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Nikola Tesla and John Jacob Astor

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Abstract -At Electricity Hall, Professor Tesla announces he will send a current of 100,000 volts through his own body without injury to life, an experiment which seems all the more wonderful when we recall the fact that the currents made use of for executing murderers at Sing Sing, N.Y., have never exceeded 2000 volts. Mr. Tesla also shows a number of other interesting experiments, some of which are so marvelous as to be almost beyond description.¹

Keywords –Nikola Tesla, John Jacob Astor.

The Chicago World's Fair of 1893

Tesla's friendship with John Jacob Astor was solidified at the Chicago World's Fair of 1893 where they both had exhibits, among them Astor a walking sidewalk and Tesla, his rotating egg. It was also Tesla's AC Polyphase system that lit the Fair through the Westinghouse Corporation. This was the first time that a "city" had been illuminated efficiently with alternating current, and Tesla became internationally famous because of this. His lecture at the Fair before 1,000 electrical engineers at Agricultural Hall in August had in attendance a "galaxy of notables" including Galileo Ferraris, Sir William Preece, Silvanus Thompson, Elihu Thomson and honorary chairman, Heinrich von Helmholtz, who Tesla also took on a tour of his personal exhibit.

Whether Astor attended this lecture is not known, but what is known is that Tesla frequently invited Astor and his alluring wife, Ava Willing, to his New York laboratory where he demonstrated many of the inventions outlined at this spectacular event.

"People crowded about the doors and clamored for admittance.... The great majority of those who came, came with the expectation of seeing Tesla pass a current of 250,000 volts through his body.... Ten dollars was offered for a single seat, and offered in vain. Only members of the Electrical Congress, with their wives, were admitted."

The elder statesman of the electrical community, Elisha Gray, escorted "a tall, gaunt young man towards the platform... [who] smiled with pleasure but modestly kept his eyes on the floor.... Intense and continuous application of his work has sapped his energy until his friends say he has almost reached the point of dissolution.... [Dressed] in a neat four-button cutaway suit of brownish gray..... his cheeks were hollow, his black eyes sunken.... but sparking with animation."

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"I give you," Gray said to a rousing applause "the Wizard of Physics, Nikola Tesla."

"I have with great reluctance accepted these compliments, because I had no right to interrupt the flow of speech of our chairman," Tesla began with characteristic humor. Appearing somewhat like a resurrected cadaver, Tesla spoke to allay the fears of all concerned of his frail health. "A number of scientific men urged [a number of us] to deliver a lecture. A great many promised that they would come, [but] when the program was sifted down, I was the only healthy man left... and so I managed to take some of my apparatus... and give you a brief outline of some of my work."²

Tesla proceeded to display his new steam generators and mechanical oscillators, some of which were so compact "that one could readily carry them in the crown of one's hat." He told the audience that his goals were multi-faceted. Such a device could, among other things be used to run motors with perfect synchrony, or electrical clocks. He had also produced a continuous wave radio transmitter, although no one at the time understood the complete ramifications of the equipment. Nevertheless, when the resonant frequency was reached, wireless lights would illuminate throughout the hall, and in that way intelligence was wirelessly transmitted.

One of Tesla's more unusual exhibits, which was similar to his Egg of Columbus, was another ring which displayed not only the principles to the rotating magnetic field, but also his theory of planetary motion. "In this experiment one large, and several small brass balls were usually employed. When the field was energized all the balls would be set spinning, the large ones remaining in the center while the small ones revolved around them, like moons about a planet...."

"But the demonstration which most impres[sed] the audiences was the simultaneous operation of numerous balls, pivoted discs and other devices placed in all sorts of positions and at considerable distances from the rotating field. When the currents were turned on and the whole animated with motion, it presented an unforgettable spectacle. Mr. Tesla had many vacuum bulbs in which small light metal discs were pivotally arranged on jewels and these would spin anywhere in the hall when the iron ring was energized."³

Journey to Other Worlds

John Jacob Astor, IV, who graduated from Harvard University at the age of 22 in 1888, was one of the wealthiest men on the planet, with assets in the neighborhood of \$100 million. By comparison, J. Pierpont Morgan's wealth at that time was, perhaps \$30 million. Like Tesla, as a youth, Astor

had been an inventor, and he had patented a bicycle brake and a pneumatic walkway which won a prize at the 1893 Chicago World's Fair. Other inventions included a storage battery, an internal combustion engine and also a flying machine.⁴

During his college years, Astor, had undertaken courses with the inimitable astronomy professor William Pickering. One of Astor's pet projects was a way for creating rain by "pumping warm, moist air from the earth's surface into the upper atmosphere," but the patent office had turned him down.⁵ Thus, when Pickering mentioned that the seasons were due to the inclination of the earth's axis off of the ecliptic, Astor became intrigued. If the earth were not tilted away from the sun, Pickering suggested, it would probably have one uniform moderate climate even at the extreme north and south latitudes.

As part of the curriculum, Astor was introduced to the Harvard Observatory. There, along with such up and comers as Perceival Lowell, brother of the president of the university, Astor could peer through the great telescope and view such wonders as the craters on the moon, the orbiting satellites around Jupiter and Saturn's spectacular rings.

In April of 1890, Professor Pickering made headlines when he photographed what he said was a snow storm on the planet Mars. He calculated the area covered was almost equal to that of the United States. Two years later, during a celebrated trip to Harvard's observatory in Arequipa, Peru, the bushily bearded professor announced another major discovery: "lakes in great numbers on Mars. The canals," Pickering proclaimed, "have dark as well as bright regions. We also observed clouds, and the melting of snows, and this confirmed Herschel's hypothesis that there was vegetation around the regions of water."⁶

If there are intelligent inhabitants of Mars or any other planet, it seems to me that we can do something to attract their attention.... I have had this scheme under consideration for five or six years.⁷

Nikola Tesla.

The idea of attempting to signal "Marsians" as they were then called, was a familiar ambition of the day, and Astor, like Tesla was caught in the fancy of it. In 1894, Perceival Lowell announced in *Nature* his description of the canals of Mars. At the same time, Astor, just 30-years-old, completed a science fiction novel about space travel. Entitled *A Journey in Other Worlds*, his book depicted a futuristic vision which took place one century into the future. A few months after publication, in February of 1895, the financier presented a copy to the great inventor. Tesla wrote back promising promised Astor to keep it "as an interesting and pleasant memento of our acquaintance."

Adorned with ethereal outerspace illustrations by Dan Beard, Astor's tale began in the year 2000, with a meeting in New York City at Delmonico's Restaurant, of the Terrestrial Axis Straightening Company, whose task it was to create fair weather throughout the planet.

Inventions Astor envisioned, 100 years hence, included a picture telephone, an aeroplane with the ability to fly to Europe in one day, an electric automobile, hidden phonographs by the police to record conversations of

criminals, color photography, a rain making device, the idea of colonizing the solar system and the understanding that the earth would appear like a crescent moon when seen from outerspace.

Perhaps Astor's most impressive prediction in 1894, was the path that his "space-ship" Callisto, took on its journey to Jupiter. Astor hypothesized that just as magnetism has a repelling force, gravity should as well. He called the opposite of gravity, apery. By harnessing apery, the astronauts in the story, aimed their ship [first] towards the sun, and then "change[d] their course to something like a tangent to the earth, and [received] their final right direction [back out towards Jupiter] in swinging near the moon... to bring apery into play."

Exactly a century after writing this book, NASA actually did send a spacecraft, named the Galileo, on a voyage along a remarkably similar trajectory, using Venus, instead of the moon as the pivot, for the swing-back out towards Jupiter.

Where a modern trip to Jupiter takes several years, Astor's weary travelers covered the distance in a matter of days. Jupiter was abundant with life. Flowers greeted them by "sing[ing] with the volume of a cathedral organ." The red spot, they found out, was caused by a forest changing color due to a cold snap. Armed, the astronauts were able to hunt down animals resembling mastodons which they killed for food. Fortunately, they also had the where-with-all to hop back on to the Callisto so that they could return to the earth.

Fueled by competitive spirit, the newspapers and magazines continued to promulgate the idea that Mars was inhabited by beings possibly more intelligent than we. As Tesla made headlines in the New York dailies and electrical journals for his bold prediction that he would "signal the stars,"⁸ and Astor made the bookstores with his space traveling "romance of the future," other luminaries were also capitalizing on the extraterrestrial fervor.

In 1895, George Lathrop, son-in-law of gothic novelist Nathaniel Hawthorne, had earthlings battle warriors from the Red Planet on the pages of *The New York Journal*. Their weapons were disintegrating death rays invented by the Wizard of Menlo Park, Thomas Edison. The following year, George duMaurier, grandfather of Daphne, wrote the novel *The Martian*, in which he described telepathic winged beings "that descend from no monkey," but are able to adorn with marble statues and irrigate the entire planet. And the year after, H.G. Wells gained notoriety with his serialized 1897 *Person's Magazine* horror story, *War of the Worlds*, where he had ghastly octopussian Martians storm the earth in their egg-shaped spaceships and take over. This 100-year-old tale was made into a blockbuster movie starring Tom Cruise, directed by Steven Spielberg in 2005.

Although fiction, these stories were based upon solid prognostications put forward by supposed sober scientists. Key culprits included the French astronomer Camille Flammarion and his American counterpart Perceival Lowell. Both, having looked through their advanced telescopes, declared that Mars had a canal system set up by intelligent beings. The plurality of worlds hypothesis, namely that life existed elsewhere in the universe, had been a well-accepted theory by such early scientists as Kepler, Newton, Laplace

and Herschel, later day electrical engineers and Tesla contemporaries like Elihu Thomson and Guglielmo Marconi, and modern NASA astrophysicists like Willey Ley and Carl Sagan.

Humans, realizing the immensity of the cosmos, knew that life was not necessarily unique to the earth. Roman and Greek mythology concerning the lives and responsibilities of specific deities, including gods for each planet, probably served as psychological templates influencing astronomers' speculations and corresponding religious beliefs. Thus, Tesla's 1899 speculation when he was in Colorado Springs that he may have intercepted signals from intelligent life-forms on Venus or Mars was well grounded in a world view shared by other prominent individuals, John Jacob Astor among them.

Tesla's connection with Astor was further solidified when the inventor spoke at the implementation of his AC Polyphase system at Niagara Falls. Astor was an important investor in the project.

Remote Controlled Robotics

We entered an immense.... [A figure] was standing motionless near the threshold. My guide touched it twice with his staff, and it put itself into a rapid and gliding movement, skimming noiselessly over the floor. Gazing on it, I then saw that it was no living form, but a mechanical automaton.... Several [other] automata... stood dumb and motionless by the walls.

The Coming Race by Bulwer-Lytton⁹

One of Tesla's greatest inventions in terms of sheer ingenuity, originality and complexity of design was a remote control robotic boat which he called the telautomaton. This device was unveiled at the Electrical Exposition held at Madison Square Garden during the height of the Spanish American War in May of 1898, but earliest precursors could be traced to wireless motors which he displayed before the Institute of Electrical Engineers in 1892.

This single invention not only established all of the essential principles to what came to be known a few years later as the radio, it also lay as the basis of such other creations as the wireless telephone, garage door opener, car radio, facsimile machine, television, the cable TV scrambler, encryption devices and remote control robotics. The precise nature of the invention, virtually its patent application, was published in most of the technical journals at the time of its inauguration.

The telautomaton paralleled precisely a model developed by English novelist, Edward Bulwer-Lytton in 1871, although Tesla insisted in a letter to Johnson written in 1900, that he did not get the idea from this science fiction tale. In *The Coming Race*, Bulwer-Lytton describes a concept which he called "vril power." This was an energy transmitted from the eye and body of the fictional advanced species which was used to animate automatons. In essence, Tesla built a working model substituting electricity for the novelist's "vril."

For Tesla, the spark of life is not only biological, but present in the very structure of matter: "Even matter called inorganic, believed to be dead, responds to irritants and gives unmistakable evidence of a living principle within." Such things as metals respond to stimuli (e.g., magnets). Tesla

refuses to separate the motive forces involved in electromagnetic effects from reactions of "living" matter. This in essence was Bulwer-Lytton's "vril power." The energy that runs the universe directs life.

"Thus, everything that exists, organic or inorganic, animated or inert, is susceptible to stimulus from the outside. There is no gap between, no break in continuity, no special and distinguishing vital agent. The momentous question of Spencer, What is it that causes inorganic matter to run into organic forms? has been answered. It is the sun's heat and light. Wherever they are there is life."¹⁰

"Long ago I conceived the idea of constructing an automaton which would mechanically represent me, and which would respond, as I do myself, but of course, in a much more primitive manner to external influences. Such an automaton evidently had to have motive power, organs for locomotion, directive organs and one or more sensitive organs so adapted as to be excited by external stimuli.... Whether the automaton be of flesh and bone, or of wood and steel, it mattered little, provided it could provide all the duties required of it like an intelligent being."¹¹

For Tesla, his remote controlled boat was not simply a machine, it was a new technological creation endowed with the ability to think. In Tesla's view, it was also, in a sense, the first non-biological life form on the planet. As a prototype, this first new life form was "embodied," in Tesla words, with a "borrowed mind," his own!

The electrical exhibition was organized by Garden manager, Stanford White, who worked with Tesla to fashion a rainbow room of neon lights at the entrance. It had been hoped that President McKinley would illuminate the exposition by means of telegraph lines from Washington, but something went awry, so Vice President Hobart opened the proceedings in person instead. Representing the Marconi company was Tom Edison's son, Tom Jr. This liaison marked the beginning of a partnership between Marconi and Edison, as the Menlo Park wizard had wireless patents which the Italian wanted to own in order to boost his legal position on priority of discovery.

Animosities between Spain and the United States had run high for a number of years. The sinking of the U.S. Maine in Cuba in Havana harbor in February of 1898 finalized any doubts, and war was officially declared two months later. Tesla had been meeting with John Jacob Astor throughout this period in his continuing attempts to woo the financier. It was probably during an outing on Astor's yacht that the inventor conceived of the idea of fashioning the telautomaton in the form of a torpedo.

The colonel jaunted along the deck of his mighty ship, while his wife played mah-jong at home with yet another group of wearysome socialites. Labeled as insipid and henpecked by gossip columnists, Astor sought his freedom on the high seas. Leaning against one of the four machine guns he had installed in order to protect against potential pirates, Astor sounded off. "Come to Cuba with me where you can demonstrate your work upon the insufferable scoundrels," the aristocrat offered as he gazed down the coastline wistfully.

In the heat of the moment, Tesla's bellicose side was awakened, but he graciously declined the offer as he felt that he was called "for a higher duty."

"There can be no 'higher duty' than serving one's country in her time of need," Astor countered.¹²

As Tesla finalized construction of his remote controlled boat, he considered how to make amends, but Astor was in Washinton, conferring with President McKinley about the war. To the amazement of many, Astor donated \$75,000 to the U.S. Army for equipping them with an artillery division for use in the Phillipines, and loaned his yacht to the Navy to be used in battle. The tall ship, nearly 100-yards in length, was equipped with a corps of military seamen. Able to feed 65 at one sitting, the steam driven three-mast schooner made a formidable war ship. With his honorary rank stepped up to Inspector General, Colonel Astor sailed his battalion down to Cuba where he could "watch Teddy Roosevelt in the Battle of San Juan Hill through a pair of field glasses."

Beating the Spanish with modern instruments of destruction became the overriding theme at the Exposition. Tesla would have, by far and away, the most sophisticated construction, but he chose to portray it by deceptively emphasizing mysterious features:

In demonstrating my invention before audiences, the visitors were requested to ask any question, however involved, and the automaton would answer them by signs. This was considered magic at the time, but was extremely simple, for it was myself who gave the replies by means of the device.¹³

The boat, approximately four-feet in length and three-feet high, was placed in a large tank in the center of the auditorium. By means of a variety of transmitters and frequencies, the inventor could start, stop, propel, steer and operate other features, such as put lights on or off. Tesla was also planning on constructing a prototype submersible, perhaps to compete in the mock battles that were staged between models of the American ships and the Spanish Armada, but one was never built.

Probably because of the war with Spain and the inability of the press to comprehend the magnitude of Tesla's accomplishment, many of the newspapers featured Marconi's wireless detonation system and ignored Tesla's invention. By means of a bomb planted on board an enemy frigate, and a simple button placed in the hands of Tom Jr., "Spanish" ships were blown to smithereens. Marconi, however, had not solved the problem of selective tuning, and so, on one occasion, Edison's son accidentally blew up a desk in a back room that had housed other bombs. It was triggered when the resonant frequency to destroy one of the enemy ships was initiated. Fortunately, no one was injured.¹⁴

It appears that the public appreciated the dramatic Marconi contraption which appealed to baser instincts, as compared to Tesla's masterwork which was 16 years ahead of its time operationally and at least a century ahead of its time conceptually, i.e., as envisioned in final form. Only the scientific journals explained in any clarity the complexity of the device.

Tesla's telautomaton remains one of the single most important technological triumphs of the modern age. In its final form, it was conceived as a new mechanical species capable of thinking as humans do, capable of carrying out complex assignments and even capable of reproduction. The

invention also comprised all of the essential features to wireless transmission and selective tuning. Here was a true work of genius.

In November of 1898, the Examiner-in-Chief of patents came to witness a demonstration of Tesla's telautomaton before granting a patent, so "unbelievable" was the claim. "I remember that when later I called on an official in Washington, with a view of offering the invention to the Government," Tesla wrote, "he burst out in laughter.... Nobody thought then that there was the faintest prospect of perfecting such a device."¹⁵

The Waldorf-Astoria

The Waldorf-Astoria was the tallest hotel in the world, it was the center of the city for banquets, concerts and conventions, and the permanent or temporary residence of the wealthiest and most eminent citizens of the day. Residing there became a goal to which Tesla aspired, and it would be one he would achieve in 1898, and he would live there for the next two decades. Built in two parts, the original Waldorf was completed by William Waldorf Astor in 1893, and the Astoria by his cousin, John Jacob Astor IV, completed in late 1897. At first Jack was reluctant to tear down his mother's home to put in a hotel, but after the Waldorf grossed \$4.5 million in its first year, he changed his mind. It's opening "marked the beginning of a new concept in living," to extol the essence of exclusiveness, cordiality, pomposity and elegant grandiosity to the masses.¹⁶

The manager, George C. Boldt, was a Prussian immigrant from the Island of Rugen situated near Denmark in the Baltic Sea. "Mild mannered, dignified and unassuming," Boldt resembled "a typical German professor with his close-cropped beard which he kept fastidiously trimmed... and his pince-nez glasses on a black silk cord." Described also as "a martinet, and a man of mercurial moods," Boldt fawned at the attention of the rich.

The manager also adored mechanical contrivances, sprinkling the hotel with such modern conveniences as pneumatic tubes, electric bulb carriage calls, flashing control panels on the elevators, and "his network of hushed but authoritative buzzers."¹⁷ A few years later, the Waldorf would be the first hotel with a radio tower. No doubt, Tesla, himself an elitist, was attractive to Boldt. With his position of inventor extraordinaire well established, it is likely that the inventor was accepted in a distinct class above the manager. Once he moved in, Tesla may even have avoided paying rent in lieu of his connection with Astor, or he may have negotiated a sweet deal.

With over 900 on staff, the acclaimed "Oscar of the Waldorf" as chef, and Boldt's capable wife overseeing the decor, there was no finer establishment. A regal fragrance wafted from every corner of the hotel with exquisite porcelain, exotic flowers and expensive furniture decorating the halls, dining rooms and suites. This was the alley where the peacocks came to strut. At over 6'2" and dressed in suede high tops, tails, cane, top hat and ever-present white gloves, Nikola Tesla was one of the proudest, best dressed and most renown guests at this grand hotel.

The Spanish-American War dragged on through most of 1898 as Tesla continued to try exploit his telautomaton for use as a naval weapon. He had offered his wireless transmitters for aiding in the organizing of ship and troop movements, but was turned down by the Secretary of the Navy for fear, as Tesla reported a year later, "that I might cause a calamity, as sparks are apt to fly anywhere in the neighborhood of such apparatus when it is at work." Tesla tried to guarantee that he had overcome "these defects and limitations," but it was to no avail. Public demonstrations and photographs of lightning bolts spewing from the wizard worked to hinder any assurances he might give. Instead, during the conflict, the Navy utilized hot air balloons connected to ships by telegraph lines instead. Being up in one would "make a man's hair turn white," as it was an easy target, but soldiers had to "obey orders, and that was all there was to it."

Tesla contacted ship builder submarine builder, John. P. Holland, and the inventor also invited military personnel to his laboratory, particularly Admiral Higginson, Chairman of the Lighthouse Board, to discuss the use of his wireless transmitters aboard a naval ships.¹⁸ But dealing with the government was anything but easy.

Astor's Backing

In August of 1898, John Jacob Astor returned from the battle grounds. He met with Tesla in December at Astor's home. While Jack was considered by many to be "cold-hearted, humorless, weak-minded and almost completely absent of personality," his wife, Ava, was seen as the most beautiful woman in America. Tesla was particularly taken by Lady Astor's loveliness, and it seems that she was enthralled with seeing the inventor's experiments. The three dined together on occasion at Delminicos or the Waldorf, and when Tesla arrived at the Astor residence, he often brought along a bouquet of flowers.¹⁹

The inventor was uncertain as to his standing in the colonel's eyes, but he had a way to smooth things over as Ava was on his side. "My dear Astor," Tesla began, "I would like to explain why I could not go down to Cuba with you."

"I understand," Astor replied. "During the gunfire, perhaps that is when it dawned on me, I realized that your life was too precious to risk on such a trip."²⁰ Tesla thereupon called a meeting with Astor, and two of his cronies, mining magnate "Bonanza" McKay and the well-known banker Darius Ogden Mills. Tesla displayed his continuing progress with his oscillators and fluorescent lights, showed his patent applications, articles which had appeared in the technical journals, and also reports on tests performed by the Royal Society in London and the Roentgen Society in Germany. "Let me read you the following dispatch from Sir William Crookes," Tesla said. "Congratulations. The performance of your machine is marvelous." And Tesla presented another report, which hailed his oscillator as "one of the most significant of the age."

"You will see how many enterprises can be built up on that novel principle, Colonel. It is for a reason that I am often and violently attacked, because my inventions threaten a number of established industries. My telautomaton, for instance, opens up a new art which will sooner or later render large guns

entirely useless, and will make impossible the building of large battleships, and will... compel the nations to come to an understanding for the maintenance of peace." Tesla was referring to a remote controlled torpedo which, because of its lethal capabilities, would move to make conventional warfare obsolete.²¹

"You are taking too many leaps for me," Astor said, causing the others to reconsider as well. "Let us stick to oscillators and cold lights. Let me see some success in the marketplace with these two enterprises, before you go off saving the world with an invention of an entirely different order, and then I will commit more than my good wishes. Stop in again when you have a sound proposal or call me on the telephone."

Tesla waited until the new year, and then hit the colonel broadside with a direct assault. "My dear Astor," Tesla said, "It has always been my firm belief that you take a genuine, friendly interest in myself personally as well as in my labors.... Now I ask you frankly, when I have a friend like J.J.A., a prince among wealthy men, a patriot ready to risk his life for his country, a man who means every word he says -- who puts such a value on my labors and who offers repeatedly to back me up -- have I not a foundation for believing that he would stand by me when, after several years of hard work I have finally brought to commercial perfection some important inventions which, even at the most conservative estimate, must be valued at several million dollars."

Informing Astor that George Westinghouse had given him \$500,000 for the AC polyphase system, and that Edward Dean Adams had invested \$100,000 to become a partner in his later endeavors when he had "14 [new] U.S. and as many foreign patents," Tesla remarked that there was a "powerful clique" which still now opposed him. "And it is chiefly for this reason that I want a few friends, like yourself, to give me at this moment their valuable financial and moral support."

Having "placed faith" in Astor's words, Tesla reveals that he had sold off securities to buy back control of his company, although "Mr. Adams still has a minority interest." Having stated that his laboratory in the past has "paid \$1500 for every \$100 invested, on the average," the inventor proclaims, "I am fully confident that the property which I have now in my hands will pay much better than this."

"I now produce a light superior by far to that of the incandescent lamp with one third of the expenditure of energy, and as my lamps will last forever, the cost of maintenance will be minute. The cost of copper, which in the old system, is a most important item, is in mine reduced to a mere trifle, for I can run on a wire sufficient for one incandescent lamp more than 1000 of my own lamps, giving fully 5000 times as much light. Let me ask you, Colonel, how much, is this alone worth, when you consider that there are hundreds of millions of dollars invested to-day in electric light in the various chief countries in which I have patented my inventions in this field?"

"Sooner or later," Tesla continued, "my system will be purchased either by the Whitney Syndicate, G.E. or Westinghouse, for otherwise they will be driven out of the market."

Astounding the financier with the full breath of his vision, the inventor moved in for the close. "Then consider my

oscillators and my system of transmitting power without wires, my method of directing the movement of bodies at a distance by wireless telegraphy, the manufactures of fertilizers and nitric acid from the air, the production of ozone.... and many other important lines of manufacture as, for instance, cheap refrigeration and cheap manufacture of liquid air, etc. -- and you will see that, putting a fair estimate on all, I cannot offer to sell any considerable amount of my property for less than \$1000/share. I am perfectly sure that I will be able to command that price as soon as some of my inventions are on the market.”

Telling Astor that he has contacts pending with “ the Creusot Works in France, the Helios Company in Germany, Ganz and Company in Austria and other firms,” Tesla requests an investment of \$100,000. “If you do not take that much interest you will put me at a great disadvantage.” Should Astor come in, other Astor associates such as Mr. McKay and Darius Ogden Mills “would do the same.” If, Tesla writes, “after six months you should have any reason to be dissatisfied, it will be my first duty to satisfy you.²²

Astor stressed interest in seeing Tesla exploit his fluorescent lights and the inventor agreed. On January 10, 1899, papers were signed whereby Astor gave Tesla \$100,000 for 500 shares of the Tesla Electric Company, and in return, Astor was elected Director of the Board. At the same time Tesla moved into the Waldorf-Astoria.²³ Tesla also received \$10,000 from the dry-goods manufacturer Simpson and Crawford,²⁴ and he may have also received funds from Mr. Mills or Mr. McKay. An older Tesla company was dissolved, and a new enterprise was created.

All the pieces of Tesla's puzzle were now in place. He had obtained fundamental patents on wireless communication and remote control, he had calculated the type of energy he needed in order to disturb the electrical conditions of the planet, he had obtained a sizeable sum of working capital from one of the wealthiest men in the world, had begun serious negotiations with the U.S. Navy, and as a social triumph, he had moved into the Waldorf-Astoria. The budding entrepreneur settled upon a plan for marketing his oscillators and cold lamps -- well, they could wait for now -- and then Tesla took the next bold step. He would test his wireless theories on a grand scale.

The laboratory at Houston Street was simply too small and vulnerable, to fires and potential spies. With few people knowing, Tesla had scouted the country to seek out potential sites for his new “Experimental Station”. George Scherff, his capable secretary, tried to get Tesla to reconsider, to stay in New York and do something tangible, something that would pay an immediate return, but he was talking to a deaf ear. Destiny was urging Tesla westward.

World Telegraphy

Using Astor's funds, Tesla moved out to Colorado Springs in 1899. There he constructed an experimental wireless transmitting station. Shortly thereafter, Tesla claimed that he was able to circumnavigate the globe with wireless pulses and also use receiving equipment to track thunderstorms 600 miles away. Tesla also claimed that he had intercepted intelligent

signals, three beated pulses, from outer space. Reading between the lines of Tesla's Colorado Springs Notes, I have suggested that this event took place in July of 1899, although there is no direct reference to it in the Notes. He speculated in a prominent article in *Colliers Magazine* entitled “Talking to the Planets,” that they came from Venus or Mars. This has proved unlikely. Two other possibilities are 1) that he intercepted the sending of the letter S in Morse Code by Marconi, who was transmitting that letter in long distance experiments on the high seas that summer, or 2) that he picked up what Jim and Ken Corum call the “morning chorus” which is a beated pulse that can be received from Jupiter at dawn and at dusk during certain times of the year. Having heard the Corum's experiments along these lines, this possibility remains a strong one. Either way, this event served to alienate Tesla from conservative investors who saw the claim as outlandish.²⁵

In 1900, Tesla returned to New York City and formed a partnership with J. Pierpont Morgan. His plan was to create a wireless tower out at Wardencllyffe, Long Island, about 60 miles from the city. Morgan gave Tesla \$150,000. In return, Tesla gave Morgan control over wireless patents but also he was forced to include his patents in lighting as well. This event apparently angered Astor, as Tesla never really exploited his inventions in lighting, but rather used the money to undertake wireless experiments in Colorado Springs. Astor wanted Tesla to sell fluorescent lights.²⁶

We know that fluorescent lights are much more efficient than Edison-based incandescent lamps. They are cold to the touch, use much less power and last for years, whereas Edison lightbulbs give off a great amount of heat and break in a matter of months. Fluorescent lights for homes and buildings would not come to the market until the 1940's. Most likely, this invention was suppressed for economic reasons.

It would take Tesla a number of years to regain his friendship with Astor. During that time, Tesla built his great wireless tower at Wardencllyffe, and ran out of funds before it was completed. Many major investors like Westinghouse, Morgan and Astor were unwilling to aid Tesla at this time, and so, by 1906, the inventor's great plans in wireless were dashed.

Aeroplanes

March 22, 1909. My dear Col. Astor:

I was very glad to know from the papers that you have returned to the city and hasten to tell you that my steam and gas turbine, pump, water turbine, air compressor and propeller have all proved a great success. In the opinion of very competent men these inventions will create an enormous revolution. My gas turbine will be the finest thing in the world for a flying machine because it makes it possible to attain as much as 4 or 5 HP for each pound of weight. I have been hard at work on a design of the flying machine and it is going to be something very fine. It will have no screw propeller or inclined plane, rudder or wane -- in fact nothing of the old, and it will enable us to lift much greater weights and propel them in the air with ever so much greater speed than has been possible so far. We are making up an automobile in which these new principles are embodied and I am also designing a

locomotive for a railroad and am adapting my new propulsion scheme to one of the biggest Atlantic liners. All this information is confidential. I am merely writing knowing that you will be pleased with my success.

With kind regards, I am, Sincerely yours, Nikola Tesla

At this time, Tesla turned his attention to various aeroplane designs, a revolutionary turbine to power ocean liners, radio guided torpedoes and also steam driven cars. In all cases, Tesla's plans were to exploit these other devices so that he could raise the funds to return to Wardenclyffe so that his wireless plant could be resurrected.

My airship will have neither gas bag, wings nor propellers.... You might see it on the ground and you would never guess that it was a flying machine. Yet it will be able to move at will through the air in any direction with perfect safety, higher speeds than have yet been reached, regardless of weather and obvious "holes in the air" or downward currents. It will ascend in such currents if desired. It can remain absolutely stationary in the air even in a wind for a great length of time. Its lifting power will not depend on any such delicate devices as the bird has to employ, but upon positive mechanical action.... [Stability will be achieved] through gyroscopic action of my engine.... It is the child of my dreams, the product of years of intense and painful toil and research.²⁸

Tesla's vehicle had the "reactive jet" placed at its "leading edge," or bulky end, and the 50 steering escape valves placed at the opposite "trailing edge" or tapered end. If fashioned as a lighter-than-air dirigible, the ship would have been modeled, in part, after the work of Henri Giffard, a Frenchman who invented the first dirigible in 1852, as well as Count von Zeppelin, the inventor who had been the first to construct a successful prototype with a rigid metal framework "within the bag." Zeppelin was also one of the first to take into consideration wind resistance, as his ships could travel at speeds upwards of 40 miles per hour. If fashioned as a heavier-than-air construction, the vehicle would have taken into account the work of such pioneers as Lilienthal the inventor of the glider and Langley and the Wright brothers who invented the motor-driven airplane.

June 8, 1908. My dear Colonel,

I am now ready to take an order from you for a self-ropelled flying machine, either of the lighter or heavier-than-air type.

Yours sincerely, Nikola Tesla²⁹

Another horseshoe crab-shaped creation designed by Tesla was called a hovercraft. This vehicle, which resembled a Corvette, placed the powerful turbine horizontally within its center. Operating much like a great fan, the engine created a heavy down draft which caused the vehicle to rise up and ride along the ground on a layer of air. This invention, which apparently worked much like the hovercraft depicted in the original Star Wars films, was the early precursor to the Army's car-sized "Aerial Jeep" which "derive[d] its thrust from ducted fans mounted rigidly in the air frame. To fly horizontally, the entire craft [was] tilted slightly [by the leaning motion of the driver]." In 1960, Scientific American could write that "this

design is being explored because of its simplicity and ... adaptability for flying at very low altitudes."

It is unknown whether or not Tesla ever constructed any of the heavier-than-air hovercrafts, although he may have built a hydrofoil model to skim over the Hudson. And if he did so, it is likely he would have constructed this fast moving boat with the help of John Jacob Astor who wrote about such an invention in his 1894 novel *Journey to Other Worlds*. Other people working on hydrofoils at this time included Alexander Graham Bell and also airplane designer Glenn Curtiss

Ideas inherent in Tesla's hovercraft and paramecium shaped reactive jet dirigibles evolved into today's Harrier fighter plane, a supersonic aircraft able to hover through powerful downdrafts. The seeds of this craft can also be traced to the work of "A.F. Zahm, a prominent aeronautical engineer who patented [in 1921] an airplane with a wing that would deflect the propeller slipstream to provide lift for hovering."

Tesla also had two other important inventions in airplane design. The first was his so-named flivver plane, which took off like a helicopter and then tilted the propeller to fly like a conventional plane. This invention evolved into the Osprey helicopter-airplane, a \$40 million dollar plane that the American armed forces presently use. Another invention was a plane that had no fuel, but rather derived its energy from ground transmitters. There is speculation that Tesla constructed a car which was powered by a wireless transmitter situated near Niagara Falls, but there is no proof that such a device was actually constructed.

As can be seen by the 1908 and 1909 letters to John Jacob Astor, Tesla had rekindled his relationship with the great millionaire. They both shared interest in future science, novel aircraft design and the very process of invention. Astor remained one of Tesla's most generous investors. It is also likely that because of Tesla's connection to the hotel owner, that he stopped paying rent at the Waldorf-Astoria. Unfortunately, Astor was one of the casualties when the Titanic sank in 1912. As it turned out, Tesla owed the hotel nearly \$20,000 in back rent. Unable to raise the funds, Tesla gave the manager, Mr. Boldt, control over the lease to Wardenclyffe in 1915. Two years later, Boldt hired a demolition team and had the Tesla tower destroyed. He used the money from the salvage to recoup some of the funds he thought he was owed. Had Astor not died on the Titanic, it is certainly likely that Wardenclyffe would not have been destroyed at that time, and Tesla would probably have continued to live at the Waldorf on the good graces of his benefactor.

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