The process of removing an egg from a mouse and then removing a single gene from the DNA in the egg is a complex and delicate task. It took twelve days to prepare the eggs. Then each of the eggs were fertilized and placed back into the female mouse that the egg was removed from.

The gestation period for mice is twenty-one days. So, Pam had some free time. She used it to write a comprehensive report on their project which she gave to Dean Crenshaw. He read it immediately and sent it to the donor who was financing the research. Both of them were pleased with the report and were anxious to know the results.

Three weeks later, thirty-seven babies were born. Thirty-one survived to adulthood.

Now that the mice were adults, Pam and Dennis began testing the surviving mice for primary biliary cirrhosis. They were expecting to find one group of mice that had no incidence of the disease, and they were not disappointed. Only one group of the seven had no indication of the disease. Pam immediately sent Dean Crenshaw a brief report of the test results.

To confirm their findings, they repeated the experiment with five mice. This time each of the females had a single gene removed from their eggs. Now their next task was to locate the same gene in human DNA. One of the reasons mice are used for genetic testing is because

their DNA is almost identical to human DNA. So, the task turned out to be relatively simple for the university's computer.

Pam and Dennis were fairly certain they had found the solution for the problem posed by the university's donor, so they now felt they could return to their original task. They wanted to use mice again to test Pam's human aging theory. The seven genes that were part of the test they just completed were all in the same DNA strand, and again, the genes were not present in the sperm. It seemed like a reasonable starting point. So, they decided to start testing with the six remaining genes.

They decided to test each gene separately, using three mice for each gene. Unlike people, there are no obvious physical changes in mice as they age. So, they had to rely on other types of tests. It took almost a year before they made their first important discovery. As the mice aged they were subjected to various tests including neuromuscular strength, social interaction, light/dark transition, and maze performance. After the first year, all of the mice exhibited decreased performance in all of the tests, except for one group. The mice in that group didn't appear to age the same way the mice in the other groups did. Their strength and general health had not deteriorated significantly. Perhaps most importantly, their ability to learn new mazes actually improved with age. The results were startling, and now they believed they found the gene responsible for aging.

Pam and Dennis decided to do the testing again. This time with only two groups. Group A consisted of normal mice. Group B were mice that had the missing gene. As these new groups developed, the mice from the previous test began to die, except for the mice with the missing gene. They continued to thrive and didn't display any reduction in physical or mental ability.

By the time the mice from the second two groups were approaching their first birthday, all the mice from the original groups died, except for the mice with the missing gene. They still appeared to be healthy in every respect.

When the mice from the second two groups were a year old their test results were validated. As expected, the mice in Group A aged normally. The mice in Group B displayed no signs of aging after a year. This confirmed their results.

During the testing, Pam had little contact with Dean Crenshaw, and when they were together, they never discussed Pam's work. But now both Pam and Dennis felt it was time to release the information concerning their discovery. They spent several weeks writing the report and adding the appropriate documentation to back up their hypothesis. When the report was finished, they gave it to Dean Crenshaw. He read it and thoroughly examined the documentation. He never believed Pam would actually accomplish what she wanted to do, but he was very happy to be proven wrong. He went to her lab to congratulate her and Dennis.

When he arrived at the lab, Pam and Dennis were looking at a group of mice. They were talking and were completely oblivious to his presence. He startled them when he walked over to where they were standing and said, "Congratulations are in order. You do realize you will both win the Nobel Prize for medicine this year."

Pam turned around quickly. She looked at him and said, "I didn't hear you come in. I presume you read the report."

"Yes, I did. There are virtually no words that can express how important your discovery is. It has the potential to change us as a species. I'm going to send it to several medical journals later today." Then he looked at the mice she was looking at and asked, "Which group is this?"

Dennis answered, “These are the mice from our original six groups. The only ones still living are the mice with the missing gene. They are now three and a half years old and none of them are showing any signs of aging.”

Dean Crenshaw watched the mice for a few seconds and said, “This is amazing. When I was doing medical research twenty-five years ago, most of our mice didn’t live past eighteen months.”

Pam asked, “Where do we go from here? We have to do more animal testing before we can begin human trials, but it should be done on a much larger scale. Also, we will eventually have to begin human trials. We can’t presume the results in humans will be the same as the results we see in mice. In any case, we aren’t equipped to do the additional research here.”

Dean Crenshaw replied, “You’re right. At this point we will turn it over to one of the large pharmaceutical firms. I’ve worked with Ross Dearborn on several occasions in the past few years. I believe Dearborn Pharmaceuticals has the resources needed to take your discovery to the next step. I’ll call him this afternoon.”

“That’s an excellent idea. Dearborn is the perfect choice,” Pam said.

Ross Dearborn was busy and it was almost three weeks later before he and Charles Williams, the head of medical research at Dearborn Pharmaceuticals, were in Dean Crenshaw’s office. Ross said, “Ben, we both read the report you sent. The implications of this are almost beyond our imagination. I think we should keep this to ourselves for now. I would need some time to do our own testing.”

Ben grimaced and said, “I’m afraid it’s too late for that. The report has already been sent to several medical journals. In fact, one of the journals published the report a few days ago.”

Ross said, “I wish I could have gotten here sooner. This could be a problem. We have people who already

detest the idea of genetically modified food. I can't even imagine their reaction to genetically modified people."

"I suppose I should have thought about that. I keep forgetting how entrenched some people's ideas are. But we can't let a very small minority of small-minded people control medical research."

Ross said, "In this case, it's not just simple medical research. It's the future of the human race. I would like to meet Dr. Reed and Dr. Trent. Can you arrange that for tomorrow morning?"

"Yes, I'm sure they would like to meet you as well. I'll have them here at 10:00."

"That will be perfect."

Ben called Pam and told her Ross Dearborn wanted to meet with her and Dennis in his office at 10:00 the next morning. Pam said she and Dennis would be there, and that she was excited to meet him.

Pam's laboratory was in the basement of the Administration Building, adjacent to the Data Processing Department. That evening, both she and Dennis were in their lab preparing for the meeting. At exactly 7:00, a massive explosion completely demolished her lab and the Data Processing Department. The fire that resulted from the explosion spread through the rest of the building in less than five minutes. Pam and Dennis were the only people in the building at the time of the explosion.

The explosion was powerful enough to break windows in nearby buildings and loud enough to be heard a mile away. Ben Crenshaw lived less than a half mile from the building. He heard the explosion and looked outside. Although he couldn't see the administration building, he could plainly see something was on fire in that general direction. He began walking quickly in the direction of the fire while praying it wasn't the administration building that was on fire.

When he was a few hundred feet from the building, he knew his prayers were not answered. He saw the fire department vehicles arriving. As he walked closer to the building, both the campus and local police arrived. Then Jim Farber, a member of the campus police force, saw Ben and ran is his direction. As he got closer he yelled, "Ben, was anyone in the building?"

"I don't know. I left about 5:30. I think Pam and Dennis may have been there when I left, but I'm not sure. I suppose it's way too soon to know what happened?"

Jim replied, "We received several calls to report a loud explosion. Once the fire is out, the fire department will investigate. But if I had to guess, it was caused by some kind of incendiary explosive. The entire building was engulfed in less than ten minutes."

"Are you telling me this was done intentionally?"

"It's definitely a possibility."

"I can't imagine why anyone would want to blow up our administration building. I'm going to call Pam and Dennis and let them know what happened." Ben called both of them, but the calls went immediately to voice mail. Then he began to think about what Ross had said earlier. He began to wonder if this was done by some fringe terrorist group. Then he thought about Pam and Dennis. He was worried he was not able to get in touch with either one of them. Now he was praying they weren't in the building when the explosion occurred.

More fire trucks arrived and Ben watched as they attempted to extinguish the fire. It appeared to him that the fire was so hot they were unable to get close to the building. There were five firehoses spraying the building, causing a massive cloud of steam to form above the remains. The water seemed to have little effect.

Ben decided to call Ross and let him know what happened. When Ross answered the phone Ben said,

“There was an explosion in the administration building this evening. The entire building has been destroyed.”

Ross could not believe what he heard. He was silent for several seconds before he asked, “Was anyone in the building at the time of the explosion?”

Ben answered hesitantly, “I think Dr. Reed and Dr. Trent may have been there preparing for the meeting tomorrow. I can’t get in touch with either one of them.”

“That is truly terrible news. Was there anything in the building that could have caused the explosion?”

“No, the building was mostly offices and meeting rooms. The data processing department for the medical school was in the basement. So was Dr. Reed’s lab.”

“So, is all of her research gone?”

“Her notes are all stored on the computer, and the computer is backed up every day. The backups are stored in a fireproof safe.”

Ross was obviously angry with the situation when he said, “Fireproof safes are only able to protect their contents for a finite amount of time and only up to a specific temperature. I would be very surprised if the computer backups survived. This was not an accident. This was an act of terrorism designed to prevent the release of Dr. Reed’s research. I read her report, as you did. You know there’s a lot of detail missing. If she and Dr. Trent are both dead, and all their notes are gone, we may never be able to duplicate her results.”

Ben asked, “Do you think this is my fault for sending her report to the medical journals?”

“I don’t know for sure. But in any case, you are somewhat isolated from the real world living on a university campus. You have no idea how many nuts there are out there. Unless you have some objection, I would like to discuss this with a friend I have at the CIA. He helped me when I got involved with some foreign terrorists and opened my eyes to the real world at a time when I was

isolated because of my position as a senator and trying to run Dearborn at the same time."

"Shouldn't we wait until we know the cause of the explosion before we involve the CIA?"

"I'm sure he's not going to start an investigation at this point, but I don't see any downside to discussing it with him."

"Okay, if you think it will be beneficial. I would guess that by tomorrow we'll know if the computer backups are useable. I'm still hoping Dr. Reed and Dr. Trent are okay, but I suspect they aren't. I'll keep you informed."

"Thanks, Ben."