

Nikola Tesla: Great Scientist, Forgotten Genius

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In the Pike's Peak mountain range, overlooking Colorado Springs, an eccentric Serbian-born inventor began at the dawn of the twentieth century a series of experiments on electrical properties of the atmosphere in a newly built laboratory 8,000 feet above sea level.

Ringed the laboratory were freshly painted signs warning all who chanced to stumble onto the premises that their lives were in danger.

Probing the heavens from atop the laboratory's roof was a 154-foot mast, anchored by guy-wires, supporting at its peak a hollow copper ball 4 feet in diameter. Its purpose was to collect and store an electrical charge inconceivably large for its day.

The new installation was the brain-child of Nikola Tesla, the immigrant from Austro-Hungary who, only a few years earlier, had developed the means to found a new electrical industry in North America. The invention making this possible was the alternating current generator which today generates powers for billions of people all over the globe.

Paired to the generator was Tesla's alternating current motor without which lathes, dentists drills, revolving doors, water pumps, elevators, and thousands of other instruments now so crucial to our civilization would not operate.

The twin inventions transformed electricity, known since long before Benjamin Franklin had hoisted his kite and key skyward, from a scientific curiosity to the principal agent of a technological revolution which altered the lifestyle of humanity.

Up to that time, electricity had been delivered only in the form of direct current through a method developed by the American genius, Thomas Edison, to power that famous product of his imagination: the light bulb. The drawback of Edison's system was its inability to transmit direct current - which quickly turns to heat when pushed through wires - over any appreciable distance with the assistance of a booster generator for every mile of distance traveled.

Tesla's new approach to the problem rendered Edison's method obsolete at a stroke. By harnessing alternating current, Tesla was able, as early as 1895, to relay a massive quantity of electricity produced by the hydroelectric turbines at Niagara Falls, to users in Buffalo, 22 miles distant, without interceding generating stations.

The man who almost singlehandedly wrought a revolution in applying electricity to man's needs was an enigma to his contemporaries. So advanced were his concepts that the science and industry of his day were unable to comprehend the essence and scope. Half a century before they became widely known, he was experimenting with radar, robots, particle accelerators, and high-temperature plasma. Possessed of such unfathomable power to anticipate the future of technology,

Tesla has caused many to wonder whether he might not have been an extra-worldly superbeing visiting for a time among lesser earthly creatures.

Born in 1856 in the village of Smiljan -- in today's Yugoslavian Croatia -- the young Tesla was urged to study theology by his father, a former professional soldier turned priest. As a child, he continually had strange visions. Frequently, it was only necessary for a word to be spoken in order for him to actually see the object which it represented appear in phantom guise before his eyes and remain there for hours.

To banish unsolicited mental pictures, Tesla conjured up his own images, but, because of his limited experience in the world, they soon became repetitive. Later he recalled that it was as if he could no longer add more frames to a movielike reel in his mind. To surmount this problem, he decided to create new thought-forms from a world beyond the day-to-day life he knew. Of these he later wrote:

I saw new scenes. These were at first blurred and indistinct and would flit away when I tried to concentrate my attention upon them. They gained strength and distinctness and finally assumed the concreteness of real things. I soon discovered that my best comfort was attained if I simply went on in my vision further and further, getting new impressions all the time, and so I began to travel; of course, in my mind. Every night, and sometimes during the day, when alone, I would start on my journeys, see new places, cities and countries, live there, meet people and make friendships and acquaintances and, however unbelievable, it is a fact that they were just as dear to me as those in actual life, and not a bit less intense in their manifestations.

When at age seventeen Tesla first turned to invention, he realized that his childhood ability to visualize objects in three dimensions, once a curse, had become a precious gift, allowing him to materialize mentally the design of any machine he wished to create, to take it apart and put it back together, or simply to observe it in action. When he built real-life machines to the specifications of his own imagining, they operated exactly as he had foreseen.

The acute sensitivity which allowed Tesla to convert his mental constructs to hardware was not unaccompanied by a host of bothersome impressions, known to few other mortals. In a biographical sketch written in 1919, he described his violent aversion to women's earrings and his obsessive fascination for crystals and plain surfaces, his revulsion at touching the hair of another person, the fever simply looking at a peach would arouse, and the nausea brought on by merely glancing at small squares of paper floating in a liquid. Evil spirits, ghosts, and ogres filled him with unremitting dread.

It was not until Tesla read, in Serbian translation, a remarkable novel, *Aoafi*, by the Hungarian writer Josika that he was given a clue about how to control the random unearthly forces coursing through him. The novelist's observations introduced him to an ingredient of the human psyche the existence and force of which he had not yet suspected: *will-power*. Extrapolating from hints in the text, he began to practice inner control his resolution to separate his intent from the clutch of habit at first would fade all too easily, but after doggedly pursuing his effort over several years, he was able to reach a state in which will became identical with desire.

He had so perfected this ability in later life that he could control his body as adroitly as any circus acrobat. At fifty-nine, while walking from his New York laboratory to his residence, he suddenly slipped on the ice and saw his legs go out from under him. As this was happening his mind, calmly observing his predicament, sent instant messages to his muscles. He twisted his body in midair and was seen by stunned passersby to land on the sidewalk in a handstand.

The extraordinary exercise of will-power was not always at Tesla's command; it was especially lacking during times of illness. As chief engineer at the first telephone exchange in Budapest in 1881, he worked himself around the clock to a nervous breakdown, at which point he was again visited by sensations only detectable to an individual of his special sensitivity. As he later recounted:

In Budapest I could hear the ticking of a watch with three rooms between me and the time-piece. A fly alighting on a table in the room would cause a dull thud in my ear. A carriage passing at a distance of a few miles fairly shook my whole body. The whistle of a locomotive twenty or thirty miles away made the bench or chair on which I sat vibrate so strongly that the pain was unbearable. The ground under my feet trembled continuously. In the dark I had the sense of a bat, and could detect the presence of an object at a distance of twelve feet by a peculiar creepy sensation on the forehead."

It was also in Budapest that Tesla, his health recovered, experienced a flash of illumination which first revealed to him how his alternating current devices might work.

While strolling in a park with a friend, he was suddenly moved to declaim lines from Goethe's Faust:

*The glow retreats,
Done is the day of toil.
It yonder hastes, new fields of life exploring.
Ah, that a wing could lift me from the soil
Upon its track to follow, follow soaring.*

Hardly were the words out of his mouth than he was struck by a vision of a magnetic whirlwind turning a motor. Excited, he exhorted his friend to watch the motor run, first in one, then in the opposite direction, and to observe carefully all the parts playing a role in its action.

The companion, who could only see Tesla staring inanely at the setting sun, became so alarmed that he began dragging the engineer towards a park bench. Snapping out of his trance, Tesla refused to sit down and went on and on with a detailed description of his vision, which, over the next several days, he worked up in detailed blueprints in his mind, where they remained stored for the next six years.

This vision was the foundation upon which Tesla invented the rotating magnetic field so fundamental to his alternating current devices.

All his life Tesla worked in privacy so strict that it bordered on secrecy. A recluse by nature, he lived for many years in New York City's Waldorf Astoria, where he could be seen dining alone, in full evening dress, at a table set aside for him by the maitre d'.

He maintained his remoteness from the world in his Rocky Mountain retreat, where he discovered new principles of energy and its transmission which have never been fully elaborated or understood to this day because Tesla and his few surviving collaborators, managed to keep them as hermetically veiled as the teachings of secret societies.

From what is known, it appears that by calculating the speed of thunderstorms, he realized that electrical waves emitted from distant lightning bolts came through in bursts of energy depending on how far away from his receiver the clouds producing them had moved .

It was after observing the electrical effects in the earth of thunderbolts that Tesla discovered the presence of stationary waves in the planet. Some of his conclusions must have mystified even his assistants, for his memoirs reveal that his supersensory powers were still fully active during his sojourn in the Rocky Mountains:

In 1899, when I was past forty and carrying on my experiments in Colorado, I could hear very distinctly thunderclaps at a distance of 550 miles. The limit of audition for my young assistants was scarce more than 150 miles. My ear was thus over three times more sensitive, yet at that time I was, so to speak, stone deaf in comparison with the acuteness of my hearing, while under the nervous strain.

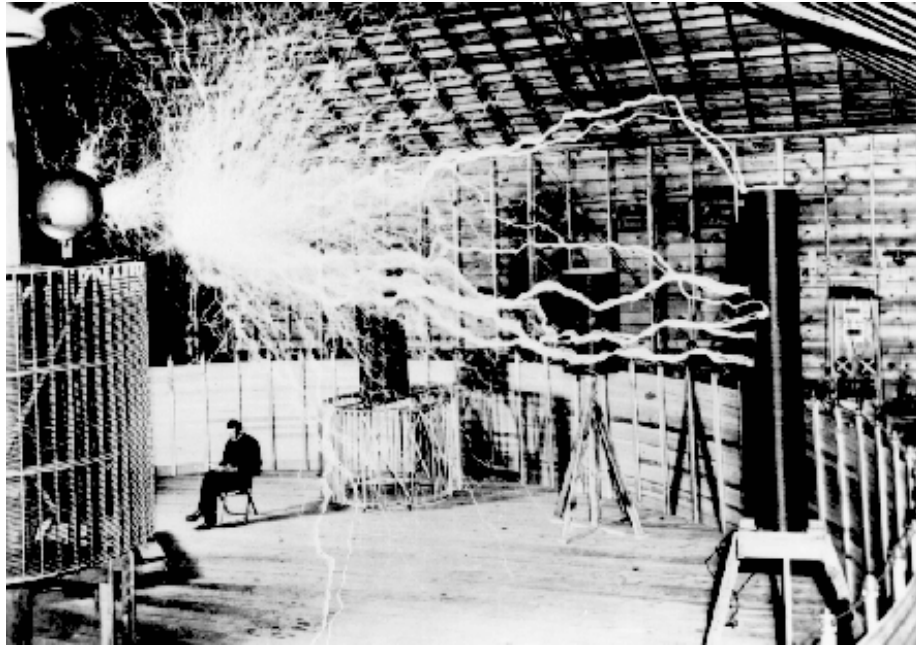
The supersensitive receiver invented by Tesla to track electrical storms also was the first manmade device to detect radio signals coming from the cosmos, over thirty years before a Bell Laboratories researcher, Karl Jansky, picked up similar signals and came to be recognized as the "father of radio astronomy."

Soon after the article appeared, Tesla was granted U.S. Patent No. 685,957 for a version of his receiver, the somewhat cryptic title of which was "Apparatus for the Utilization of Radiant Energy." In the technical idiom of the Victorian Age, he described the operation of the receiver as follows:

By carefully observing well-known rules of scientific design of instruments, the apparatus may be made extremely sensitive and capable of responding to the feeblest influences or disturbances from very great distances and too feeble to be detected or utilized in any of the ways heretofore known, and on this account the method here described lends itself to many scientific and practical uses of great value.

In Colorado, Tesla was also the first and only person to create fire balls, phenomena which remain a complete puzzle to science. These balls often appear in the wake of thunderstorms; moving slowly, they bounce when they strike the earth or any solid object. No one knows why they are more common in certain parts of the earth, such as Sweden or Australia, or why they only average a lifetime of no more than five seconds, although some have been observed to last up to five minutes.

To produce ball lightning, Tesla built a huge model of what the world knows as the "Tesla coil," a radio frequency transformer of unheard-of dimensions and power. It produced 12 million volts and created sparks, or artificial lighting bolts, over 100 feet long. When first energized, it blew out the generator of the Colorado Springs Lighting and Power Company; Tesla supervised the rebuilding.



Tesla's record output has only recently [1975] been equaled in Utah, where in a 60,000 square-foot hangar at Wendover Air force Base, 16 miles from Great Salt Lake's Bonneville Flats, Robert Golka, a Massachusetts-born engineer working under a classified contract, has achieved the production of 15 million volts.

Golka hopes that by duplicating Tesla's equipment as exactly as documentation will allow he can be the second man to produce ball lightning for U.S. government agencies interested in its possible application to thermonuclear power generation.

Golka made a careful study of Tesla's Colorado Springs diary at the Nikola Tesla Museum on Proletarian Brigade Street in Belgrade, Yugoslavia, where his entire inventive and literary estate was transferred after his death.

The estate comprises 100,000 documents, or more than enough to keep researchers with a technical understanding of the four foreign languages in which they were written busy for years. Included are 13,780 pages of biographical material; 75,000 pages of letters to 6,900 correspondents; 34,552 pages of scientific articles, notes, drafts articles, and patents; all of Tesla's diplomas, scientific honors, and newspaper clippings; 5,297 pages of technical drawings and plans; and over 1,000 photographs.

While in his Colorado experimental station, Tesla realized that the earth's atmosphere is analogous to an electric wire of *specific length*. Such a wire can only accommodate a set number of electrical frequencies and their harmonics, just as a string pressed at a fret, and thus shortened or lengthened, will reverberate only a specific family of sound.

Tesla therefore believed that, were enough electrical energy pumped into the earth's atmosphere - which stretches from the ground to the ionosphere, an electrically conducting set of layers 30 miles, and higher, above it - and oscillated at specific frequencies, a growing number of harmonic waves would be set in motion within it. Propagated around the globe, they could then be used, thought Tesla, not only for radio transmission but for wireless broadcast of electricity into homes and industrial plants, as well as to ships at sea and aircraft, if all were equipped with suitable receivers. As he wrote:

Impossible as it seemed, this planet, despite its vast extent, behaves like a conductor of limited dimensions. The tremendous significance of this fact in the transmission of energy in my system had already become quite clear to me. Not only was it possible to telegraphic messages to any distance without wires, as I recognized long ago, but also to impress on the entire globe the faint modulation of the human voice. Far more significant is the ability to transmit power in unlimited amounts to almost any terrestrial distance and without loss.

More importantly, Tesla's research led him to the conclusion that the electrical properties of the negatively charged earth and its positively charged upper atmosphere could be used to supply an almost unlimited quantity of electricity.

To test his ideas, Tesla built a mammoth 75-million-watt "magnifying transmitter" able to light a bank of two hundred 50-watt light bulbs, of his own design, for a total of 10,000 watts of energy, at a distance of 26 miles. (The California Institute of Technology has only recently achieved an optimal figure of 43% in the transmission of microwaves over a maximum distance of 1 mile.) No wires of any kind were utilized. The energy passed right through the ground. And Tesla claimed that only 5% of it was wasted.

If Tesla's design was correct, his scheme could supplant burgeoning projects for solar heating going forward in a number of countries and for which the United States Energy Research and Development Agency has budgeted more than \$125 million dollars for the fiscal year 1977.

The same system, Tesla hinted, could be adapted to military purposes in the form of a defensive weapon. He wrote in *Liberty* magazine (9 February 1935):

My invention requires a large plant, but once it is established it will be possible to destroy anything, men or machines, approaching within a radius of 200 miles. It will, so to speak, provide a wall of power offering an insuperable obstacle against any effective aggression.

What effect such a system would have on intercontinental ballistic missiles is anyone's guess.

The possibility that the Soviet Union may already be at work on potential military aspects of a Tesla system was suggested, however tangentially, by a story appearing 29 October 1976 in the

Washington Star, headlined: "Who's Fouling Up Global Radio? - FCC Prods Soviets on Mystery Signal.

The article called attention to a "superpowerful mysterious radio signal" emanating from somewhere in the region between Minsk and the Baltic Sea which, over several months, had been disrupting maritime, aeronautical, and amateur radio communications to the point where various channels have become virtually useless. All attempts by the United States Federal Communications Commission, which received several hundred complaints, the International Amateur Radio Union in England, and the International Telecommunications Union in Geneva, to elicit precise information from the Russians about the exact location and purpose of the signal have failed.

Tesla also alluded to the fact that his ultra sensitive receiver could be modified to pick-up, store, and amplify the natural vibrations constantly going on in the upper reaches of the earth's gaseous envelope. Such a "solar collector" making use of charged particles instead of heat or light energy, would work night and day and in any weather. Containing not a single moving part, it would have the unnerving appearance of just "sitting there" and putting out electricity- seemingly creating something from nothing.

If Tesla had been the only person to have made such a claim, his evidence might have been discounted and forgotten. However, others, inspired after reading of his achievement, have followed in his footsteps.

Writing on 10 June 1902 to his friend Robert U. Johnson, editor of *Century Magazine*, Tesla included a clipping from the previous day's *New York Herald* about one Clemente Figueras, a woods and forests engineer in Las Palmas, capital of the Canary Islands, who had invented a device for generating electricity without burning fuel.

Figueras's subsequent history is not known, but his achievement prompted Tesla, in his letter to Johnson, to claim priority for first having developed a device similar to the one produced at Las Palmas and, especially, for having revealed the physical laws underlying it.

On 29 July 1920 the Seattle Post Intelligencer ran a front-page spread, including a three-column-wide picture under the title "Hubbard Coil Runs Boat on Portage Bay Ten Knots an Hour; Auto Test Next." The boat, 18 feet long, was propelled across Seattle's Lake Union by a 35 HP electric motor attached to the mysterious coil, the invention of Alfred M. Hubbard, a nineteen year-old gadgeteer.

The newspaper account provides a fascinating description of a small "fuelless" power unit generating a very large amount of electricity. It also recounts some of the difficulties Hubbard experienced in overheating of wires:

The boat circled about the bay and returned to the wharf with never a slackening of speed. The wires connecting coil and motor had begun to heat under the excessive current, and fearing that some part of the coil might give way under the extra heavy strain put on it, Hubbard declined to permit the motor to be run continuously for any length of time. It was tried out later several times, after brief periods, which allowed the wires to cool, and its power apparently showed no diminution.

Hubbard's coil, no larger than a small wastebasket, measured only 11 inches in diameter and 14 inches in length. Its output of current totaled 35,000 watts (280 amperes at 125 volts), or enough power to light 350 100-watt bulbs. The electric motor had to be specially reconstructed for use in conjunction with the coil (however, no details were given).

The inventor maintained that his power unit could operate for years, and that it could drive a large touring car at normal speed, illuminate a medium sized office building, heat seven two room apartments, and allow an airplane to fly all the way around the world without stopping.

Because his device derived its energy from the surrounding air, Hubbard called it an "atmospheric power generator." From the *Post-Intelligencer* account it is clear that the young Washingtonian's generator was quite different, as far as the principle of its construction was concerned, from Tesla's concept. "In general," allowed Hubbard, "it is made up of a group of eight electro-magnets, each with primary and secondary windings of copper wire, which are arranged around a large steel core."

Obviously, the Seattle newspaper accounts do not provide sufficient data to allow us to reconstruct the Hubbard coil or even to learn the amount of wire used, its size, or the number of turns around the axis.

In July 1973 a former resident of Seattle then living in Houston, Texas, wrote to the *Post-Intelligencer* to inquire whether it had published any additional data on Hubbard since the appearance of the articles in the 1920s. In answer to this query, Don Carter, a staff reporter, wrote a follow-up story, dated 16 July 1973 and headlined "Saga of a Boy Inventor and His Mystery Motor." Carter hints that the Hubbard invention was remanded to oblivion by officialdom. "As the Texas reader remembers it," he wrote, "the marvelous invention was quickly squelched by the federal government, which wisely acted to prevent the manufacture and sale of this static electric generator to avert a national financial panic." Carter also dug up the fact that, after making a trip to Washington, D.C., to press for a patent on his device, Hubbard was indicted for using his talents to produce and operate radio transmitters over which rumrunners out of Canadian territory were advised, during Prohibition, when and where it was safe to land their boats and offload contraband liquor. He was cleared of this charge by a federal jury in 1928.

Shortly after Hubbard's exoneration, the *Detroit Free Press* ran a story on 25 July 1928 with a banner headline "Engine Works, Needs No Gas Nor Any Other Fuel - Whirling of Globe May Be Utilized for Driving Planes, Automobiles and Other Machinery at High Speeds."

The new "fuelless motor" had been designed by one Lester Jennings Hendershot of West Elizabeth, Pennsylvania, and successfully tested at Selfridge Army Airfield outside Detroit in a demonstration witnessed by the world-famous aviator Charles Lindbergh, who testified that the motor worked.

When the Seattle *Post-Intelligencer* published the same story, Hubbard, suspecting that his own invention might have been purloined by Hendershot, complained to a staff reporter, R. B. Bermann, who three days later wrote an article headlined "Hubbard Believes Mystery Motor Based upon His Own Invention."

Though Hubbard waffled on exactly how the energy for his motor was actually acquired, he continued to insist that there was no great difference between the instrument tested in Detroit and his own. Trying to establish a link between his work and Hendershot, he did provide a vivid description of the obstacles he had come up against. As he told the *Post Intelligencer* reporter:

I never heard of this Lester J. Hendershot who is demonstrating the motor, but it must be remembered that I worked on the invention for two years in Pittsburgh, in 1921 and 1922. It was Dr. Greenslade who represented the people who were financing me at the time - but, of course, if the people who bought out most of my interest in the invention were to bring it out as their own machine, they would probably do it through a man with whom I never worked. When I made my discovery I was only sixteen years old, and until that time I never even had an ice cream soda. So you can imagine that a couple of thousand dollars looked mighty big to me. I never hesitated for an instant when the people who were financing me insisted on taking fifty percent interest from the start, and I didn't protest when they kept demanding that I sign over more and more of my rights. But at last I just quit them cold.

Hendershot was not more forthcoming than his Seattle predecessor when it came to clearly explaining the principle of his motor's functioning. He maintained that it would run for more than 2,000 hours before any recharging of the magnet was required," that it could "make its own electricity" to "start itself," and that, "based on electromagnetism applied to the rotary motion of the earth," the energy which drove it was the same as that which caused a magnetic compass to rotate.

Seattle Post-Intelligencer

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MYSTERY MOTOR RUN WITHOUT GAS

Meisnest To Resign U. W. Post Today

**GRADUATE
HEAD TO JOIN
COAST FIRM**

**Snow-Laden
Gale Sweeps
Mid-Oregon**

**CALDWELL IS
FINED \$50
BY BOURQUIN**

**Two Unhorsed
As Wales And
Brothers Hunt**

**MUD-SLINGING
INCREASES IN
MAYOR RACE**

**More Seeking
Gold In City
Of Snohomish**

**LINDY TESTS
ELECTRIFIED
AIR ENGINE**

THE POST-INTELLIGENCER.

**ACTION STARTED
ON WATER POWER
AT WASHINGTON**

PLUMBERS ARE EAGER

**NO HOPE FOR WETS
TO BE PUT FORTH
IN COX ADDRESS**

**SEMPER PARATI TO
BANK GAS PRICE**

**WERNER A FELLOW
SEES A FRIEND**

**NONPARTISAN HEADS
DENIED NEW TRIAL**

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DRIVES BOAT WITH NEW ELECTRIC GENERATOR



Hubbard Coil Runs Boat On Portage Bay Ten Knots An Hour; Auto Test Next

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**Seattle Bay Inventor Makes
Good His Claims of Last
Summer When He Announced
Discovery to F. A.**

HUBBARD'S CLAIMS

**SEMPER PARATI TO
BANK GAS PRICE**

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**G. O. PROOF NEW YORK
NOMINATES MILLER
FOR GOVERNORSHIP**

**SEMPER PARATI TO
BANK GAS PRICE**

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**NONPARTISAN HEADS
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**GERMANS BACK
SPA AGREEMENT
BY BIG MAJORITY**

GREENS BOOED BY TURKS

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**Harding to Quit His Porch
For Long Speaking Tour
Through Principal Cities**

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It appeared that Hendershot had first conceived of his motor, not in a waking illumination like Tesla, but in a dream, while experimenting in 1925 on ways of building an improved compass for airplanes.

The officer in command of Selfridge Field, Major Thomas Lanphier, at first highly sceptical, was soon impressed with Hendershot's motor. "I believe," he told the press, "that the invention is something more than the pipe dream I thought it was when I first heard of it. It has no hidden batteries or other phony business. Anyone can convince himself of its efficacy by just throwing the switch and watching it run."

The Hendershot motor attracted the attention of personages of national stature who deprecated or extolled it, depending on whether they viewed it as a threat to their security (financial or otherwise) or as a boon to mankind. On the one hand, the Guggenheim Fund for the Promotion of Aeronautics announced that it would examine the motor. On the other, William S. Knudsen, soon to become president of General Motors, denounced it as impractical "bunk," not failing to add that the internal combustion motor would be around for a long time. Another antagonist was Dr. Frederick Hoffstetter, who, as head of his own research laboratory in Pittsburgh, went to the length of hiring a lecture hall in New York City, where he announced to a large audience that the whole Hendershot story reported in the press was a fraud. He exhibited a model of the motor which he had brought with him, showed that it would not work, and, to clinch his argument, reported that he had found a carbon pencil battery concealed within it.

The furor surrounding the motor led Hendershot to dismantle it and conceal it in a location known only to him. The Free Press announced that, within thirty days, it would be put in operation in an airplane.

Then, on 9 March 1928, the same paper's Washington correspondent reported that Hendershot was lying in serious condition in the District of Columbia's Emergency Hospital, where he had been taken after receiving a severe electric shock from his motor while demonstrating it to patent attorneys.

After his recovery, Hendershot disappeared from public view for more than thirty years, resurfacing only once in 1945, when he sent a letter to the Free Press from the Standard Ship Company's U. S. Navy Office in San Pedro, California. The letter accused scientists who had earlier belittled his efforts of now repeating his statements word for word.

At the end of 1960, Hendershot's device, now called a "magnatronic generator," became the object of a research grant proposal made to the U. S. Navy's Office of Naval Research. The submission was made by Force Research, a group of some twenty Californians who, to quote the proposal, were "united in one centrally administered body to correlate their findings on experiments and problems which otherwise have been unsolved."

Organized by Lloyd E. Cannon, a retired department head at the Weyerhaeuser Lumber Company, it included the controller of Capitol Records in Hollywood, the owner of the Precision Tool and Clock Company in Pasadena, an oil tycoon from Long Beach, a research engineer at the California Institute of Technology's Jet Propulsion Labs in Sierra Madre, the president of McCaffrey

Research Corporation in Palm Springs, and Dr. Daniel Fry, who a few years earlier had written about his incredible contact with an Unidentified Flying Object in his classic, *The White Sands Incident*.

Fry was to be project manager, Hendershot project engineer, for the development of the magnatronic generator for which the group sought \$150,000 from the navy. The proposal provided the names of twenty-two persons (including businessmen, attorneys, contractors, publishers, and engineers) who had witnessed the generator in action, including a Colonel Lanphier, now retired.

The generator was reported to have lit a 100-watt lamp with "induced radio frequency energy. " A Federal Communications Commission engineer who investigated the locale of the experiment told his superiors that he could find "no condition which could account for such a phenomenon," and Bernard Linden, the engineer in charge of the FCC's Los Angeles office, wrote to one of the experiment's witnesses, Dr. Robert Fondiller, a New York engineer, for information on the apparatus used "when observing the above condition. "

The Force Research project came to an end in 1961, when Lester Jennings Hendershot, his dream of providing the world with free energy still unrealized, committed suicide.

One year before Hendershot's death, a book, *The Sea of Energy in Which the Earth Floats*, was privately printed in Salt Lake City by its author, T. Henry Moray, Doctor of Electrical Engineering, who had earned his degree at the University of Uppsala in Sweden while on a stint as a missionary for the Mormon Church.

The book was Moray's account of a nearly fifty-year-long, apparently successful effort to develop yet another collector of atmospheric energy. The inventor states that he took first inspiration from a statement made by Tesla in an 1892 lecture:

Ere many generations pass, our machinery win be driven by a power obtainable at any point of the universe. Throughout space there is energy. Is this energy static or kinetic? If static, our hopes are in vain; if kinetic-and this we know it is, for certain-then it is a mere question of time when men win succeed in attaching their machinery to the very wheelwork of nature.

By the fall of 1910 Moray had collected sufficient power to operate small electrical devices which he demonstrated to friends. It was only after pursuing static energy for more than a year, however, that he finally came to agree with Tesla's statement. In his own words:

It was during the Christmas holidays of 1911 that I began to realize the fact that the energy I was working with was not of a static nature but of an oscillating nature, and that the energy was not coming out of the Earth but that it rather was coming in to the Earth from some outside source.

As principal owner of a Salt Lake electric company, Moray built, during the 1920s and 1930s, a number of radiant energy devices, the parts for each one cannibalized from its predecessor and supplemented with new components.

It was during the second term of President Franklin Delano Roosevelt that Moray, now become chief consulting engineer for the western branch of the Rural Electrification Agency, finally completed an instrument which, though it weighed only slightly over 55 pounds, could deliver up to 50,000 watts.

The new device so contravened the belief structures and training of Moray's fellow REA engineers that one of them, angered by Moray's assertion that he was obtaining energy straight from outer space, took a sledgehammer to the invention and smashed it to pieces. It has been estimated that its reconstruction would today cost over a million dollars.

Before its untimely demise, the Moray invention was said to have lit up a bank of thirty-five light bulbs with bright, cold light. Precisely how - or even whether - it really worked may never be known. However, in his book, Moray sandwiches into a long treatise on cosmic processes involved in the operation of his collector the claim that his early invention of a solid-state component - a type of valve, forerunner of the transistor - was the real key to its functioning. He also submitted that the energy collecting activity of his generator was initiated by stroking its first stage for a minute or so with a magnet to produce oscillations. What happened subsequently, Moray put forward - not entirely lucidly - in a lecture at Valley State College in Northridge, California, on 23 January 1962:

"The circuit is then balanced through synchronization until the oscillations are sustained by harmonic coupling with the energies of the universe. The reinforcing action of the harmonic coupling increases the amplitude of the oscillations until the peak pulses 'spill' over into the next stage through special detectors of valves which then prevent the return or feedback of the energy from the preceding stages. These oscillating pulsations drive each succeeding stage which oscillate at a controlled frequency and which are again reinforced by harmonic coupling with the everpresent energies of the Cosmos. "

The device could also be set going with power from an electric battery, but according to Moray's son, John, his father eschewed its use in demonstrations in favor of the magnet so that witnesses could not say afterwards - as they did about Hendershot's motor - that the invention was basically battery operated.

It is strange that witnesses have testified that both Hendershot's and Moray's inventions would work only with the inventors present. The ONR proposal noted that of many working models of Hendershot's motor built over thirty-five years, none gave sufficient performance "without the hand of Hendershot."

This statement was corroborated by Charles Fort, an original who spent his life collecting and collating unusual data by combing reports in several hundred newspapers on a day-to-day basis; in his book *Wild Talents* Fort suggests that Hendershot might have possessed some power of mind over matter which caused the motor to run only when he was there to affect it.

The fact that Hendershot's motor operated at Selfridge Field only when oriented north-south by not east-west also seems to suggest that it may have been related in its underlying principle to

Wilhelm Reich's motor, said to draw power from a nonelectrical energy called "orgone" which permeates the atmosphere above and rotates in an eastwest direction around the earth.

Whatever the case, since Hendershot's time, Fort's "wild talents" have now invaded the scientific laboratories of several countries where physicists have proved the ability of certain individuals to affect matter in as yet totally inexplicable manner. Despite protests made by professional magicians claiming that his feats are only sleight of hand, the Israeli Uri Geller has astounded scientific observers by bending metal at a distance. In controlled experiments throughout the world, a number of children have recently succeeded in equaling, and even surpassing, Geller's psychokinetic exploits. A book is now on its way to the publisher detailing the scope of what may lead to a Copernican revolution in science.

Late twentieth-century technology has not yet followed up on the trails blazed by Tesla, Hubbard, Hendershot, and Moray. It is not difficult to realize the havoc these inventors would have caused had they been put into operation at the time of their appearance. If "fuelless" power had been widely available in the first decades or even in the middle of this century, whole industries involving massive amounts of capital and employing thousands of workers might have gone under.

In the last quarter of the century it may be that, in the face of mounting costs for oil and uncertainty about the side effects of atomic power plants, new efforts will be made to probe behind the curtain with which Tesla so ingeniously surrounded himself.

Federal officials in Canada are presently studying some aspects of Tesla's power transmission system in the hope of obviating the construction of expensive transmission lines designed to carry hydroelectric power developed in the country's northern regions to the large urban centers concentrated in the south. They are also considering Tesla's charged particle collector as a way of furnishing electricity to Canada's remote Arctic regions, small prairie communities, and individual homes and factories. The potential of energy obtainable from Canadian waterfalls and rivers is so great that there is also the possibility of adapting the Tesla system to export energy to energy-short underdeveloped countries anywhere on earth.

A mystery shrouded the last thirty years of Tesla's life.

Reports leaking out on his Colorado experiments spurred J. Pierpont Morgan to put up money to finance similar work in the East. In 1901 Tesla began erecting a new experimental station on two hundred acres of Long Island land, donated by Morgan's fellow banker, James Warden. The Wardencliff development, almost an exact duplicate of the Pike's Peak installation, was to be the fulfillment of Tesla's dream of creating the hub for a "city beautiful."

When completed in 1905, the station was closed. It seems that Tesla, who had ignored practical monetary matters all his life, had consumed the entire sum made available by Morgan for the station's construction. Operating the laboratory would have required another large donation, not forthcoming.

Though chosen to share the 1912 Nobel Prize in Physics with Edison, Tesla refused it. The Nobel Committee, perhaps angered at this slight, turned its back on America and finally awarded the prize to the Swedish physicist Gustav Dalen. In *Prodigal Genius*, a biography of Tesla, John J. O'Neill speculated on Tesla's motive for turning down the honor:

Tesla made a very definite distinction between the inventor of useful appliances and the discoverer of new principles . . . a pioneer who opens up new fields of knowledge into which thousands of inventors flock to make commercial applications of the newly revealed information. Tesla declared himself discoverer and Edison an inventor; and he held the view that placing the two in the same category would completely destroy all sense of the relative value of the two accomplishments.

From this point on, Tesla's life presents a picture of steadily dwindling energy, though in the 1920s he still had enough forward motion to patent a helicopterlike flying machine and develop an advanced steam turbine.

Legal recognition for his pioneer work in wireless radio transmission came only one year before his death, when the United States Supreme Court wrote an opinion that several important features of Gugliermo Marconi's invention, for which he was awarded the Nobel Prize in 1909, had been anticipated by Tesla.

As recently as January 1976, at a Tesla Symposium held by the Institute for Electronic and Electrical Engineers in New York's Statler Hilton Hotel, J. Roland Morin, Chief Engineer for Large Lamps at Sylvania GTE International, announced that industrial firms are now reinvestigating Tesla's concept for electrodeless discharge lamps inductively coupled to a high-frequency power supply, developed way back in the 1880s but overshadowed by Edison's achievement.

What accounted for Tesla's decline? The only explanation given was based on a story told by the inventor to his biographer, O'Neill, who characterized it as "without parallel in human annals."

O'Neill had noticed that Tesla, poverty-stricken and lonely, spent hours feeding pigeons which he would call from under the Gothic tracery of St. Patrick's Cathedral and eaves of the New York Public Library. What, asked O'Neill, was his fascination with the birds?

'I have been feeding pigeons, thousands of them, for years, ' replied Tesla, 'but there was one pigeon, a beautiful bird, pure white with light gray tips on its wings. That one was different . . . No matter where I was that pigeon would find me; when I wanted her I had only to wish and call her and she would come flying to me . . . I loved that pigeon . . . I loved her as a man loves a woman, and she loved me.

'Then one night as I was lying in my bed in the dark, solving problems, as usual, she flew in through the open window and stood on my desk. I knew she wanted me; she wanted to tell me something important, so I got up and went to her. As I looked at her I knew she wanted to tell me - she was dying. And then, as I got her message, there came a light from her eyes - powerful beams of light . . . a light more intense than I had ever produced by the most powerful lamps in my laboratory.

'When that pigeon died, something went out of my life. Up to that time I knew with a certainty that I would complete my work, no matter how ambitious my program, but when that something went out of my life I knew my life's work was finished.'

Tesla's "World System of Wireless Transmission" as summarized in his article "The Problem of Increasing Human Energy through the Use of the Sun's Energy" (*Century Illustrated Monthly Magazine*, June 1900):

The World System has resulted from a combination of several original discoveries made by the inventor in the course of long-continued research and experimentation. It makes possible not only the instantaneous and precise wireless transmission of any kind of signals, messages, or characters, to all parts of the world, but also the interconnection of the existing telegraph, telephone, and other signal stations without any change in their present equipment. By its means, for instance, a telephone subscriber here may call up and talk to any other subscriber on the globe. An inexpensive receiver, no bigger than a watch, will enable him to listen anywhere, on land or sea, to a speech delivered or music played in some other place, however distant.

The World System is based on the application of certain important inventions and discoveries, including:

1. *The Tesla Transformer.* This apparatus is in the production of electrical vibrations as revolutionary as gunpowder in warfare.
2. *The Magnifying Transmitter.* This is Tesla's best invention - peculiar transformer specially adapted to excite the Earth, which is in the transmission of electrical energy what the telescope is in astronomical observation.
3. *The Wireless System.* This system comprises a number of improvements and is the only means known for transmitting economically electrical energy to a distance without wires

The first World System power plant can be put in operation in nine months. With this power plant it will be practicable to attain electrical activities up to 10 million horsepower (25 billion watts), and it is designed to serve for as many technical achievements as are possible without undue expense.

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