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EDITORIAL

• Faster Than Light! •

By *HUGO GERNSBACK*

IT may come as a shock, to most students of science, to learn that there are still in the world some scientists who believe that there are speeds greater than that of light.

Since the advent of Einstein, most scientists and physicists have taken it for granted that speeds greater than 186,800 miles per second are impossible in the universe. Indeed, one of the principal tenets of the relativity theory is that the mass of a body increases with its speed, and would become infinite at the velocity of light. Hence, a greater velocity is impossible.

Among those who deny that this is true, there is Nikola Tesla, well known for his hundreds of important inventions. The induction motor and the system of distributing alternating current are but a few of his great contributions to modern science. In 1892, he made his historic experiments in Colorado; where he manufactured, for the first time, artificial lightning bolts 100 feet long, and where he was able, by means of high-frequency currents, to light electric lamps at a distance of three miles without the use of any wires whatsoever.

Talking to me about these experiments recently, Dr. Tesla revealed that he had made a number of surprising discoveries in the high-frequency electric field and that, in the course of these experiments, he had become convinced that he propagated frequencies at speeds higher than the speed of light.

In his patent No. 787,412, filed May 16, 1900, Tesla showed that the current of his transmitter passed over the earth's surface with a speed of 292,880 miles per second, while radio waves proceed with the velocity of light. Tesla holds, however, that our present "radio" waves are not true Hertzian waves, but really sound waves.

He informs me, further, that he knows of speeds several times greater than that of light, and that he has designed apparatus with which he expects to project so-called electrons with a speed equal to twice that of light.

Coming from so eminent a source, the statement should be given due consideration. After all, abstract mathematics is one thing, and actual experimentation is another. Not so many years ago, one of the world's greatest scientists of the time proved mathematically that it is impossible to fly a heavier-than-air machine. Yet we are flying plenty of airplanes today.

Tesla contradicts a part of the relativity theory emphatically, holding that mass is unalterable; otherwise, energy could be produced from nothing, since the kinetic energy acquired in the fall of a body would be greater than that necessary to lift it at a small velocity.

It is within the bounds of possibility that Einstein's mathematics of speeds greater than light may be wrong. Tesla has been right many times during the past, and he may be proven right in the future. In any event, the statement that there are speeds faster than light is a tremendous one, and opens up entirely new vistas to science.

While it is believed by many scientists, today, that the force of gravitation is merely another manifestation of electromagnetic waves, there have, as yet, been no proofs of this. There are, of course, many obscure things about gravitation that we have not, as yet, fathomed.

At one time, it was believed by many scientists that the speed of gravitation is instantaneous throughout the universe. This is simply another way of putting it that there are speeds greater than light.

Yet, from a strictly scientific viewpoint, no one today has any idea how fast gravitational waves—always providing that the force is in *waves*—travel. If the moon, for instance, were to explode at a given moment, how long would it be before the gravitational disturbance would be felt on earth? Would the gravitational impulse or waves travel at the speed of light—that is, 186,000 miles per second—or would the effect be instantaneous? We do not know.

The entire subject will no doubt arouse a tremendous interest in scientific circles. It is hoped that other scientists will be encouraged to investigate Dr. Tesla's far-reaching assertions; either to definitely prove or to disprove them.

Painting by Harry T. Fisk

Tesla. "It seems," he says, "that I have always been ahead of my time."

A MACHINE to END WAR

A Famous Inventor, Picturing Life 100 Years from Now, Reveals an Astounding Scientific Venture Which He Believes Will Change the Course of History

by NIKOLA TESLA

AS TOLD TO

George Sylvester Viereck

READING TIME ● 11 MINUTES 20 SECONDS

EDITOR'S NOTE: Nikola Tesla, now in his seventy-eighth year, has been called the father of radio, television, power transmission, the induction motor, and the robot, and the discoverer of the cosmic ray. Recently he has announced a heretofore unknown source of energy present everywhere in unlimited amounts, and he is now working upon a device which he believes will make war impracticable.

Tesla and Edison have often been represented as rivals. They were rivals, to a certain extent, in the battle between the alternating and direct current in which Tesla championed the former. He won; the great power plants at Niagara Falls and elsewhere are founded on the Tesla system. Otherwise the two men were merely opposites. Edison had a genius for practical inventions immediately applicable. Tesla, whose inventions were far ahead of the time, aroused antagonisms which delayed the fruition of his ideas for years.

However, great physicists like Kelvin and Crookes spoke of his inventions as marvelous. "Tesla," said Professor A. E. Kennelly of Harvard University when the Edison medal was presented to the inventor, "set wheels going round all over the world. . . . What he showed was a revelation to science and art unto all time."

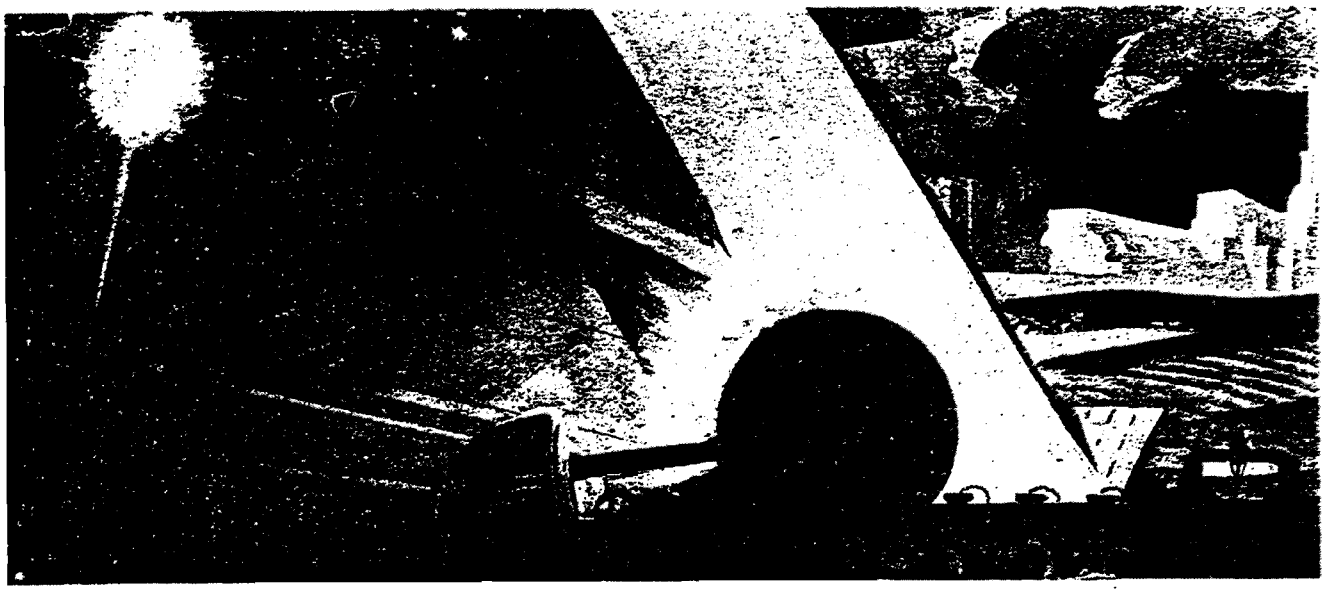
"Were we," remarks B. A. Behrend, distinguished author and engineer, "to seize and to eliminate the results of Mr. Tesla's work, the wheels of industry would cease to turn, our electric cars and trains would stop, our towns would be dark, our mills would be dead and idle."

FORECASTING is perilous. No man can look very far into the future. Progress and invention evolve in directions other than those anticipated. Such has been my experience, although I may flatter myself that many of the developments which I forecast have been verified by events in the first third of the twentieth century.

It seems that I have always been ahead of my time. I had to wait nineteen years before Niagara was harnessed by my system, fifteen years before the basic inventions for wireless which I gave to the world in 1893 were applied universally. I announced the cosmic ray and my theory of radio activity in 1896. One of my most important discoveries — terrestrial resonance — which is the foundation of wireless power transmission and which I announced in 1899, is not understood even today. Nearly two years after I had flashed an electric current around the globe, Edison, Steinmetz, Marconi, and others declared that it would not be possible to transmit even signals by wireless across the Atlantic. Having anticipated so many important developments, it is not without assurance that I attempt to predict what life is likely to be in the twenty-first century.

Life is and will ever remain an equation incapable of solution, but it contains certain known factors. We may definitely say that it is a movement even if we do not fully understand its nature. Movement implies a body which is being moved and a force which propels it against resistance. Man, in the large, is a mass urged on by a force. Hence the general laws governing movement in the realm of mechanics are applicable to humanity.

There are three ways by which the energy which determines human progress can be increased: *First*, we



may increase the mass. This, in the case of humanity, would mean the improvement of living conditions, health, eugenics, etc. *Second*, we may reduce the frictional forces which impede progress, such as ignorance, insanity, and religious fanaticism. *Third*, we may multiply the energy of the human mass by enchaining the forces of the universe, like those of the sun, the ocean, the winds and tides.

The first method increases food and well-being. The second tends to bring peace. The third enhances our ability to work and to achieve. There can be no progress that is not constantly directed toward increasing well-being, peace, and achievement. Here the mechanistic conception of life is one with the teachings of Buddha and the Sermon on the Mount.

While I am not a believer in the orthodox sense, I commend religion, first, because every individual should have some ideal -religious, artistic, scientific, or humanitarian —to give significance to his life. Second, because all the great religions contain wise prescriptions relating to the conduct of life, which hold good now as they did when they were promulgated.

There is no conflict between the ideal of religion and the ideal of science, but science is opposed to theological dogmas because science is founded on fact. To me, the universe is simply a great machine which never came into being and never will end. The human being is no exception to the natural order. Man, like the universe, is a machine. Nothing enters our minds or determines our actions which is not directly or indirectly a response to stimuli beating upon our sense organs from without. Owing to the similarity of our construction and the sameness of our environment, we respond in like manner to similar stimuli, and from the concordance of our reactions, understanding is born. In the course of ages, mechanisms of infinite complexity are developed, but what we call "soul" or "spirit," is nothing more than the sum of the functionings of the body. When this functioning ceases, the "soul" or the "spirit" ceases likewise.

I expressed these ideas long before the behaviorists, led by Pavlov in Russia and by Watson in the United States, proclaimed their new psychology. This apparently mechanistic conception is not antagonistic to an ethical conception of life. The acceptance by mankind at large of these tenets will not destroy religious ideals. Today Buddhism and Christianity are the greatest religions both in number of disciples and in importance. I believe that the essence of both will be the religion of the human race in the twenty-first century.

The year 2100 will see eugenics universally established. In past ages, the law governing the survival of the fittest roughly weeded out the less desirable strains. Then man's new sense of pity began to interfere with the ruthless workings of nature. As a result, we continue to keep alive and to breed the unfit. The only method compatible with our notions of civilization and the race is to prevent the breeding of the unfit by sterilization and the deliberate guidance of the mating instinct. Several European countries and a number of states of the American Union sterilize the criminal and the insane. This is not sufficient. The trend of opinion among eugenists is that we must make marriage more difficult. Certainly no one who is not a desirable parent should be permitted to produce progeny. A century from now it will no more occur to a normal person to mate with a person eugenically unfit than to marry a habitual criminal.

Hygiene, physical culture will be recognized branches of education and government. The Secretary of Hygiene or Physical Culture will be far more important in the cabinet of the President of the United States who holds office in the year 2035 than the Secretary of War. The pollution of our beaches such as exists today around New York City will seem as unthinkable to our children and grandchildren as life without plumbing seems to us. Our water supply will be far more carefully supervised, and only a lunatic will drink unsterilized water.

MORE people die or grow sick from polluted water than from coffee, tea, tobacco, and other stimulants. I myself eschew all stimulants. I also practically abstain from meat. I am convinced that within a century coffee, tea, and tobacco will be no longer in vogue. Alcohol, however, will still be used. It is not a stimulant but a veritable elixir of life. The abolition of stimulants will not come about forcibly. It will simply be no longer fashionable to poison the system with harmful ingredients. Bernarr Macfadden has shown how it is possible to provide palatable food based upon natural products such as milk, honey, and wheat. I believe that the food which is served today in his penny restaurants will be the basis of epicurean meals in the smartest banquet halls of the twenty-first century.

There will be enough wheat and wheat products to feed the entire world, including the teeming millions of China and India, now chronically on the verge of starvation. The earth is bountiful, and where her bounty fails, nitrogen drawn from the air will refertilize her womb. I developed a process for this purpose in 1900. It was perfected fourteen years later under the stress of war by German chemists.

Long before the next century dawns, systematic reforestation and the scientific management of natural resources will have made an end of all devastating droughts, forest fires, and floods. The universal utilization of water power and its long-distance transmission will sup-

ply every household with cheap power and will dispense with the necessity of burning fuel. The struggle for existence being lessened, there should be development along ideal rather than material lines.

Today the most civilized countries of the world spend a maximum of their income on war and a minimum on education. The twenty-first century will reverse this order. It will be more glorious to fight against ignorance than to die on the field of battle. The discovery of a new scientific truth will be more important than the squabbles of diplomats. Even the newspapers of our own day are beginning to treat scientific discoveries and the creation of fresh philosophical concepts as news. The newspapers of the twenty-first century will give a mere "stick" in the back pages to accounts of crime or political controversies, but will headline on the front pages the proclamation of a new scientific hypothesis.

"It will be possible to destroy anything approaching within 200 miles. My invention will provide a wall of power," declares Tesla.

PROGRESS along such lines will be impossible while nations persist in the savage practice of killing each other off. I inherited from my father, an erudite man who labored hard for peace, an ineradicable hatred of war. Like other inventors, I believed at one time that war could be stopped by making it more destructive. But I found that I was mistaken. I underestimated man's combative instinct, which it will take more than a century to breed out. We cannot abolish war by outlawing it. We cannot end it by disarming the strong. War can be stopped, not by making the strong weak but by making every nation, weak or strong, able to defend itself.

Hitherto all devices that could be used for defense could also be utilized to serve for aggression. This nullified the value of the improvement for purposes of peace. But I was fortunate enough to evolve a new idea and to perfect means which can be used chiefly for defense. If it is adopted, it will revolutionize the relations between nations. It will make any country, large or small, impregnable against armies, airplanes, and other means for attack. 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.

If no country can be attacked successfully, there can be no purpose in war. My discovery ends the menace of airplanes or submarines, but it insures the supremacy of the battleship, because battleships may be provided with some of the required equipment. There might still be war at sea, but no warship could successfully attack the shore line, as the coast equipment will be superior to the armament of any battleship.

I want to state explicitly that this invention of mine does not contemplate the use of any so-called "death rays." Rays are not applicable because they cannot be produced in requisite quantities and diminish rapidly in intensity with distance. All the energy of New York City (approximately two million horsepower) transformed into rays and projected twenty miles, could not kill a human being, because, according to a well known law of physics, it would disperse to such an extent as to be ineffectual.

My apparatus projects particles which may be relatively large or of microscopic dimensions, enabling us to convey to a small area at a great distance trillions of times more energy than is possible with rays of any kind. Many thousands of horsepower can thus be transmitted by a stream thinner than a hair, so that nothing can resist. This wonderful feature will make it possible, among other things, to achieve undreamed-of results in television, for there will be almost no limit to the intensity of illumination, the size of the picture, or distance of projection.

I do not say that there may not be several destructive wars before the world accepts my gift. I may not live to see its acceptance. But I am convinced that a century from now every nation will render itself immune from attack by my device or by a device based upon a similar principle.

At present we suffer from the derangement of our civilization because we have not yet completely adjusted ourselves to the machine age. The solution of our problems does not lie in destroying but in mastering the machine.

Innumerable activities still performed by human hands today will be performed by automatons. At this very moment scientists working in the laboratories of American universities are attempting to create what has been described as a "thinking machine." I anticipated this development.

I actually constructed "robots." Today the robot is an accepted fact, but the principle has not been pushed far enough. In the twenty-first century the robot will take the place which slave labor occupied in ancient civilization. There is no reason at all why most of this should not come to pass in less than a century, freeing mankind to pursue its higher aspirations.

And unless mankind's attention is too violently diverted by external wars and internal revolutions, there is no reason why the electric millennium should not begin in a few decades.

THE END