

## FERMI QUESTIONS

Enrico Fermi was one of this country's greatest physicists. Among his accomplishments were the 1938 Nobel Prize for nuclear and particle physics and the title "Father of the Atomic Age" for his role in building the first nuclear reactor. He had a rare talent as both a gifted theorist and experimentalist. One of his legacies is the "Fermi Question," an insightful question requiring both an understanding of physics principles and estimation skills.



ENRICO FERMI

1901 - 1954

The Fermi Questions given below require information gathered for this workbook, estimation and some clever thinking. The additional questions provide hints for *one possible* way to figure out the answer.

1. How many times do you have to ride Colossus to pay for your Lagoon entrance ticket? Assume an electric motor is 30% efficient, lifts a fully loaded Colossus roller coaster (7200 kg) up the first hill on Colossus.
  - a. Calculate the power necessary to raise the train.
  - b. If Utah Power and Light charges 10 cents per kilowatt-hour, determine the cost of the electricity used to power this ride for one hour. Assume the ride to be operating at maximum capacity of a new train every two minutes.
  - c. So, how many times do you have to ride Colossus?
2. Go check out the Skyscraper Ferris Wheel. This is one big, bright ride! Is it bigger or brighter?
  - a. How much mechanical power is required to turn the Ferris wheel? Estimate the radius, mass and angular velocity to calculate the power needed to form the Ferris wheel. Assume the wheel turns 50% of the time and that the electric motor is 30% efficient.
  - b. How much power is required to run the lights? They are 40 W. bulbs.
  - c. Does it take more power to turn the Ferris wheel or light it?