

# HISTORICAL NOTES AND DISCUSSION GUIDE





Image credit: Cole Sarar

# THE PEOPLE

**Nikola Tesla (1856-1943)** – Born in Smiljan, Croatia, Tesla was an innovative inventor and scientist whose major contributions to electrical engineering are the induction motor (aka AC motor) and the Tesla coil. He pioneered robotics, wireless transmission, fluid mechanics, among other sciences. His primary project was the transmission of power through the air with the intention of creating a “world wireless system.” He emigrated to the United States in 1884 and became a citizen in 1891. In his autobiography he credits his mother Djuka as his primary influence.

**Djuka Mandic Tesla (1822-1892)** – The oldest of eight children and mother of five, Djuka was responsible for caring for her younger siblings until her marriage to Milutin Tesla, a Serbian Orthodox priest much like her father Nikola Mandic. Djuka never had an opportunity to be educated but was influenced by her father and grandfather, who enjoyed tinkering and inventing. She embodied this curious and inventive spirit in her domestic innovations by inventing household devices, including machines to enable weaving and embroidery using fibers she grew and spun herself. While we have copious biographical sources available about Nikola Tesla’s life experience, there is very little written about Djuka.



# THE PEOPLE

**Immigration Clerk** - This fictional character is a **foil**—in literary terms, a character who contrasts with another character in order to draw out or contextualize the other character's aspects. While Djuka and Nikola are based on real life historical individuals, this character is from the imagination of the authors in a scenario that provides **exposition**—a literary device that fills in essential background information about the characters and world of the story and helps to establish their emotional stakes.

It's estimated that 3,694,294 immigrants arrived in the United States in the decade between 1890-1900, a decade which also saw the Immigration Act of 1891 which imposed additional restrictions on immigration, and the opening of Ellis Island in 1892.



Image credit: Cole Sarar

# THE SCIENCE

## KEY TERMS

**Lightning** – A naturally occurring electrostatic discharge during which two electrically charged regions temporarily neutralize, or balance, themselves, causing the instantaneous release of energy.

**Static electricity** - An electric phenomenon in which charged particles are transferred from one body to another.

**Simple Machines** - devices (lever, pulley, inclined plane, wedge, wheel and axle, screw) with few or no moving parts that perform work by modifying motion and magnitude of force. They are the simplest mechanisms known that can use leverage, or mechanical advantage, to increase force, and can be considered building blocks for more complex, or compound machines.

**Electromagnetism** - Attractive and repulsive forces between objects caused by the motion of electric charge.

**Dynamo** - A generator that creates electricity, using a commutator (an attachment through which electrical connection is made). A dynamo converts mechanical power into electrical power. Dynamos were the first generators that delivered power to industry.



Image credit: Cole Sarar

# THE SCIENCE

## KEY TERMS

**Direct Current** - Electrical energy that flows through a circuit in one direction.

**Alternating Current** - Electrical energy that periodically changes direction as it flows through a circuit.

**Induction Motor or AC Motor** - Tesla's breakthrough invention was an electric motor that uses a rotating magnetic field to convert alternating electrical energy into rotational motion. In Tesla's autobiography, the induction motor appeared "fully formed in my mind" after a mental breakdown, during which the smallest sounds were like explosions to his ears.

**Tesla Coil** - A device that allows for the precise control of electrical currents. Tesla used it to produce high-voltage, low-current, high frequency AC electricity. Tesla used the coil to experiment with phosphorescence, x-rays, electrotherapy, lighting, and much more. In *Nikola Tesla and the Mother of Invention*, the Tesla coil is used as a magnifying transmitter, for transmitting power through the air.

# DISCUSSION QUESTIONS

1. Tesla family lore suggested that Nikola Tesla was born at midnight during a lightning storm, prompting a nurse to tell his mother the child was a demon, to which Djuka replied “no, he is a child of light.” What role does superstition play in Djuka’s life, and her relationship with Nikola?

2. Djuka shows herself to be creative and mechanically minded despite her lack of formal education. Imagine a different timeline in which Djuka had access to schooling and support in her studies. How might her life be different?

3. Later in his life, Tesla imagined a future with women as leaders. Where did his admiration of women originate, and how is it reflected in Nikola Tesla and the Mother of Invention?

4. While DC dynamos were the first source of industrial power, eventually AC was established as the dominant form of electricity. Sparking brushes on the DC dynamo spurred Tesla to invent the alternating current motor, but the real reason AC became standard was that its voltage could be transformed higher and lower along a power line. Why is that so important?





# DISCUSSION QUESTIONS

5. Geopolitically, the Eastern European region the Teslas called home has undergone many changes, shifting borders, and migrations of people. While Nikola Tesla was born and grew up in the country called Croatia, he considers his identity to be Serbian. How is cultural identity different or the same as national identity, and what makes the distinction important?

6. We are living in a “wirelessly connected world” about which Tesla dreamed. Do you think the internet has made humanity more peaceful and sympathetic, as Tesla theorized? Why or why not?

7. The play uses metaphor to illustrate science concepts through human stories. One metaphor is the “spark of curiosity.” Another is “running in circles” to inspire the mechanics of the AC motor. What other metaphors did you notice in the play, and how does metaphor affect the way you think about a seemingly unrelated concept?



# DISCUSSION QUESTIONS

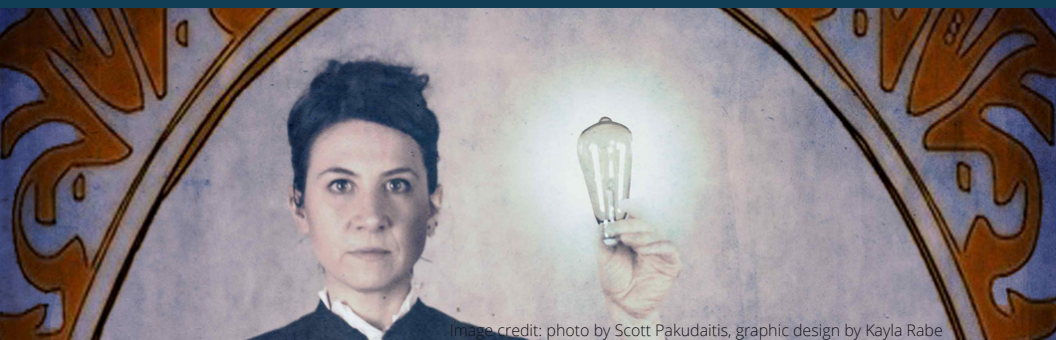
8. Nikola Tesla first arrived in the United States in 1884 and became a citizen in 1891. Two years before his arrival, in 1882, the US passed the Chinese Exclusion Act, which barred Chinese citizens from immigrating to the US. In 1891, the year Tesla became a citizen, the Immigration Act of 1891 imposed further restrictions on who could enter the US. How do you think Nikola Tesla benefited from or was challenged by American attitudes toward immigration during that time in history? Do you think Nikola Tesla would be welcomed as an immigrant today? Why or why not?

9. The character of the immigration clerk goes on a journey from antagonistic to sympathetic in her relationship to Nikola Tesla. What did that character and her personal character add to your understanding of Nikola and Djuka?

10. There is extensive biographical and autobiographical material that tells of Nikola Tesla's life and life experience, but almost no sources that detail Djuka's biography, except in her relationship to her son. If you were to write a play or story that fills in the details of her day to day experience, her feelings and desires, would you write a different story than the one presented here?







# RECOMMENDED READING

*Nikola Tesla and the Mother of Invention* is based on Nikola Tesla's autobiography and widely available biographical information about Nikola, and the rest is imagined by the authors. For more, check out these books, which were major inspirations of the play's authors.

**Cheney, Margaret:** *Tesla: Man Out of Time.*

**Tesla, Nikola:** *My Inventions: An Autobiographical Account of Nikola Tesla.*

**Tesla, Nikola:** *Very Truly Yours, Nikola Tesla.*

And a movie: **"Tesla, Master of Lightning,"** a documentary directed by Robert Uth.

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*Nikola Tesla and the Mother of Invention* was written by Ricky Coates and Sadie Bowman, with music and lyrics by Sadie Bowman and orchestration by Joe McMorrow. Directed by Jason Ballweber.