

An impending unnatural disaster begins to unfold in 2040. Microplastics are wreaking havoc with the oceans. A research facility accident makes the problem worse and it comes down to three scientists who try to save humanity from extinction.

Short-Sight

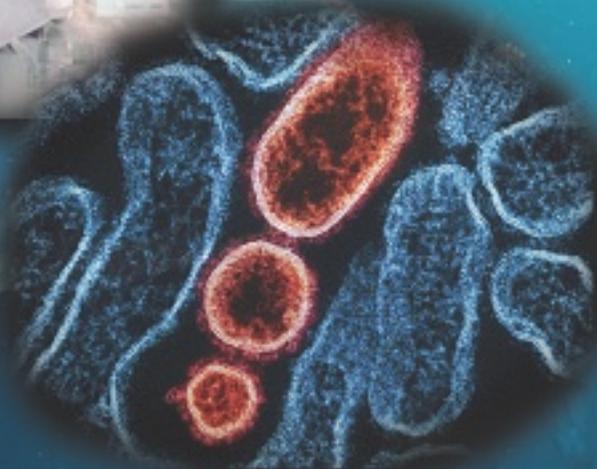
By Joe A. Wilson

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Joe A. Wilson

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Chapter Two

Todd Purcell, a dark-haired, six-foot, handsome man graduated with a Ph.D. in marine biology from UCLA. He had graduated in 2040 and then went on to do post-doctoral work at UC-Berkeley for two years. He quickly found that academic life was not what he was meant to do. Todd had an entrepreneurial spirit and wanted to do research differently from the way it was done in academia. He wanted to work on projects that would turn a profit and possibly even make him famous. He saw himself in the same class of people as Elon Musk.

He had noble goals for his research. He, like Elon Musk, wanted humankind to benefit from his inventions. He wanted the world to be a better place – he just wanted to make money while he was doing it. Since Todd wasn't wealthy, he needed wealthy people to believe in him to get him started.

The first thing he needed was a business model and some ideas about what it was that he was going to invent that would transform humanity for the better. While he was still working as a post-doc, he happened to read several research articles from the mid-2020's referencing genetic engineering of a bacterial strain that could eat a certain kind of plastic in saltwater. He had also been studying enzymatic metabolism in phytoplankton. These concepts gave him the spark of an idea.

Todd sketched together several other ideas as well to round out a series of viable projects for a functioning company and wrote up a prospectus. He ensured that it contained a complete set of details and parameters for a five-year business model and

contained only limited information about the research projects themselves. He wanted to ensure that no one else with any expertise in this field would swoop in and realize these goals before he could.

By April of 2042, he had convinced a group of angel investors and venture capitalists to come to a lecture he put together to entice them to invest in his new corporation. Each attendee was required to sign a non-disclosure agreement as standard practice before being seated in the conference room.

He rented a modest conference room, the best he could afford at this time, at a hotel near the airport so that the investors from out of town didn't have far to go. The walls were a drab yellowish color and the carpet was a multi-shade of brown patterns. The windows in the room didn't have a particularly good view of anything except for the airport. The room was just large enough to accommodate his guests. In a way, this made it seem as though there were an abundance of investors in attendance competing with each other who might be willing to secure a greater stake in his company.

Todd gave them a memorable and eloquent lecture.

“Ladies and gentlemen, thank you for coming today. I know some of you traveled quite a distance to get here, but I assure you – you will not be disappointed by today's presentation. What I have to show you will be worth your investment.”

He brought up the first slide.

“As you can see, our oceans are being choked with piles of floating garbage. Much of that garbage is plastic. Unlike a lot of other garbage which decomposes after a relatively short

period of time, plastics take many hundreds of years to decompose. These piles of garbage soon end up being all plastic once the other parts of the piles have decomposed into the ocean. Granted, there is some glass, rubber, and steel, etc. that were in the pile, but these usually sink once the biodegradable parts have decomposed.”

Todd moved on to the second slide.

“Almost 92% of the plastic in these garbage piles are made from polyethylene and polypropylene. It takes centuries for these polymers to biodegrade under normal conditions. In other words, we call these ‘forever chemicals’.”

“The other 8% of the plastics are made up mainly of polyethylene terephthalate – or PET – and nonylphenol and bisphenol-A. The problem of PET in the environment was solved about a decade ago when researchers found a way to use the two enzymes produced from *Ideonella sakaiensis* to decompose that plastic. The trick was to use genetic engineering to transfer the genes responsible for making those enzymes into a saltwater bacterium, *Candidatus eudoremicrobium*, to cause the enzymes to function in the new host. That new host could then decompose the PET in saltwater.”

“There is still the problem of the nonylphenol and the bisphenol-A out there, but they are – relatively speaking – very minor in the grand scheme of things. They are still worth researching, and we plan to put a team together to do so, but the big picture is to solve the polyethylene and polypropylene problems. This is where the bread-and-butter of the company’s research will be.”

The next slide got more complicated.

“Genetic engineering has been a boon to humankind. It has made crop yields much higher and given us an abundant supply of insulin created by genetically modified bacteria. This is all done through the movement of genes from one organism to another.”

“A gene is a piece of DNA that is the code for making a protein. A protein can be a regular protein, or it can be an enzyme. So, if we need an organism to make a particular protein or enzyme, we can ‘splice’ that piece of DNA from the original organism into the new organism’s DNA structure. That new host organism will then begin to create that protein or enzyme for us. The human insulin from bacteria is just one such example.”

A hand came up from the audience.

“So you’re tellin’ me that a bacteria – like that found in shit – is now makin’ insulin to keep people alive? They’re actually injectin’ themselves with this stuff?”

“With the insulin, yes sir,” Todd replied. “It is purified prior to shipment to the customers, of course.” This received a laugh from all the attendees.

“As you can imagine, this is all much harder than it looks,” Todd continued. “It has taken years usually to make these things work. *But* it is getting easier with each breakthrough to make more breakthroughs. Each successive breakthrough comes in shorter periods of time because we are able to learn from the previous steps.”

The next slide brought into focus the big project Todd had been planning.

“Phytoplankton are tiny plants that survive at the bottom of the food chain,” Todd told them. “They are eaten by just about everything, including other kinds of plankton. They use photosynthesis for energy production, which means that they use sunlight to convert carbon dioxide and water into sugar and oxygen gas through a series of complicated enzymatic reactions. You can see a simplified diagram of this process here on the slide.”

“Traditionally, genetic engineering has transferred genes into bacteria to make them produce a substance in bulk. Another route genetic engineering has taken is the transfer of genes into other organisms to create the so-called ‘genetically modified organisms’ or GMO’s that people were so afraid of, but still consumed without knowing it. The idea with these organisms was to confer some added benefit, such as disease resistance, not to have it produce a compound in bulk.”

“I intend to continue this work, but in a way that combines these two concepts. I foresee putting genes that code for enzymes that eat both polyethylene and polypropylene into phytoplankton. This way, we let the plant do all the work of eating the plastic without unleashing a whole bunch of bacteria into the ocean.”

“The engineered phytoplankton will be easier to control also. Bacteria would just dissipate into the ocean waters. We would set up a containment system around the workspace where the plastic is to be consumed so that no proprietary product is lost into the ocean. Even if a little of it was lost, chances are it would be eaten by other marine life before it got very far.”

“It is already known that several enzymes exist that ‘eat’ polyethylene and still others are thought to exist. More research is needed on these substances to determine whether they really do biodegrade polyethylene or not. Some of these sources are bacterial, but several are also insect derived. These insects have been observed eating the plastic and their stomachs have contained just metabolic products – no intact plastic. It seems really promising.”

He paused for a moment, hoping the audience would show some enthusiasm. He wasn’t sure if he saw any or not. All he heard, though, was the intermittent buzzing of one of the fluorescent lights above them.

Todd put up the next slide which finally showed the investors what they had been waiting for.

“I have started the corporation PhytoKine to capitalize on the concepts of genetic engineering and making technological breakthroughs that benefit humanity. I want to take genetic engineering to the next level to solve the problem of plastics in the environment, particularly in the oceans. I think we can do this and make a profit while still helping to save the world.”

“As you can see on this slide, I have made projections for the first year of the capital inputs and outlays that are needed to open the business, hire the right expertise, buy the correct equipment, and get to work. Obviously, this is the most expensive year of the five-year business model since this is the launch year. The purchase of the equipment alone accounts for nearly fifty-seven percent of the budget.”

“On the next set of slides, you can see years two through five stabilize the spending outlays. We hope to be generating revenue by year three. It is the goal for the company to have broken even by year five.”

As Todd turned off the projector and turned on the lights, he flashed a broad smile and asked, “Are there any questions?”

After about an hour or so of the usual fiduciary back and forth, an audience member had a question about the project.

“So, these sea plants... What are they rooted to? Aren’t all plants rooted into something? How can they be rooted to something out in the ocean?”

“Well, you are correct that most land plants are rooted into the soil and some sea plants are rooted into the ocean floor,” Todd told them. “But plants like phytoplankton don’t need roots to get their nutrients. They are able to absorb them directly from the water.”

Another audience member asked, “Since they use photosynthesis for energy, does that mean they have to live right near the surface of the water?”

“Yes,” Todd replied. “They must live right at and below the surface of the water. The nutrients are brought up to them from the deep ocean by the mixing of the ocean water from below by winds and currents.”

“How fast do you think these plants can eat that plastic?” another audience member asked.

“Well, that question is unanswerable at this time,” Todd replied. “That is where the research comes in. Technical terms such as

kinetics, equilibria, metabolic engineering, etc. will play big roles in answering your question.”

“Hopefully not too fast if we charge by the hour!” that same audience member said jokingly.

Todd smiled; these were all good signs. They were interested in the research as well as the monetary concerns. That last comment gave him real hope.

The meeting ended as a huge success and Todd came out with a combined commitment of thirty-four million dollars in start-up money for PhytoKine. He held three of these meetings that year, each unknown to the other sets of investors, and walked away with a total investment pledge of over one hundred million dollars. He was shrewd and had huge plans for spending way more money than he let on to each group of investors.

At the time, San Francisco had seemed like the perfect place for Todd to establish the headquarters for the company. It was very close to the Pacific Ocean, was in a major urban center, and had easy access to all the beauty that California had to offer.

He leased a small building in the Civic Center area just north of the Mission District. The building was drab with dirty bricks on the outside but inside was another world. The corporate office areas were nicely appointed and a modest research lab was set up on the third floor. The outward appearance was that the company was starting small and would grow as technological achievements were made. The truth was much more complex.

A much larger research facility, dubbed ‘the Parthenon’ was built and completed in June of 2043 on a very small island in the south Pacific Ocean. This island was in international waters and was purchased for a very small sum of money, given its remote location and no natural resources. The owner didn’t ask what its intended purpose was, and none was proffered by the company. However, a non-disclosure agreement was required to be signed by the previous owner stating that they would not reveal the sale of the island to PhytoKine to anyone.

This ‘under the radar’ research facility housed several laboratories, each with different functions. There was the genetic engineering laboratory, the metabolic engineering laboratory, the new species identification and characterization laboratory, the biochemistry laboratory, etc. There were also process engineering facilities that were made ready for the time when any laboratory breakthroughs were ready to be scaled up for production-level preparation of material.

Recruiting of high-level technical personnel took some serious work. Since this laboratory was a corporate secret, there was no public advertising for the open positions. Each person the company was interested in hiring had to be approached and courted quietly. Standard NDAs and no-compete agreements had to be signed even before discussing the nature of the research to be conducted. Some candidates turned down the offer, but there were enough young, energetic scientists wowed by the opportunity to meet their needs.

The lower-level staff didn’t take that much work to hire. Most of them were foreign workers on visas who were just happy to have a job. They were counseled on the strict conditions of no

outside communication with anyone about what was going on at the Parthenon, including to their family members. If it was found out that any such communication had occurred, they would be deported immediately back to their home countries and veiled threats to their safety were made.

Because the Parthenon was a remote facility, everyone understood that they would be living on-site. There were regular flights of helicopters bringing in equipment and supplies on a weekly basis, and they would also transport some people back and forth to Manila in the Philippines. This would allow them to make flight connections to their destinations for vacations. Overall, the system worked pretty well; there were only minor glitches in getting the Parthenon fully functioning.

As expected, work was slow and tedious as everyone got to know each other and their methods. Routines had to be developed and styles of working together had to be ironed out. Egos had to be overcome, but flareups did occur from time-to-time. Even though they were aware of the bad news happening around the world as time went on, most of them continued their work unaffected. Only those with family directly impacted by the devastating droughts, epic flooding, and severe famines occurring around the world caused any delay in the work being performed. Sometimes, those workers needed to be replaced.

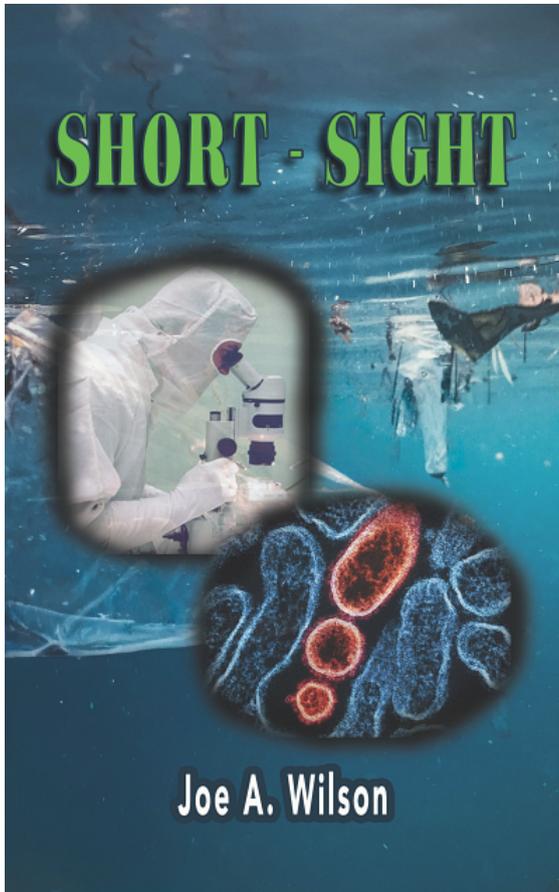
In mid-November of 2043, Todd decided it was time to abandon San Francisco as the headquarters for PhytoKine. The out-of-control wildfires engulfing northern California that were now approaching the city coupled with the rolling electrical blackouts made staying there untenable. He arranged for office

space to be leased in Research Triangle Park, North Carolina. It was done quickly, so he wasn't even sure if a laboratory could be accommodated there or not. It didn't matter; all he cared about was getting all the files, data, and servers moved as quickly as possible out of San Francisco.

It took two weeks to get everything cleared out and on the road, but it was done. All the workers had all been notified that they would be contacted once everything had been worked out about arrangements for the new facility. In the meantime, they should find suitable accommodations and stay safe. No mention was made of continued pay or benefits.

Todd reached the new offices before any of the truckloads of materials. It was two floors of office space only. There was no way to convert any of it into a laboratory. He actually didn't even care at this point. So long as there was room for the office staff, IT personnel, and the servers, that was all that he cared about. The small research lab in San Francisco had mostly been a sham anyway. They weren't producing anything of substance and were only there for looks to the investors.

With everything going on in the world, Todd wasn't worried about hiding the fact that there wasn't even a lab in the new office building. If the investors asked, he would simply put them off by saying that he was in the process of leasing another space in another part of RTP to set up the laboratory to continue operations.



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